Analysis of EMR Health Complaints Register Data 2010-2012

ARPANSA commenced Australia's first centralised Electromagnetic Radiation (EMR) Health Complaints Register on 4 July 2003. The Register collects reports of health concerns related to possible EMR field exposures in the range of 0-300 GHz. Members of the public who believe they have suffered ill-effects as a result of exposure to EMR can lodge a written complaint to the Register. ARPANSA does not investigate or attempt to resolve individual complaints but a standard reporting form allows people to describe the nature of their exposure and any adverse health effects they claim to have experienced. The Register operates in strict compliance with the Privacy Act 1988 and, as such, personal information on people reporting may not be disclosed.

Reports

Since its commencement the Register has received 55 reports. Of the 55 reports, 24 were received in the period July 2003 – June 2004, 5 between July 2004 – June 2005, 1 between July 2005 – June 2006, 7 between July 2006 – June 2007, 3 between July 2007 – June 2008 and 9 between July 2008 – June 2010 the analyses of which are available at: http://www.arpansa.gov.au/RadiationProtection/EMR/index.cfm.

A total of 6 reports were received in the period July 2010 – June 2012. The following is an analysis of these 6 reports as well as a cumulative analysis of all 55 reports currently in the Register.

EMR sources

The sources of EMR reported, noting that some reports included more than one EMR source, were:

EMR source	July 2010 – June 2012	Cumulative
household 50Hz electric and magnetic fields	1	16
mobile phones	-	14
communications infrastructure	1	7
broadcast towers	-	5
mobile phone base stations	1	8
cordless phones	1	4
wireless networks	-	4
UHF 2-way radios	-	1
microwave ovens	-	2
satellite dishes	1	1
security devices	-	1
transmission power lines	-	4
distribution power lines	-	5
electricity mains box	1	2
Smart meter	1	1
transformers	-	1
electricity industry	-	1
radar	-	1
welding	-	1
magnetic resonance imaging (MRI) scan	-	1
compact fluorescent lights (CFLs)	1	2
not specified	-	2

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Health effects

Health effects reported, noting that the majority of the reports included more than one health effect, were:

Health effect	July 2010 – June 2012	Cumulative	Health effect	July 2010 – June 2012	Cumulative
anxiety	1	4	itchy eyes		1
attention deficit hyperactivity disorder		1	leukaemia		1
body pain	3	17	lethargy	2	12
bruising		1	memory loss		6
burning sensation		10	miscarriage		1
cognitive problems		3	muscle spasms		3
conception problems		1	muscle stiffness		2
co-ordination problems	1	3	nausea	2	8
cyst above ear		1	nervous tension		2
depression		5	non-Hodgkin's lymphoma		2
digestive problems		1	numbness	1	3
disorientation	2	6	obsessive compulsive disorder		1
disturbed sleep		6	perceived noise	1	5
dizziness	2	16	phosphenes		1
ear ache		4	poor concentration		6
eczema		1	poor vision		2
empty sella syndrome		1	pressure sensations		3
eye strain	1	3	profuse sweating		2
glioblastoma		2	prostate cancer		1
Hair loss	1	1	seizure		2
headaches	1	25	tingling sensation	2	2
heart arrhythmia	2	5	tinnitus	3	6
inflamed vessels		1	vibrating sensations		2
insomnia	2	7	vomiting		2
irritability		3	weight loss		1

Demographics

Age (years)

	Min	Max	Median
July 2010 – June 2012*	42	65	44
Cumulative	8	88	51

*One person during this period did not report their date of birth

Gender (no. of reports)

	males	females
July 2010 – June 2012	1 (17%)	5 (83%)
Cumulative	26 (47%)	29 (53%)

State (no. of reports)

	NSW	Vic	SA	WA	Qld	Tas	ACT	NT
July 2010 – June 2012	4(67%)	2(33%)	-	-	-	-	-	-
Cumulative	28(51%)	14(25%)	3(6%)	4(7%)	4(7%)	1(2%)	1(2%)	-

Other

- One person reporting during July 2010 – June 2012 was not willing to be contacted (6 people in total reporting since the commencement of the register were not willing to be contacted).
- One person reporting had not seen a medical practitioner about their condition during July 2010 – June 2012 (13 in total since the commencement of the register).

Analysis of EMR Health Complaints Register Data 2012–2013

ARPANSA commenced Australia's first centralised Electromagnetic Radiation (EMR) Health Complaints Register on 4 July 2003. The Register collects reports of health concerns related to possible EMR field exposures in the range of 0-300 GHz. Members of the public who believe they have suffered ill-effects as a result of exposure to EMR can lodge a written complaint to the Register. ARPANSA does not investigate or attempt to resolve individual complaints but a standard reporting form allows people to describe the nature of their exposure and any adverse health effects they claim to have experienced. The Register operates in strict compliance with the *Privacy Act 1988* and, as such, personal information on people reporting may not be disclosed.

Reports

Since its commencement the Register has received 91 reports. Of the 91 reports, 24 were received in the period July 2003 – June 2004, 5 between July 2004 – June 2005, 1 between July 2005 – June 2006, 7 between July 2006 – June 2007, 3 between July 2007 – June 2008, 9 between July 2008 – June 2010 and 6 between July 2010 – June 2012 the analyses of which are available at: http://www.arpansa.gov.au/RadiationProtection/EMR/index.cfm.

A total of 36 reports were received in the period July 2012 – June 2013. The following is an analysis of these 36 reports as well as a cumulative analysis of all 91 reports currently in the Register.

EMR sources

The sources of EMR reported, noting that some reports included more than one EMR source, were:

EMR source	July 2012 – June 2013	Cumulative
household 50Hz electric and magnetic fields	5	23
mobile phones	5	19
broadcast towers	-	5
mobile phone base stations	8	23
cordless phones	2	6
wireless networks	4	8
UHF 2 way radios	-	1
airport scanners	1	1
satellite dishes	-	1

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EMR source	July 2012 – June 2013	Cumulative
security devices	-	1
transmission power lines	-	4
distribution power lines	2	7
electricity mains box	1	3
smart meter	21	22
smart meter base station	4	4
sub-stations	3	3
transformers	1	2
solar inverters	2	2
radar	-	1
welding	-	1
magnetic resonance imaging (MRI) scan	-	1
compact fluorescent lights (CFLs)	2	4
not specified	1	3

Health effects

Health effects reported, noting that the majority of the reports included more than one health effect, were:

Health effect	July 2012 – June 2013	Cumulative	Health effect	July 2012 – June 2013	Cumulative
anxiety	6	10	insomnia	13	20
arthritis	1	1	irritability	9	12
attention deficit hyperactivity disorder	-	1	itchy eyes	1	2
body pain	15	32	lethargy	4	16
bruising	-	1	memory loss	3	9
burning sensation	6	16	miscarriage	-	1
cancer	1	5	muscle spasms	1	4
cognitive problems	2	5	muscle stiffness	2	4
conception problems	-	1	nausea	7	15
co-ordination problems	-	3	nervous tension	2	4
cyst	-	1	numbness	5	8

Health effect	July 2012 – June 2013	Cumulative	Health effect	July 2012 – June 2013	Cumulative
dehydration	1	1	obsessive compulsive disorder	-	1
depression	2	7	perceived noise	-	5
digestive problems	1	2	phosphenes	-	1
disorientation	1	7	poor concentration	6	12
disturbed sleep	2	8	poor vision	8	10
dizziness	10	26	pressure sensations	2	5
ear ache	5	9	profuse sweating	-	2
eczema	-	1	renal failure	1	1
empty sella syndrome	-	1	seizure	-	2
eye strain	3	6	stress	1	1
flatulence	1	1	tingling sensation	4	6
hair loss	-	1	tinnitus	9	15
headaches	22	47	vibrating sensations	4	6
hearing loss	1	1	vomiting	2	4
heart arrhythmia	9	14	weight loss	1	2
inflamed vessels	1	2			

Demographics

Age (years)

	Min	Max	Median
July 2012 – June 2013*	13	88	55
Cumulative	8	88	52

*One person during this period did not report their date of birth

Gender (no. of reports)

	males	females
July 2012 – June 2013*	10 (29%)	25 (71%)
Cumulative	36 (40%)	54 (60%)

*One person during this period did not report their gender

State (no. of reports)

	NSW	Vic	SA	WA	Qld	Tas	ACT	NT
July 2012 – June 2013	5(14%)	28(78%)	-	-	-	3(8%)	-	-
Cumulative	33(36%)	42(46%)	3(3%)	4(4%)	4(4%)	7(8%)	1(1%)	-

Other

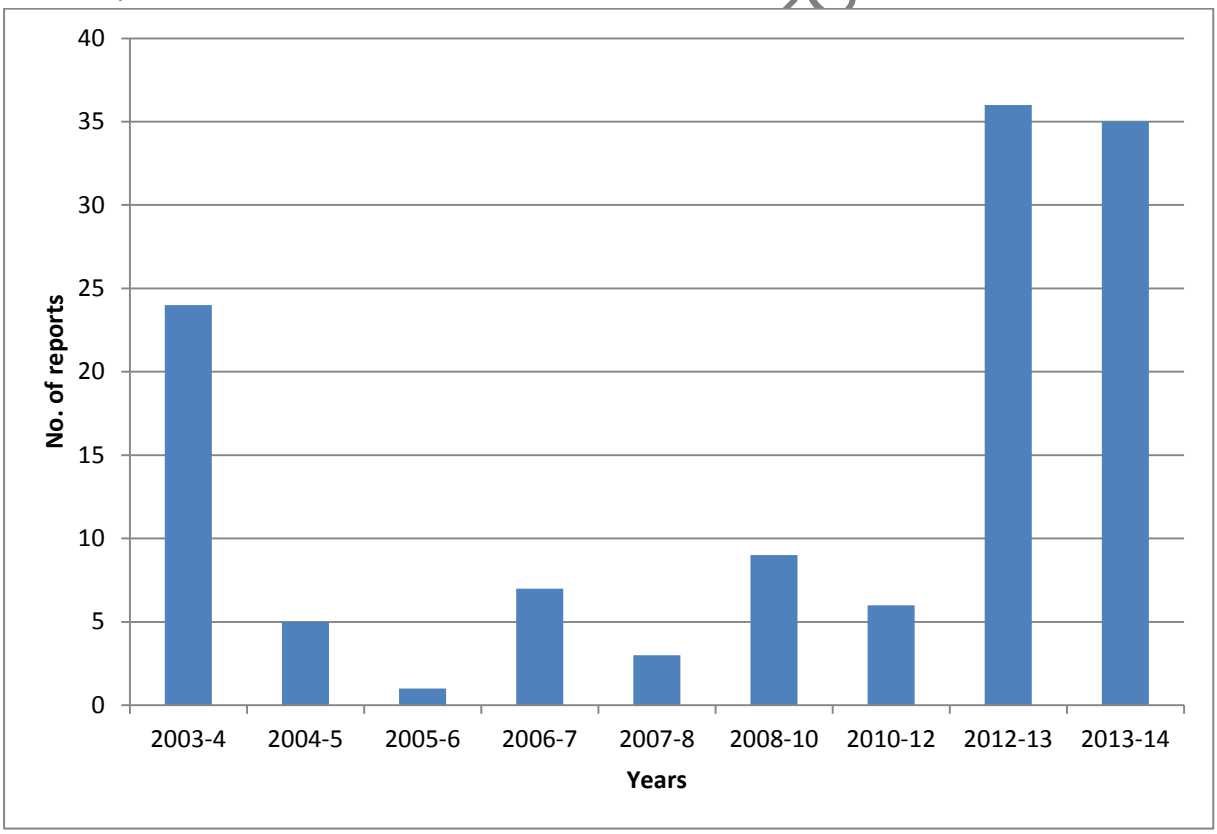
- Ten people reporting during July 2012 – June 2013 were not willing to be contacted (16 people in total reporting since the commencement of the register were not willing to be contacted).
- Six people reporting had not seen a medical practitioner about their condition during July 2012 – June 2013 (19 in total since the commencement of the register).

Analysis of EMR Health Complaints Register Data 2013–2014

ARPANSA commenced Australia's first centralised Electromagnetic Radiation (EMR) Health Complaints Register on 4 July 2003. The Register collects reports of health concerns related to possible EMR field exposures in the range of 0-300 GHz. Members of the public who believe they have suffered ill-effects as a result of exposure to EMR can lodge a written complaint to the Register. ARPANSA does not investigate or attempt to resolve individual complaints but a standard reporting form allows people to describe the nature of their exposure and any adverse health effects they claim to have experienced. The Register operates in strict compliance with the *Privacy Act 1988* and, as such, personal information on people reporting may not be disclosed.

Reports received

Since its commencement the Register has received 126 reports. The number of reports received for different years is shown below.



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EMR sources

The top ten sources of EMR reported during July 2013-June 2014, noting that some reports included more than one EMR source, were:

EMR source	July 2013 – June 2014	Cumulative
smart meter	23	45
mobile phones	12	31
wireless networks	10	18
mobile phone base stations	7	30
household 50Hz electric and magnetic fields	4	27
cordless phones	4	10
compact fluorescent lights (CFLs)	3	7
broadcast towers	2	7
electricity mains box	2	5
transformers	2	4

Health effects

The top ten health effects reported during July 2013-June 2014, noting that the majority of the reports included more than one health effect, were:

Health effect	July 2013 - June 2014	Cumulative
Headaches	21	68
Body pain	12	44
Anxiety	11	21
Lethargy	10	26
Disturbed sleep	8	16
Heart arrythmia	8	22
Tinnitus	8	23
Muscle stiffness	7	11
Nausea	7	22
Burning sensation	6	22

Demographics

Age (years)

	Min	Max	Median
July 2013 – June 2014	34	85	52
Cumulative	8	88	52

Gender (no. of reports)

	males	females
July 2013 – June 2014	16 (46%)	19 (54%)
Cumulative	52 (41%)	74 (59%)

State (no. of reports)

	NSW	Vic	SA	WA	Qld	Tas	ACT	NT
July 2013 – June 2014	1(3%)	30(86%)	-	1(3%)	2(6%)	1(3%)	-	-
Cumulative	34(26%)	72(56%)	3(2%)	5(4%)	6(5%)	8(6%)	1(1%)	-

Other

- Nine people reporting during July 2013 – June 2014 were not willing to be contacted (25 people in total reporting since the commencement of the register were not willing to be contacted).
- Six people reporting had not seen a medical practitioner about their condition during July 2013 – June 2014 (25 in total since the commencement of the register).

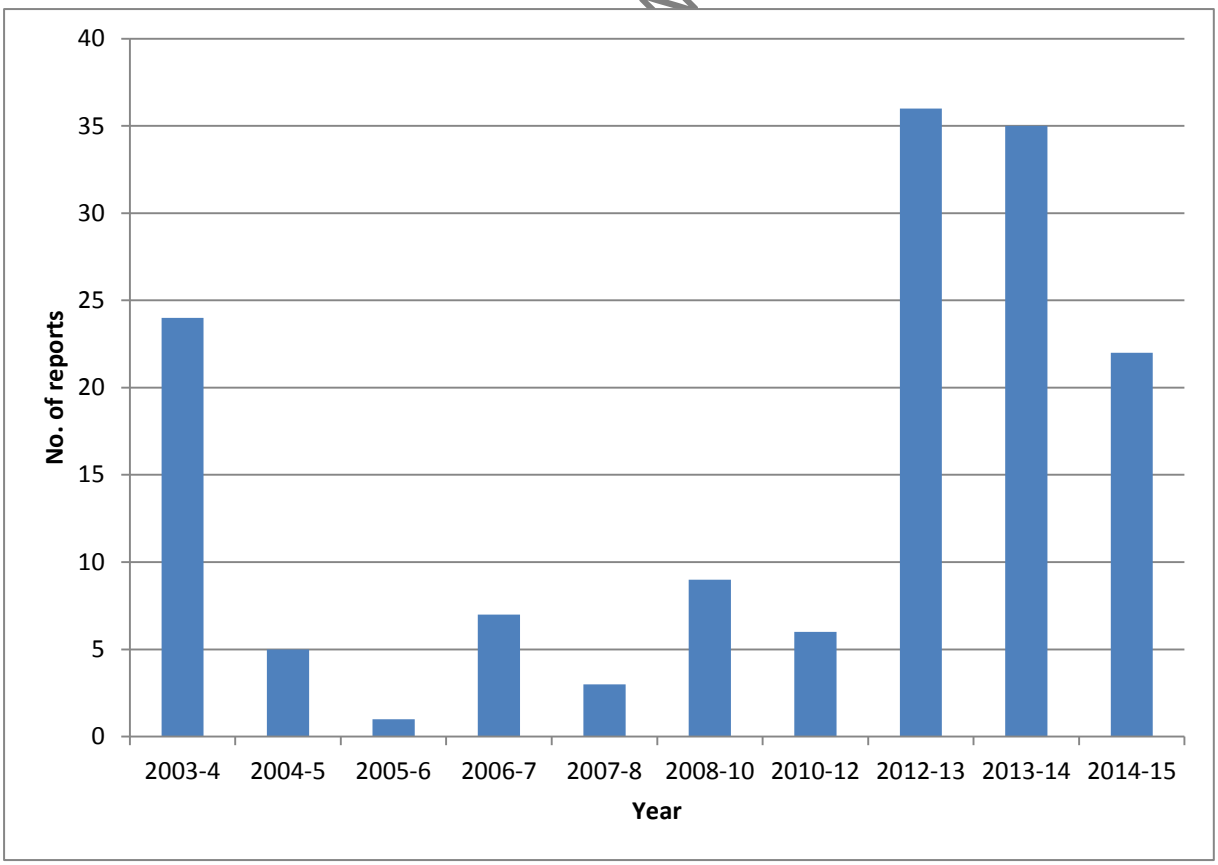
Australian Government
Australian Radiation Protection and Nuclear Safety Agency

Analysis of EMR Health Complaints Register Data 2014–2015

ARPANSA commenced Australia's first centralised Electromagnetic Radiation (EMR) Health Complaints Register on 4 July 2003. The Register collects reports of health concerns related to possible EMR field exposures in the range of 0-300 GHz. Members of the public who believe they have suffered ill-effects as a result of exposure to EMR can lodge a written complaint to the Register. ARPANSA does not investigate or attempt to resolve individual complaints but a standard reporting form allows people to describe the nature of their exposure and any adverse health effects they claim to have experienced. The Register operates in strict compliance with the *Privacy Act 1988* and, as such, personal information on people reporting may not be disclosed.

Reports received

Since its commencement the Register has received 148 reports. The number of reports received for different years is shown below.



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EMR sources

The top ten sources of EMR reported during July 2014-June 2015, noting that some reports included more than one EMR source, were:

EMR source	July 2014 – June 2015	Cumulative
smart meter	15	60
mobile phones	6	37
wireless networks	4	22
household 50Hz electric and magnetic fields	3	30
mobile phone base stations	2	32
broadcast towers	1	8
cordless phones	1	11
distribution power lines	1	8
smart meter base station	1	5
compact fluorescent lights (CFLs)	1	8

Health effects

The top ten health effects reported during July 2014-June 2015, noting that the majority of the reports included more than one health effect, were:

Health effect	July 2014 - June 2015	Cumulative
Tinnitus	10	33
Headaches	8	76
Heart arrythmia	7	29
Disturbed sleep	5	21
Lethargy	5	31
Burning sensation	4	26
Body pain	3	47
Insomnia	3	28
Poor concentration	3	20
Cancer	2	7

Demographics

Age (years)

	Min	Max	Median
July 2014 – June 2015	30	83	55
Cumulative	8	88	52

Gender (no. of reports)

	Males	Females	Not specified
July 2014 – June 2015	7 (32%)	12 (54%)	3 (14%)
Cumulative	59 (40%)	85 (57%)	4 (3%)

State (no. of reports)

	NSW	Vic	SA	WA	Qld	Tas	ACT	NT
July 2014 – June 2015	4(18%)	18(82%)	-	-	-	-	-	-
Cumulative	38(26%)	90(61%)	3(2%)	5(3%)	6(4%)	5(3%)	1(1%)	-

Other

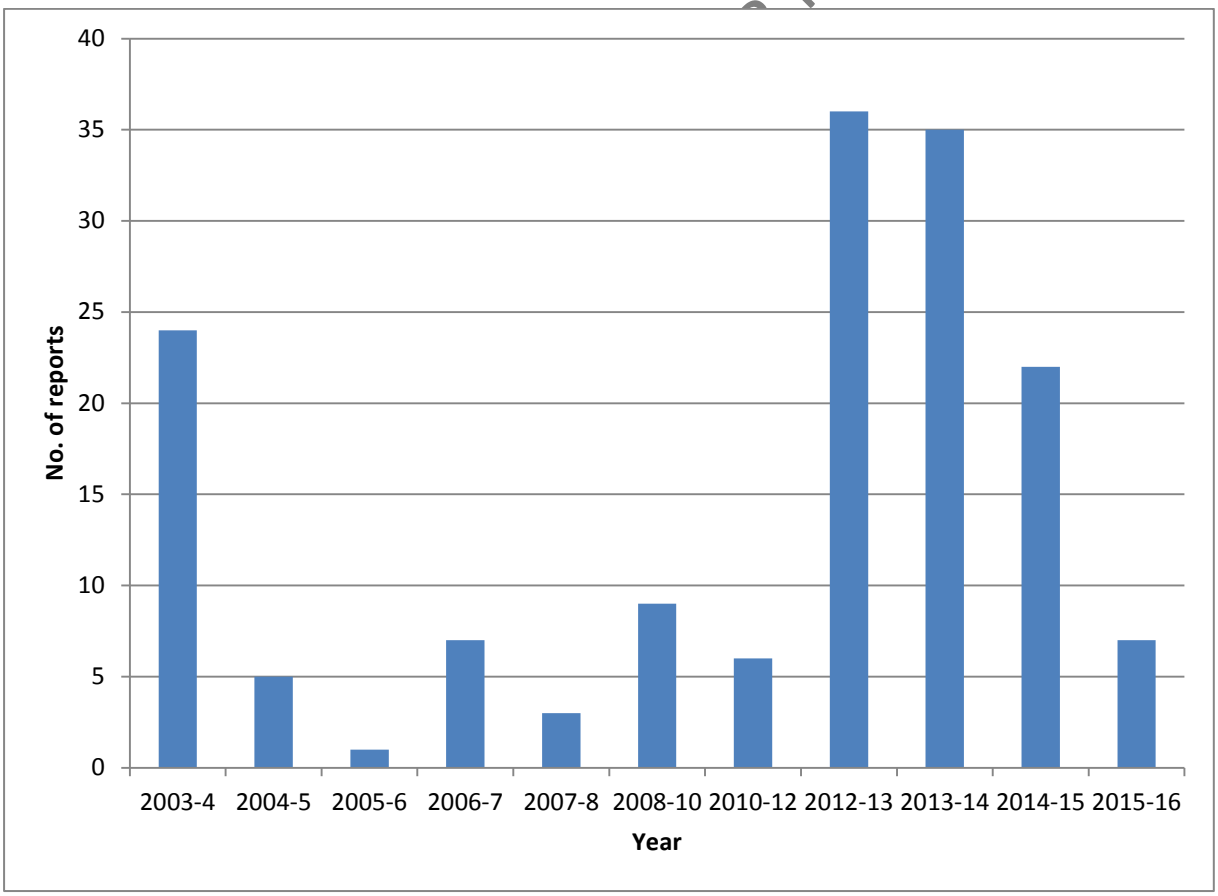
- Four people reporting during July 2014 – June 2015 were not willing to be contacted (29 people in total reporting since the commencement of the register were not willing to be contacted).
- Seven people reporting had not seen a medical practitioner about their condition during July 2014 – June 2015 (32 in total since the commencement of the register).

Analysis of EMR Health Complaints Register Data 2015–2016

ARPANSA commenced Australia's first centralised Electromagnetic Radiation (EMR) Health Complaints Register on 4 July 2003. The Register collects reports of health concerns related to possible EMR field exposures in the range of 0-300 GHz. Members of the public who believe they have suffered ill-effects as a result of exposure to EMR can lodge a written complaint to the Register. ARPANSA does not investigate or attempt to resolve individual complaints but a standard reporting form allows people to describe the nature of their exposure and any adverse health effects they claim to have experienced. The Register operates in strict compliance with the *Privacy Act 1988* and, as such, personal information on people reporting may not be disclosed.

Reports received

Since its commencement the Register has received 155 reports. The number of reports received for different years is shown below.



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EMR sources

The sources of EMR reported during July 2015-June 2016, noting that some reports included more than one EMR source, were:

EMR source	July 2015 – June 2016	Cumulative
smart meter	4	64
household 50Hz electric and magnetic fields	4	34
mobile phone base stations	3	35
electricity mains box	2	7
mobile phones	2	39
wireless networks	2	24
distribution power lines	1	9
solar inverters	1	5

Health effects

The top ten health effects reported during July 2015-June 2016, noting that the majority of the reports included more than one health effect, were:

Health effect	July 2015 - June 2016	Cumulative
Headaches	5	81
Heart arrhythmia	4	33
Nausea	3	27
Poor concentration	3	23
Anxiety	2	23
Insomnia	2	30
Lethargy	2	33
Dizziness	1	35
Burning sensation	1	27
Disturbed sleep	1	22

Demographics

Age (years)

	Min	Max	Median
July 2015 – June 2016	27	77	58
Cumulative	8	88	53

Gender (no. of reports)

	Males	Females	Not specified
July 2015 – June 2016	5 (71%)	2 (29%)	-
Cumulative	61 (39%)	90 (58%)	4 (3%)

State (no. of reports)

	NSW	Vic	SA	WA	Qld	Tas	ACT	NT
July 2015 – June 2016	-	5(71%)	-	1(14%)	1(14%)	-	-	-
Cumulative	38(25%)	95(61%)	3(2%)	6(4%)	7(5%)	5(3%)	1(1%)	-

Other

- Four people reporting during July 2015 – June 2016 were not willing to be contacted (33 people in total reporting since the commencement of the register were not willing to be contacted).
- Two people reporting had not seen a medical practitioner about their condition during July 2015 – June 2016 (34 in total since the commencement of the register).
- Data on people reporting as being electromagnetic hypersensitive since the establishment of the Register was provided (with their permission) to an Australian university for research purposes.

Australian Government
Australian Radiation Protection and Nuclear Safety Agency

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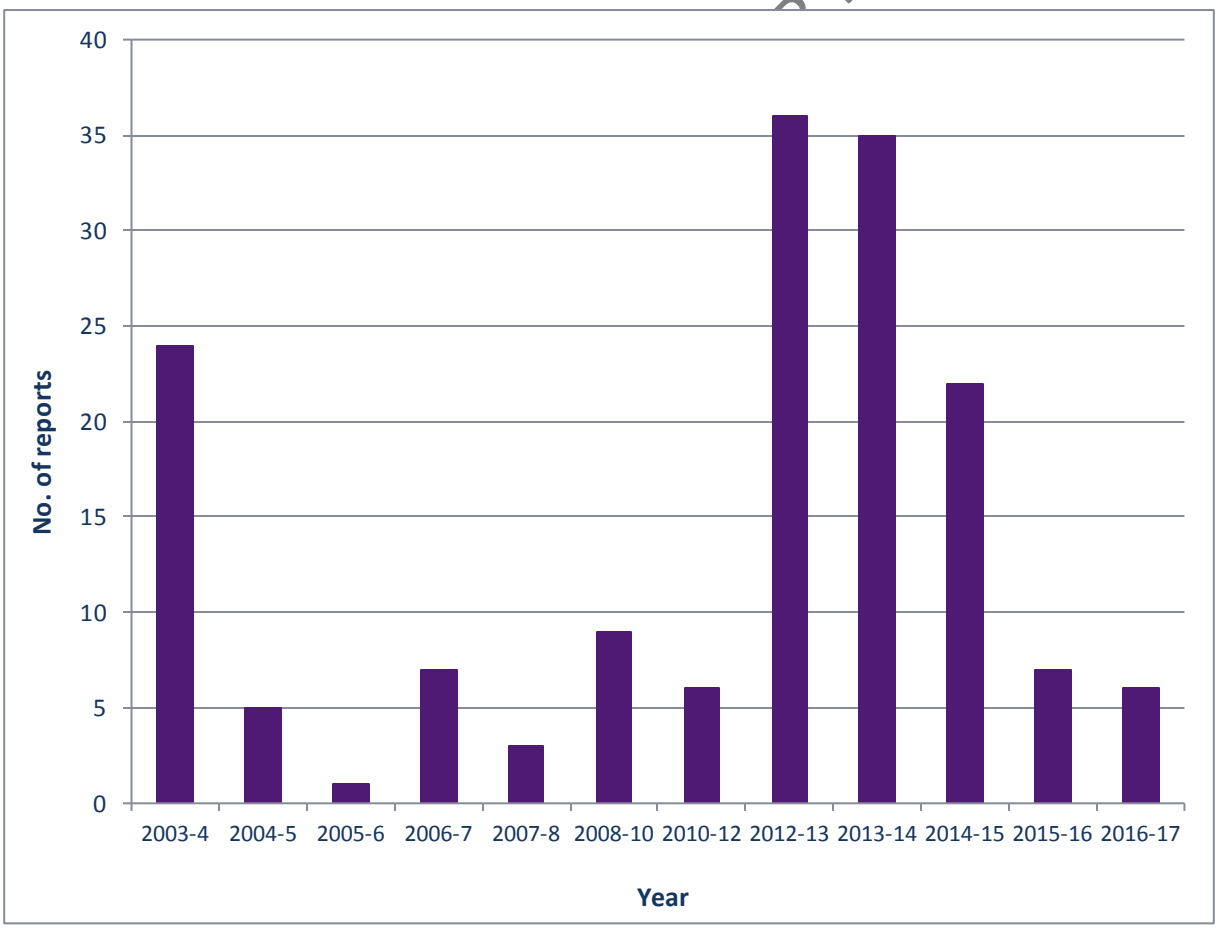
Analysis of EMR Health Complaints Register Data 2016–2017

ARPANSA commenced Australia's first centralised Electromagnetic Radiation (EMR) Health Complaints Register on 4 July 2003. The Register collects reports of health concerns related to possible EMR field exposures in the range of 0-300 GHz. Members of the public who believe they have suffered ill-effects as a result of exposure to EMR can lodge a written complaint to the Register describing the nature of their exposure and any adverse health effects they claim to have experienced. ARPANSA does not investigate or attempt to resolve individual complaints. Relevant data gathered is used to produce annual statistical summaries on the nature and level of complaints received. The Register operates in strict compliance with the *Privacy Act 1988* and, as such, personal information on people reporting may not be disclosed.

Reports received

Since its commencement the Register has received 161 reports. The number of reports received for different years is shown below.



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EMR sources

The sources of EMR reported during July 2016-June 2017, noting that some reports included more than one EMR source, were:

EMR source	July 2016 – June 2017	Cumulative
mobile phones	4	43
wireless networks	3	27
household 50Hz electric and magnetic fields	2	36
mobile phone base stations	2	37
smart meter	2	66
cordless phones	1	12
electricity mains box	1	8
solar inverters	1	6

Health effects

The top ten health effects reported during July 2016-June 2017, noting that the majority of the reports included more than one health effect, were:

Health effect	July 2016 - June 2017	Cumulative
Lethargy	5	38
Insomnia	3	33
Memory loss	3	17
Tinnitus	3	36
Body pain	2	49
Dehydration	2	4
Disorientation	2	13
Headaches	2	83
Nausea	2	29
Poor concentration	2	25

Demographics

Age (years)

	Min	Max	Median
July 2016 – June 2017	45	66	54
Cumulative	8	88	53

Gender (no. of reports)

	Males	Females	No specified
July 2016 – June 2017	45	66	-
Cumulative	8	88	4 (3%)

State (no. of reports)

	NSW	Vic	SA	WA	Qld	Tas	ACT	NT
July 2016 – June 2017	1(17%)	3(50%)	-	-	2(33%)	-	-	-
Cumulative	39(24%)	98(61%)	3(2%)	6(4%)	9(6%)	5(3%)	1(1%)	-

Other

- All of the people reporting during July 2016 – June 2017 were willing to be contacted (33 people in total reporting since the commencement of the register were not willing to be contacted).
- All of the people reporting during July 2016 – June 2017 had seen a medical practitioner about their condition (34 people in total reporting since the commencement of the register had not seen medical practitioner).

Week ending	RF Smart meters
23/04/2010	
30/04/2010	1
7/05/2010	
14/05/2010	
21/05/2010	
28/05/2010	
4/06/2010	
11/06/2010	
18/06/2010	
25/06/2010	
2/07/2010	
9/07/2010	
16/07/2010	
23/07/2010	1
30/07/2010	
6/08/2010	
13/08/2010	
20/08/2010	
27/08/2010	
3/09/2010	
10/09/2010	
17/09/2010	1
24/09/2010	
1/10/2010	
8/10/2010	
15/10/2010	
22/10/2010	1
29/10/2010	
5/11/2010	
12/11/2010	
19/11/2010	
26/11/2010	
3/12/2010	
10/12/2010	
17/12/2010	1
24/12/2010	
31/12/2010	
7/01/2011	

TOTAL SMART METER CALL ENQUIRIES TO 5 OCTOBER 2017 = 651

Week ending	RF Smart meters
14/01/2011	
21/01/2011	
28/01/2011	
4/02/2011	
11/02/2011	
18/02/2011	
25/02/2011	
4/03/2011	
11/03/2011	2
18/03/2011	3
25/03/2011	
1/04/2011	
8/04/2011	5
15/04/2011	9
22/04/2011	2
29/04/2011	1
6/05/2011	2
13/05/2011	3
20/05/2011	2
27/05/2011	2
3/06/2011	3
10/06/2011	3
17/06/2011	3
24/06/2011	1
1/07/2011	1
8/07/2011	3
15/07/2011	2
22/07/2011	5
29/07/2011	2
5/08/2011	2
12/08/2011	3
19/08/2011	4
26/08/2011	3
2/09/2011	4
9/09/2011	1
16/09/2011	2
23/09/2011	1
30/09/2011	3

Week ending	RF Smart meters
7/10/2011	1
14/10/2011	
21/10/2011	2
28/10/2011	5
4/11/2011	7
11/11/2011	7
18/11/2011	2
25/11/2011	3
2/12/2011	
9/12/2011	3
16/12/2011	5
23/12/2011	
30/12/2011	
6/01/2012	
13/01/2012	6
20/01/2012	5
27/01/2012	2
3/02/2012	5
10/02/2012	5
17/02/2012	3
24/02/2012	2
2/03/2012	6
9/03/2012	4
16/03/2012	4
23/03/2012	1
30/03/2012	6
6/04/2012	6
13/04/2012	4
20/04/2012	6
27/04/2012	7
4/05/2012	5
11/05/2012	3
18/05/2012	5
25/05/2012	2
1/06/2012	
8/06/2012	2
15/06/2012	1
22/06/2012	1

	RF
Week ending	Smart meters
29/06/2012	1
6/07/2012	4
13/07/2012	5
20/07/2012	4
27/07/2012	6
3/08/2012	3
10/08/2012	2
17/08/2012	4
24/08/2012	
31/08/2012	6
7/09/2012	2
14/09/2012	2
21/09/2012	
28/09/2012	2
5/10/2012	2
12/10/2012	1
19/10/2012	4
26/10/2012	5
2/11/2012	1
9/11/2012	6
16/11/2012	2
23/11/2012	1
30/11/2012	4
7/12/2012	6
14/12/2012	1
21/12/2012	4
28/12/2012	
4/01/2013	
11/01/2013	4
18/01/2013	6
25/01/2013	4
1/02/2013	3
8/02/2013	5
15/02/2013	1
22/02/2013	1
1/03/2013	7
8/03/2013	1
15/03/2013	3

	RF
Week ending	Smart meters
22/03/2013	4
29/03/2013	4
5/04/2013	1
12/04/2013	
19/04/2013	6
26/04/2013	1
3/05/2013	3
10/05/2013	1
17/05/2013	3
24/05/2013	3
31/05/2013	2
7/06/2013	3
14/06/2013	4
21/06/2013	4
28/06/2013	1
5/07/2013	4
12/07/2013	3
19/07/2013	3
26/07/2013	2
2/08/2013	1
9/08/2013	3
16/08/2013	
23/08/2013	1
30/08/2013	1
6/09/2013	2
13/09/2013	1
20/09/2013	2
27/09/2013	5
4/10/2013	2
11/10/2013	1
18/10/2013	2
25/10/2013	2
1/11/2013	3
8/11/2013	2
15/11/2013	2
22/11/2013	2
29/11/2013	1
6/12/2013	2

Week ending	RF Smart meters
13/12/2013	3
20/12/2013	1
27/12/2013	
3/01/2014	
10/01/2014	1
17/01/2014	
24/01/2014	2
31/01/2014	
7/02/2014	
14/02/2014	1
21/02/2014	2
28/02/2014	3
7/03/2014	1
14/03/2014	2
21/03/2014	
28/03/2014	1
4/04/2014	1
11/04/2014	1
18/04/2014	1
25/04/2014	1
2/05/2014	1
9/05/2014	1
16/05/2014	1
23/05/2014	2
30/05/2014	1
6/06/2014	5
13/06/2014	1
20/06/2014	5
27/06/2014	2
Q1&Q2 2014	36
4/07/2014	
11/07/2014	1
18/07/2014	12
25/07/2014	2
1/08/2014	1
8/08/2014	3
15/08/2014	2
22/08/2014	1

Week ending	RF Smart meters
29/08/2014	
5/09/2014	
12/09/2014	3
19/09/2014	1
26/09/2014	3
3/10/2014	
10/10/2014	
17/10/2014	
24/10/2014	
31/10/2014	6
7/11/2014	1
14/11/2014	
21/11/2014	3
28/11/2014	1
5/12/2014	1
12/12/2014	
19/12/2014	1
26/12/2014	
Q3&Q4 2014	42
2/01/2015	
9/01/2015	2
16/01/2015	1
23/01/2015	
30/01/2015	
6/02/2015	1
13/02/2015	
20/02/2015	1
27/02/2015	
6/03/2015	1
13/03/2015	1
20/03/2015	
27/03/2015	1
Q1 2015	8
3/04/2015	1
10/04/2015	
17/04/2015	
24/04/2015	
1/05/2015	

Week ending	RF Smart meters
8/05/2015	
15/05/2015	
22/05/2015	2
29/05/2015	1
5/06/2015	
12/06/2015	
19/06/2015	
26/06/2015	
Q2 2015	4
3/07/2015	1
10/07/2015	
17/07/2015	1
24/07/2015	2
31/07/2015	
7/08/2015	1
14/08/2015	
21/08/2015	
28/08/2015	2
4/09/2015	1
11/09/2015	
18/09/2015	
25/09/2015	1
Q3 2015	9
2/10/2015	2
9/10/2015	1
16/10/2015	1
23/10/2015	
30/10/2015	1
6/11/2015	
13/11/2015	
20/11/2015	
27/11/2015	
4/12/2015	
11/12/2015	
18/12/2015	1
25/12/2015	
Q4 2015	6
1/01/2016	

Week ending	RF Smart meters
8/01/2016	
15/01/2016	
22/01/2016	
29/01/2016	
5/02/2016	1
12/02/2016	
19/02/2016	
26/02/2016	1
4/03/2016	
11/03/2016	1
18/03/2016	
25/03/2016	
1/04/2016	2
8/04/2016	1
15/04/2016	1
22/04/2016	2
29/04/2016	
6/05/2016	1
13/05/2016	
20/05/2016	1
27/05/2016	3
3/06/2016	
10/06/2016	1
17/06/2016	1
24/06/2016	
1/07/2016	
8/07/2016	
15/07/2016	
22/07/2016	
29/07/2016	1
5/08/2016	
12/08/2016	
19/08/2016	
26/08/2016	
2/09/2016	
9/09/2016	
16/09/2016	1
23/09/2016	1

Week ending	RF Smart meters
30/09/2016	
7/10/2016	
14/10/2016	1
21/10/2016	
28/10/2016	
4/11/2016	
11/11/2016	1
18/11/2016	
25/11/2016	
2/12/2016	
9/12/2016	
16/12/2016	
23/12/2016	
30/12/2016	
6/01/2017	
13/01/2017	1
20/01/2017	
27/01/2017	
3/02/2017	
10/02/2017	
17/02/2017	
24/02/2017	
3/03/2017	
10/03/2017	1
17/03/2017	
24/03/2017	
31/03/2017	
7/04/2017	
14/04/2017	
21/04/2017	
28/04/2017	
5/05/2017	
12/05/2017	
19/05/2017	
26/05/2017	
2/06/2017	
9/06/2017	
16/06/2017	

Week ending	RF Smart meters
23/06/2017	1
30/06/2017	
7/07/2017	
14/07/2017	
21/07/2017	1
28/07/2017	
4/08/2017	1
11/08/2017	
18/08/2017	
25/08/2017	2
1/09/2017	
8/09/2017	
15/09/2017	
22/09/2017	
29/09/2017	1
6/10/2017	

Week ending	RF Smart meters
1/07/2011	
8/07/2011	
15/07/2011	
22/07/2011	
29/07/2011	
5/08/2011	
12/08/2011	
19/08/2011	1
26/08/2011	
2/09/2011	
9/09/2011	
16/09/2011	
23/09/2011	
30/09/2011	1
7/10/2011	
14/10/2011	
21/10/2011	
28/10/2011	
4/11/2011	
11/11/2011	4
18/11/2011	
25/11/2011	
2/12/2011	1
9/12/2011	
16/12/2011	
23/12/2011	
30/12/2011	
6/01/2012	
13/01/2012	
20/01/2012	1
27/01/2012	
3/02/2012	1
10/02/2012	2
17/02/2012	
24/02/2012	
2/03/2012	
9/03/2012	
16/03/2012	
23/03/2012	

TOTAL SMART METER EMAIL ENQUIRIES TO 5 OCTOBER 2017 = 96

Week ending	RF Smart meters
30/03/2012	1
6/04/2012	
13/04/2012	1
20/04/2012	
27/04/2012	
4/05/2012	
11/05/2012	
18/05/2012	
25/05/2012	
1/06/2012	
8/06/2012	
15/06/2012	
22/06/2012	
29/06/2012	1
6/07/2012	1
13/07/2012	
20/07/2012	
27/07/2012	1
3/08/2012	
10/08/2012	
17/08/2012	
24/08/2012	2
31/08/2012	1
7/09/2012	
14/09/2012	
21/09/2012	1
28/09/2012	
5/10/2012	
12/10/2012	
19/10/2012	
26/10/2012	
2/11/2012	
9/11/2012	
16/11/2012	
23/11/2012	
30/11/2012	
7/12/2012	
14/12/2012	1
21/12/2012	1

Week ending	RF Smart meters
28/12/2012	
4/01/2013	
11/01/2013	
18/01/2013	
25/01/2013	
1/02/2013	
8/02/2013	
15/02/2013	1
22/02/2013	1
1/03/2013	
8/03/2013	2
15/03/2013	
22/03/2013	
29/03/2013	
5/04/2013	
12/04/2013	
19/04/2013	
26/04/2013	
3/05/2013	
10/05/2013	
17/05/2013	1
24/05/2013	2
31/05/2013	
7/06/2013	
14/06/2013	
21/06/2013	
28/06/2013	1
5/07/2013	3
12/07/2013	
19/07/2013	
26/07/2013	
2/08/2013	
9/08/2013	
16/08/2013	
23/08/2013	
30/08/2013	
6/09/2013	
13/09/2013	
20/09/2013	2

Week ending	RF Smart meters
27/09/2013	
4/10/2013	
11/10/2013	
18/10/2013	
25/10/2013	
1/11/2013	
8/11/2013	
15/11/2013	
22/11/2013	
29/11/2013	
6/12/2013	1
13/12/2013	
20/12/2013	1
27/12/2013	
3/01/2014	
10/01/2014	
17/01/2014	
24/01/2014	
31/01/2014	1
7/02/2014	1
14/02/2014	
21/02/2014	
28/02/2014	
7/03/2014	
14/03/2014	
21/03/2014	
28/03/2014	
4/04/2014	
11/04/2014	
18/04/2014	1
25/04/2014	
2/05/2014	
9/05/2014	
16/05/2014	
23/05/2014	
30/05/2014	1
6/06/2014	3
13/06/2014	
20/06/2014	1

Week ending	RF Smart meters
27/06/2014	1
Q1&Q2 2014	9
4/07/2014	
11/07/2014	
18/07/2014	1
25/07/2014	2
1/08/2014	
8/08/2014	1
15/08/2014	1
22/08/2014	
29/08/2014	
5/09/2014	
12/09/2014	
19/09/2014	
26/09/2014	
3/10/2014	
10/10/2014	
17/10/2014	
24/10/2014	
31/10/2014	
7/11/2014	
14/11/2014	
21/11/2014	2
28/11/2014	
5/12/2014	
12/12/2014	
19/12/2014	1
26/12/2014	
Q3&Q4 2014	8
2/01/2015	
9/01/2015	
16/01/2015	
23/01/2015	
30/01/2015	
6/02/2015	
13/02/2015	
20/02/2015	1
27/02/2015	
6/03/2015	

Week ending	RF Smart meters
13/03/2015	
20/03/2015	
27/03/2015	
3/04/2015	
10/04/2015	
17/04/2015	
24/04/2015	
1/05/2015	
8/05/2015	
15/05/2015	1
22/05/2015	
29/05/2015	
5/06/2015	
12/06/2015	
19/06/2015	2
26/06/2015	
3/07/2015	
10/07/2015	1
17/07/2015	
24/07/2015	2
31/07/2015	
7/08/2015	
14/08/2015	
21/08/2015	
28/08/2015	2
4/09/2015	
11/09/2015	
18/09/2015	
25/09/2015	
2/10/2015	
9/10/2015	1
16/10/2015	1
23/10/2015	
30/10/2015	1
6/11/2015	
13/11/2015	1
20/11/2015	1
27/11/2015	
4/12/2015	

Week ending	RF Smart meters
11/12/2015	
18/12/2015	
25/12/2015	
1/01/2016	
8/01/2016	
15/01/2016	
22/01/2016	
29/01/2016	
5/02/2016	
12/02/2016	
19/02/2016	
26/02/2016	
4/03/2016	
11/03/2016	
18/03/2016	
25/03/2016	
1/04/2016	1
8/04/2016	2
15/04/2016	
22/04/2016	
29/04/2016	
6/05/2016	1
13/05/2016	1
20/05/2016	
27/05/2016	
3/06/2016	
10/06/2016	
17/06/2016	
24/06/2016	
1/07/2016	1
8/07/2016	
15/07/2016	1
22/07/2016	
29/07/2016	
5/08/2016	
12/08/2016	
19/08/2016	
26/08/2016	
2/09/2016	

Week ending	RF Smart meters
9/09/2016	
16/09/2016	
23/09/2016	
30/09/2016	
7/10/2016	
14/10/2016	1
21/10/2016	
28/10/2016	
4/11/2016	
11/11/2016	
18/11/2016	
25/11/2016	
2/12/2016	1
9/12/2016	
16/12/2016	
23/12/2016	
30/12/2016	
6/01/2017	
13/01/2017	
20/01/2017	
27/01/2017	
3/02/2017	
10/02/2017	
17/02/2017	
24/02/2017	
3/03/2017	
10/03/2017	
17/03/2017	
24/03/2017	
31/03/2017	
7/04/2017	
14/04/2017	
21/04/2017	
28/04/2017	
5/05/2017	
12/05/2017	
19/05/2017	1
26/05/2017	
2/06/2017	

Week ending	RF Smart meters
9/06/2017	
16/06/2017	
23/06/2017	
30/06/2017	
7/07/2017	
14/07/2017	
21/07/2017	
28/07/2017	
4/08/2017	
11/08/2017	
18/08/2017	
25/08/2017	
1/09/2017	
8/09/2017	
15/09/2017	
22/09/2017	
29/09/2017	
6/10/2017	1
13/10/2017	

06/12/2012
Attention: Dr Carl-Magnus Larsson
Chief Executive Officer
ARPANSA

s 47F
[redacted]

Dear Dr Larsson,

I was once a fit and healthy individual but since the rollout of smart meters in our neighbourhood my health has begun to decline noticeably. I have begun to suffer constant headaches, disturbed sleep, insomnia, chest pain, heart palpitations and am always feeling lethargic. The situation appears to be getting worse for me over time as I am finding I am becoming sensitive to things that I have never been sensitive too before, including simple things like my deodorant which I have been using for years. I can no longer sleep in my bedroom or use my front office. I have had to relocate my bed to the back of house where I am able to get some relief. What makes matters worse, is my 6 year old daughter has recently started to complain almost daily of waking up with headaches too.

I recently advised your organisation of my sensitivity in a recent letter to update your organisations complaints register with respect to my sensitivity to Radio Frequency (RF) emissions. I would expect the Government to have a duty of care to protect its citizen's health and wellbeing. That if there are people claiming to be suffering health issues due to exposure to wireless emissions that it would warrant further investigation. Instead people such as myself are being stonewalled and ignored. Not one person from your organisation has contacted me to validate my complaint or provide me with advice on how to mitigate or minimise my exposure. What does ARPANSA do with these complaints? Are they shared with other government departments including the health department? Are there follow up actions taken to consult with those who suffer? What is the point of a complaint register if there is no investigation of the matter? Are we just being used as a measure for statistical analysis and that's all? Who ultimately has the responsibility to investigate the health concerns of affected individuals and why haven't they acted? This lack of consideration and the fact I am being made to suffer in my own home, which is supposed to be my sanctuary, is outrageous and demands immediate investigation particularly since I am not the only one suffering since the rollout started.

A little history for you, I have known I am sensitive to RF frequencies for around 10 years or more and up until recently have been able to manage and limit my exposure. However with the recent rollout of wireless enabled smart meters in Victoria I am finding that my options are very limited especially when my neighbours smart meters, 2 of them, are within a couple of meters of my bedroom. As a result of my sensitivity and the fact that my symptoms began to flare up dramatically after the rollout of smart meters in my street I decided to do some detailed research on both the effects Radio Frequencies (RF) have on Humans and the state of our current RF standards. I had previously sent a letter to the Hon. Michael O'Brien about my concerns with respect to the health and safety of RF frequencies used by smart meters after they were rolled out in my street. I have included the executive summary from that letter below.

Executive Summary

"I would like to start my case by stating up front that I am not an uninformed person that is afraid of technology or progress, nor am I a conspiracy theorist. I embrace technological advances if it is proven to be beneficial to the community and it does not pose a health concern. I am an educated person, holding a Bachelor degree in Science (Monash University), majoring in Biochemistry and Microbiology. I have 20+ years of experience in Information Technology (I am a software architect) and I have a good understanding of the technology used in smart meters. I have two young children

and I want them to grow up in an environment free from the concern that they are being exposed to "potentially carcinogenic" RF radiation.

I do not consent to having a smart meter installed on my property because of the following reasons:

1. I am hypersensitive to RF frequencies, particularly those around 1 Ghz and above. This is real and not imaginary. I understand that I am one of a small number of the population who have this condition (~5 to 10%). There appears to be no provisions in the government mandate that covers people such as me.
2. No choice regarding the frequency of exposure that will occur every day and night. I understand that I am already exposed 24x7 due to mobile towers installed in and around my neighbourhood (without my consent) but this does not mean I accept a smart meter on my property.
3. Powercor's supporting documents are purposely misguiding people by only presenting part of the facts and not the full context (example provided within this letter – relating to number of times data is transmitting especially if a meshed network is used).
4. Wireless/RF safety – The World Health Organisation ("WHO") has classified wireless communication devices such as mobiles as class 2B – Possibly carcinogenic. Group 2B is a category used when "*a causal association is considered credible, but when chance, bias or confounding cannot be ruled out with reasonable confidence."*
5. No definitive causal/proof linking wireless RF with cancer is not the same as proof of safety
6. Scientific studies are flawed and contradictory. Many studies are funded by the same industry that markets wireless devices. Research to date has not looked at the impact beyond 10 -15 years for pulsed microwaves. Cancers can take 20+ years to materialise.
7. Government RF standards are antiquated and focus only on the heat effects. There is no real consideration for non-heat effects of microwaves. They also do not appear to take into consideration the level of RF saturation (manmade) already present in today's environment.
8. Wireless communication is potentially a trillion dollar industry globally. It is significantly doubtful that we can expect to get truthful answers on wireless effects given the amount of investment and the value of the industry.
9. In my eyes, history seems to be repeating itself with the same confounding and contradictory arguments used for and against wireless as a potential carcinogen that we saw 25-30 years ago when scientists debated the effects of smoking. Again conflict of interest prevailed i.e. Revenues of large companies vs long term public health was a problem back then too and is still a problem today."

Mr O'Brien's response to this letter was to say he had been "advised that smart meters meet all the relevant Australian Standards for electricity metering equipment and safety guidelines….. The Exposure Standard is based on the exposure limits in the Radiation Protection Standard for Maximum Exposure Levels to Radiofrequency Fields – 3 khz to 300 GHz published by Australian Radiation Protection and Nuclear Safety Agency (the ARPANSA Standard)…". My response to this is detailed quite comprehensively below and I would be interested in understanding what ARPANSA's take on my findings are and what actions your organisation will be taking to address my concern that Australia's RF standards are out of date and irrelevant when it comes to providing long term public health and safety assurances against manmade RF emissions?

RF Standards are out of date and irrelevant for long term public health and safety

From my research of ARPANSA's RF Standards I have noted that they have not been updated since April 2002 and are in fact based on even older guidelines published in 1998 called the 1998 Guidelines of the International Commission on Non-Ionizing Radiation Protection (ICNIRP). So, not only are our standards out dated, they do not take into consideration any of the latest scientific findings and developments which are the basis for determining public health policy. The RF standards make no reference to the BioInitiative report (2007) or offer any repudiation of any of the

BioInitiative findings (discussed in detail further below). In other words, without updating the RF standards, the health policy regarding smart meters is not evidenced based. Moreover, the standards address short term acute exposure only with measurements being recorded for a 6 minute period for both SAR (Table 2 below) as well as RMS Electrical and Magnetic Fields (Table 7 below) – this does not, and cannot answer the question of what happens in the long term after people are subjected to continuous long term exposure to pulsed RF radiation. This is further complicated by the fact that it appears by default that installed smart meters are actually transmitting 100's to 1000's of times a day (I have personally verified this using an EMR meter on a number of smart meters in my street) rather than what is being told to us by the power companies who advise us that transmissions occur every 4 hours. Technically the power utilities are correct in that "power usage" data for that specific household is transmitted every 4 hours but what the power companies neglect to tell us is that smart meters in many cases are being set up in a meshed network which results in a large number of transmissions simply to keep the network up and to potentially pass on power usage data from other houses (refer to table 2-1 on page 10 of this letter).

"In the frequency range between 100 kHz and 6 GHz, basic restrictions on whole body average SAR are provided to prevent whole-body heat stress. Basic restrictions on spatial peak SAR, in the head and torso and in the limbs, are intended to prevent excessive localised temperature rise in tissue. Due to thermal inertia of tissue, a six minute averaging time is appropriate for time averaged SAR measurements (see Table 2)." [1]

TABLE 2

BASIC RESTRICTIONS FOR WHOLE BODY AVERAGE SAR AND SPATIAL PEAK SAR

Exposure category	Frequency range	Whole-body average SAR (W/kg)	Spatial peak SAR in the head & torso (W/kg)	Spatial peak SAR in limbs (W/kg)
Occupational	100 kHz–6 GHz	0.4	10	20
General public	100 kHz–6 GHz	0.08	2	4

NOTES:

1 For comparison with the limits in Table 2, the measured or calculated SAR exposure level should be averaged over any six minute period.

2 Whole body average SAR is determined by dividing the total power absorbed in the body by the total mass of the body.

3 Spatial peak SAR averaging mass is any 10 g of contiguous tissue in the shape of a cube.

TABLE 7

REFERENCE LEVELS FOR TIME AVERAGED EXPOSURE TO RMS ELECTRIC AND MAGNETIC FIELDS (UNPERTURBED FIELDS)

Exposure category	Frequency range	E-field strength (V/m rms)	H-field strength (A/m rms)	Equivalent plane wave power flux density S_{eq} (W/m^2)
Occupational	100 kHz – 1 MHz	614	$1.63/f$	—
	1 MHz – 10 MHz	$614/f$	$1.63/f$	$1000/f^2$ (see note 5)
	10 MHz – 400 MHz	61.4	0.163	10 (see note 5)
	400 MHz – 2 GHz	$3.07 \times f^{0.5}$	$0.00814 \times f^{0.5}$	$f/40$
	2 GHz – 300 GHz	137	0.364	50
General public	100 kHz – 150 kHz	86.8	4.86	—
	150 kHz – 1 MHz	86.8	$0.729/f$	—
	1 MHz – 10 MHz	$86.8/f^{0.5}$	$0.729/f$	—
	10 MHz – 400 MHz	27.4	0.0729	2 (see note 6)
	400 MHz – 2 GHz	$1.37 \times f^{0.5}$	$0.00364 \times f^{0.5}$	$f/200$
	2 GHz – 300 GHz	61.4	0.163	10

NOTES:

1 ***f* is the frequency in MHz.**

2 For frequencies between 100 kHz and 10 GHz, S_{eq}, E^2 and H^2 must be averaged over any 6 minute period.

3 For frequencies exceeding 10 GHz, S_{eq}, E^2 and H^2 must be averaged over any $9.6 \times 10^4 / f^{1.05}$ minute period (see note 1).

4 Spatial averaging of the time averaged reference levels of Table 7 should be performed according to the requirements of clause 2.7.

5 For occupational exposure, E and H reference levels of Table 7 are given in plane wave ratio at frequencies greater than or equal to 1 MHz. However, for many occupational exposure situations, equivalent plane wave power flux density is not an appropriate metric if 'far-field' exposure conditions do not apply. Survey meters may be calibrated in terms of W/m², but both E and H will generally require independent measurement and evaluation if measured in the near-field.

6 For general public exposure E and H reference levels of Table 7 are given in plane wave ratio at frequencies greater than or equal to 10 MHz. However, equivalent plane wave power flux density is not an appropriate metric if 'far-field' exposure conditions do not apply. Survey meters may be calibrated in terms of W/m², but both E and H will generally require independent measurement and evaluation if measured in the near-field.

Unfortunately there does not appear to be any current, relevant public safety standards for pulsed RF involving chronic exposure of the public, nor of sensitive populations, nor of people with metal and medical implants that can be affected both by localized heating and by electromagnetic interference (EMI). I do however acknowledge ARPANSA RF standards have a significant role to play in protecting workers under routine occupational tasks that may result in exposure to significant RF energy over a short duration, that is, compliance with the limits will eliminate the possibility of RF burns or shock. But that is as far as their use for protection goes. They provide no guarantees when it comes to constant long term exposures to Radio Frequencies from established and documented non thermal affects (even those that are well below the "reference levels" advised in ARPANSA's RF standards).

I have included a selection of quotes taken from the RADIATION PROTECTION STANDARD Maximum Exposure Levels to Radiofrequency Fields — 3 kHz to 300 GHz Radiation Protection Series Publication No. 3 and a number of ARPANSA FACT sheets to clearly demonstrate that our standards do not provide guarantees of health and safety with respect to Radio Frequencies.

"There is currently a level of concern about RF exposure, which is not fully alleviated by existing scientific data. It is true that data regarding biological effects, at levels below the limits specified in the Standard, are incomplete and inconsistent. The health implications for these data are not known and such data could not be used for setting the levels of the basic restrictions in the Standard."

"A further and more vexing question is whether there may exist a form of RF energy absorption that may not manifest itself in a measurable increase in tissue temperature, but could nevertheless be linked to bio-effects. These have been termed athermal or non-thermal effects…… Whether the mechanism is actually thermal or not, or whether these reported bio-effects are real or artefactual, those effects suggesting statistically significant biological interactions at SAR levels well below 1 W/kg need to be replicated satisfactorily, particularly if they are suggestive of harm, before they can form the basis of standard setting. Whilst these low-level effects have not been established, they cannot be ruled out and so more research is needed."

"A number of biological effects have been reported in cell cultures and in animals, often in response to exposure to relatively low-level fields. Such effects are not well established but may have health

implications and are, therefore, the subject of on-going investigations (European Commission 1996)."

"Cases of neurological effects, particularly dysaesthesiae (abnormal sensations), have been reported after exposure to a wide range of frequencies typically within the range from 10 MHz to 2450 MHz. In some cases symptoms are transitory but lasting in others." – Here we have clear evidence acknowledged by our standards of symptoms of RF exposure that are regularly experienced by those who suffer EHS (EMF Hyper Sensitivity) which our Government does not recognise as a syndrome/disease state or its cause.

"There is insufficient data to establish that adverse health effects would result from low-level exposures, although it cannot be unequivocally stated that such effects do not exist."

"There is some debate as to whether RF causes any effects below the threshold of exposure capable of causing heating and electro-stimulation, and in particular whether any effects occur at or below the exposure levels of the limits. If any low level RF effects occur, they are unable to be reliably detected by modern scientific methods, but a degree of uncertainty remains. The data of long term exposure is limited."

"At levels of RF exposure below the limits, the risk of any effect is low, but some uncertainty exists, and the precautionary approach could be applied (WHO 2000)."

"In situations of simultaneous exposure to fields of different frequencies and depending upon the nature of exposure and the distribution of RF absorption within the body, the combined effects of exposure to multiple frequency exposure sources may be additive."

"Therefore, the only residual concern is the possibility of effects of an unknown mechanism occurring at levels below the thresholds for electrostimulation or SAR heating, which might not therefore be afforded the same factor of protection as those intended by the standard in respect of the established mechanisms of tissue interaction."

"While much of the basis for the limits recommended in this standard are derived from the SAR limits, the measurement of SAR may be impractical for other than device compliance testing or scientific research." This highlighted section gives me absolutely no confidence in our RF safety standards because it is at best useful for research only. Not for establishing health policies or making claims that RF emissions from cell phone towers, wireless networks, smart meters, mobile phones etc. are safe particularly when exposed over an entire lifetime.

The ARPANSA RF Standards are riddled with uncertainties that have remained unanswered 10 years since the time they were last published. The typical response documented in the RF standards is "more research is needed". I could easily have filled another page with more quotes but I think the ones I have provided in this letter are sufficient to prove my case that safety is not and cannot be guaranteed with Australia's RF standards in their current form.

When it comes to RF emissions it appears to me that ethics have gone out the window. It is open slather where all that is required is for a device manufacturer to test their device against ARPANSA RF standards (6 minutes of exposure) and ensure they are under the stated SAR and RMS magnetic and Electric field levels. Meeting these standards allows people such as the Minister of Energy to claim that devices are safe when in fact there is no consideration for the current level of RF

saturation in the environment (which is increasing year on year) or documented and proven non-thermal effects.

The deployment of RF into the environment is a big experiment that the public has no say in. I am expected to believe that I am safe because the ARPANSA RF Standards have been followed. There is plenty of research that says otherwise. It is unfortunate however that early warning researchers who have found evidence demonstrating RF is causing a number of Human diseases including cancer are in the best case ignored and in the worst, criticised, hounded and ostracised by Industry interference.

Microwaves and other forms of electromagnetic radiation are major factors in many modern unexplained disease states but are conveniently ignored and overlooked. They include insomnia, anxiety, vision problems, swollen lymph, headaches, extreme thirst, night sweats, fatigue, memory and concentration problems, muscle and joint pain, weakened immunity, allergies, heart problems, and intestinal disturbances. All of these symptoms can be found in a disease process originally described in the 1970s as Microwave Sickness. As you can see many of these same symptoms have also been more recently used to describe symptoms of EHS (same health issues just a different name) which our Government and Health Department conveniently chooses not to recognise.

Radio Frequencies: Are they Safe or Unsafe?

Cast your mind back to other Government/scientific mistakes where incorrect statements had been made about the safety of asbestos, smoking, thalidomide etc. It appears to me that history seems to be repeating itself where the community is again being treated like guinea pigs in some Government/Industry orchestrated experiment. My sensitivity to RF is one of the reasons that I recently decided to investigate ARPANSA's RF standards as well as Medical and Scientific research papers that look at whether RF has biological effects and whether there are any potential safety concerns. My findings to date have mostly been in opposition to what the Telecommunications Industry, the Victorian State Government and Government bodies such as yours are saying.

Research into health effects of low level electromagnetic and RF radiation has been an ongoing activity for over the past 70+ years. In 1971, The Navy Medical Research Institute published a bibliography of over 2,000 studies finding biological health effects from microwave and RF radiation going back to the 1930s. [5]

Effects were broken down into the following broad categories, noting as well for each, the number of sub categories (in parentheses) also described and distinguished:

1. Heating of organs (8)
2. Changes in physiologic function (29)
3. Central nervous system effects (9)
4. Autonomic nervous system effects (4)
5. Peripheral nervous system effects (1)
6. Psychological disorders-Human behavioural studies (17)
7. Behavioural Changes-Animal studies (1)
8. Blood disorders (12)
9. Vascular disorders (2)

10. Enzyme and other biochemical changes (13)
11. Metabolic disorders (4)
12. Gastro-intestinal disorders (4)
13. Histological changes (2)
14. Genetic and chromosomal changes (5)
15. Pearl chain effect and orientation of cellular and other particles (1)
16. Miscellaneous effects (10)

It is precisely because of this large spectrum of effects, the US military is creating weapons using RF/microwave frequencies. [6]

More recently, the independent UK group Powerwatch reviewed approximately 1300 EMF/RF studies from the past 20 years organizing the studies into 3 categories: finding effects from exposure to RF radiation, finding no effects from exposure to RF radiation or offering important insights but offering neither positive or null findings. As they note:

"When it comes to EMF issues, one of the most frequently heard phrase is: '*There is no evidence to support EMFs having health effects*' or simply '*There is no conclusive evidence*.' We believe that this is completely wrong; there is an enormous body of evidence out there, but public and even academic awareness seems to be very poor. Therefore, we will be presenting a list of papers which either show serious effects or are considered important papers on the subject which we have collected over the years."[7]

RF Non thermal effects have been shown to result in double-strand breaks in DNA – one of the undisputed causes of cancer – were reported in tests with animal cells. Swedish neuro-oncologist Leif Salford, chairman of the Department of Neurosurgery at Lund University has led a team of researchers that have exposed thousands of laboratory rats to microwave radiation from various sources. Since the late 1990s they have used mobile telephones as the source of this radiation. Their results have been consistent and alarming: not only does radiation from a cell phone damage the blood-brain barrier, but it does so at even when the exposure level is reduced a thousandfold. Even more disturbingly, and contrary to what was expected, the damage to the blood-brain barrier worsened when the experimenters reduced the exposure level. This implies that SAR ratings for cell phones may be worthless and that it may not be possible to make cell phones safer by reducing their power. [8]

Salford found that cell phone radiation damaged neurons in rats, particularly those cells associated with memory and learning. The damage occurred after an exposure of just two hours. He also found that cell phone EMFs cause holes to appear in the barrier between the circulatory system and the brain in rats. Punching holes in the blood-brain-barrier is not a good thing. It allows toxic molecules from the blood to leach into the ultra-stable environment of the brain. One of the potential outcomes, Salford notes, is dementia. Yet for all this, there is no scientific consensus on the risks of RF-EMFs to human beings and we all continue play Russian roulette with many people knowing full well what the consequences are as we debate and keep a careful eye on the statistics.

In 2007, the BioInitiative Working Group, an international collaboration of prestigious scientists and public health experts from Columbia University and the University at Albany (New York), University of Washington (Seattle), the Karolinska Institute, Umea University and Orebro University Hospital (Sweden), the European Environmental Agency (Denmark) Medical University of Vienna (Austria) and Zhejiang University School of Medicine, (China) released a 650-page report citing more than

2000 studies documenting health effects of EMFs and RF from all sources (pre-smart meters). Chapter titles include:

1. The Existing Public Exposure Standards
2. Evidence for Inadequacy of the Standards
3. Evidence for Effects on Gene and Protein Expression (Transcriptomic and Proteomic Research)
4. Evidence for Genotoxic Effects – RFR and ELF DNA Damage
5. Evidence for Stress Response (Stress Proteins)
6. Evidence for Effects on Immune Function
7. Evidence for Effects on Neurology and Behavior
8. Evidence for Brain Tumors and Acoustic Neuromas
9. Evidence for Childhood Cancers (Leukemia)
10. Magnetic Field Exposure: Melatonin Production; Alzheimer's Disease; Breast Cancer
11. Evidence for Breast Cancer Promotion (Melatonin links in laboratory and cell studies)
12. Evidence for Disruption by the Modulating Signal
13. Evidence Based on EMF Medical Therapeutics
14. Key Scientific Evidence and Public Health Policy Recommendations
15. APPENDIX - Ambient ELF and RF levels

The result of ARPANSA omitting many EMF studies, including those on the stress response, is that many research results have not been utilized in setting EMF safety standards. A careful examination of basic assumptions will show that the omissions are crucial and that they indicate an urgent need to reconsider the entire basis for EMF safety standards.

Below in bold are the assumptions that have been made by government bodies/organizations that establish RF standards, followed by the re-evaluations (Bioinitiative Report):

• **Safety standards are set by division of the EM spectrum**. It may come as a surprise to the engineers and physicists who set up the divisions of the EM spectrum, but biology does not recognize EM spectrum divisions. The same biological reaction can be stimulated in more than one subdivision.

• **EMF standards are based on the assumption that only ionizing radiation causes chemical change.** The stress response in both ELF and RF ranges has shown that non-ionizing radiation also causes chemical change.

• **EMF standards are based on the assumption that non-ionizing EMF only causes damage by heating (i.e., damage by thermal effects only)**. Research on the stress response in the ELF range has shown that a thermal response to a rise in temperature and the non-thermal response to EMF are associated with different DNA segments of the same gene. Both the thermal and the non-thermal mechanisms are natural responses to potential damage.

Furthermore, the non-thermal stress response can occur in both the ELF and RF ranges. Other non-thermal effects of EMF have been demonstrated, e.g., acceleration of electron transfer reactions and DNA strand breaks.

• **Safety limits in the non-ionizing range are in terms of rate of heating (SAR)**. The above described effects occur below the thermal safety limits in the non-ionizing range, so the safety limits provide no protection against non-thermal damage. Safety limits must include non-thermal effects.

Recent EMF research has shown that a basic assumption used to determine EMF safety is not valid. The safety standard assumes that EMF causes biological damage only by heating, but cell damage occurs in the absence of heating and well below the safety limits. This has been shown in many studies repeatedly, including the cellular stress response where cells synthesize stress proteins in reaction to potentially harmful stimuli in the environment, including EMF. The stress response to both the power (ELF) and radio (RF) frequency ranges shows the inadequacy of the thermal (SAR) standard.

A key finding from the report states: "Not everything is known yet about this subject; but what is clear is that existing public safety standards limiting these radiation levels in nearly every country of the world look to be thousands of times too lenient. Changes are needed."[9]

In November, 2009, a scientific panel met in Seletun, Norway, for three days of intensive discussion on existing scientific evidence and public health implications of the unprecedented global exposures to artificial electromagnetic fields (EMF). In the full Selentun Scientific Statement (2010) [10], two recommendations included:

1. "The Panel recommends against the use of cordless phones (DECT phones) and other wireless devices, toys and baby monitors, wireless internet, wireless security systems, and wireless power transmitters in SmartGrid-type connections that may produce unnecessary and potentially harmful EMF exposures.

2. The Panel strongly discourages the technology that allows one mobile (cell) phone to act as a repeater for other phones within the general area. This can increase exposures to EMF that are unknown to the person whose phone is piggy-backed upon without their knowledge or permission." (Substitute smart meters for mobile phones in this statement and the same principle applies).

They say governments should take decisive action *now* to protect biological function as well as the health of future generations. Yet our government officials appear to be sitting on their collective hands doing nothing but spreading misinformation, referring to outdated standards and living in a state of denial.

Exert from "Children and Mobile Phones 3: The Research © Alasdair and Jean Philips" Official comments on the implications of the health research [11]

"Eric Huber, the Speaker for Environmental Medicine for the Doctor's Chamber for Vienna said

'If medications delivered the same test results as mobile phone radiation one would have to immediately remove them from the market.' He continued 'We must assume that children are more sensitive towards high frequency radiation than adults since the skull bones are thinner and the children's child-like cells show an increased rate of division, in which they are more sensitive to genotoxic effects' As a response to this research Dr Michael Clark of the HPA-RPD said 'If future research delivers the same or similar results then public health practices may need to be re-examined.'

Dr Henry Lai of the University of Washington, Seattle, said that among the peer-reviewed, published studies with no direct industry funding, biological effects from cellphone frequencies, such as altered

gene expression, DNA breaks and death of animal brain cells, were noted 81 per cent of the time. When corporate money is directly funding the science, effects were noted only 19 per cent of the time.

At the time of writing '36 studies focused on genetic effects, such as DNA damage, 53 per cent showed some kind of biologic effect that might indicate concern. Of those studies, a vast majority, 79 per cent, were independent. Conversely, studies showing no effects had direct industry funding 82 per cent of the time.'"

Although the comments above relate to mobile phone usage they are equally relevant to Smart Meters. When set-up in a meshed network, smart meters (see Table 2-1 below) are transmitting 1000's of times a day. With respect to health this frequent transmission of RF is further exacerbated when smart meters are installed close to locations such as bed rooms and living rooms where a significant portion of a person's life is spent.

Electric: Table 2-1 presents scheduled electric SmartMeter™ system messages and their durations. As noted in Response 1, the information presented applies only to the 900 MHz radio. Table 2-1 presents data for all "scheduled" messages; i.e., those inherently required to sustain communications in the network that occur routinely without user intervention. "Non-Scheduled" messages created only at non-recurring times are addressed in Response 3.

TABLE 2-1

Electric System Message Type [a]	Transmission Frequency Per 24-Hour Period: Average [b]	Transmission Frequency Per 24-Hour Period: Maximum (99.9th Percentile) [c]
Meter Read Data	6	6
Network Management	15	30
Time Synch	360	360
Mesh Network Message Management	9,600	190,000
Weighted Average Duty Cycle	45.3 Seconds[4]	875.0 Seconds

The electric system message types are defined as:

- Meter Read Data refers to the messages generated by each meter to transmit energy usage data.
- Network Management refers to network tasks that need to be performed to maintain the health of the network (e.g., route establishment).
- Time Synch refers to network administration messages needed to update the internal clock in the NIC.
- Mesh Network Message Management refers to activities required to forward routed messages.

It appears likely that much of the radiation that is making people sick (including myself) is simply to maintain the mesh wireless network and not the transmission of power usage data.

This raises the question as to why Power Companies are deploying meters which are transmitting every few seconds 24/7. A Smart Meter could upload the customers' time-of-use data one time per month. The Power Companies could use this data in the exact same way for their billing and energy producing predictions, so the 24/7 wireless mesh network that is saturating our neighbourhoods serves zero purpose for billing or energy conservation. Instead, the environment is becoming toxic especially for EHS sufferers as they have no recourse to protect themselves.

The European Council/Parliamentary Assembly recently created resolution 1815 that recognises the potential dangers of electromagnetic fields and their effect on the environment. I have included this document as evidence with this letter. [12]

I have also included two points that stand out and deserve further attention from the referenced resolution. They are:

6. The Assembly regrets that, despite calls for the respect of the precautionary principle and despite all the recommendations, declarations and a number of statutory and legislative advances, there is still a lack of reaction to known or emerging environmental and health risks and virtually systematic delays in adopting and implementing effective preventive measures. Waiting for high levels of scientific and clinical proof before taking action to prevent well-known risks can lead to very high health and economic costs, as was the case with asbestos, leaded petrol and tobacco.

7. Moreover, the Assembly notes that the problem of electromagnetic fields or waves and their potential consequences for the environment and health has clear parallels with other current issues, such as the licensing of medication, chemicals, pesticides, heavy metals or genetically modified organisms. It therefore highlights that the issue of independence and credibility of scientific expertise is crucial to accomplish a transparent and balanced assessment of potential negative impacts on the environment and human health.

In this regard, Australia's position on RF safety appears to be sadly lacking as we appear to be falling behind with recent develops in the health practices and recognition of the dangers posed by RF emissions when compared to our European counterparts. There appears to be reluctance to seriously address this issue perhaps because of the implications it may have on the Industry that is pushing these devices on an uninformed public.

What a recognised EMF expert has to say on the issue of smart meter safety

Below are some excerpts from an expert report written by David O. Carpenter, April 30 2012 in response to the smart meter rollout by the Electricity Distributor HYDRO-QUEBEC in Canada. David Carpenter is the Co-Editor and a Contributing Author of the BioInitiative Report. [13]

"15. ….smart meters would therefore constantly expose persons in the immediate vicinity of the meter. On that matter, I wish to stress that duration may be an even more potent contributing factor to RF/MW radiation bioeffects than exposure levels. Chronic, such as all-day exposure, is more likely than short and intermittent exposure, such as cell phone use, to produce harmful health effects. Although the exposure levels may be lower, the accumulated exposure over time has the potential to be greater and to cause greater harm.

26. Exposure to high-frequency RF and MW radiation have been linked to a variety of adverse health outcomes. Some of the many adverse effects reported to be associated with and/or caused by RF/MW radiation include cancer, neurologic, endocrine, immune, cardiac, reproductive and other effects.

27. Studies of isolated cells have shown that RF/MW exposures may cause changes in cell membrane function, cell communication, metabolism, activation of proto-oncogenes, and can trigger the production of stress proteins at exposure levels below the above FCC and Health Canada guidelines. Resulting effects in cellular studies include DNA breaks and chromosome aberrations, cell death including death of brain neurons, increased free radical production, activation of the endogenous opioid system, cell stress and premature aging.

28. Human studies of comparable RF/MW radiation parameters show changes in brain function including memory loss, retarded learning, performance impairment in children, headaches and neurodegenerative conditions, melatonin suppression and sleep disorders, fatigue, hormonal

imbalances, immune dysregulation such as allergic and inflammatory responses, cardiac and blood pressure problems, genotoxic effects like miscarriage, cancers such as childhood and adult leukemia, childhood and adult brain tumors, and more.

29. There is consistent evidence for increased incidence of cancer and other adverse effects in individuals who live near to high-power short-wave, AM, FM and TV transmission towers. This is particularly relevant because, like WI-FI and smart meters, radio and TV transmission towers give continuous, whole-body radiation, not just radiation to the head.

30. In addition, it is to be noted that, should the 2,4 GHz ZigBee antennas of the proposed Hydro-Quebec Landis+Gyr meters be activated in the future, their wavelength, at ~ 12.2 cm or ~ 4.8 inches, would be more absorbable by children's and adults' bodies and brains than radio or TV wavelengths. The harmfulness of such radiation therefore likely exceeds that of radio or TV towers. The 2.4 GHz frequency is similar to that used by a microwave oven. Such frequency was chosen for the oven because of its wavelength and harmonic resonance with the water molecule, to ensure the most efficient absorption by living tissues and effective heating by way of the agitation of water at the molecular level.

31. Like second-hand smoke, EMF and RF/MW radiation involve complex mixtures, where different frequencies, intensities, durations of exposure(s), modulation, waveforms and other factors are known to produce variable effects, often more harmful with greater complexity.

Decades of scientific study have produced substantial evidence that EMF and RF/MW radiation may be considered neurotoxic, carcinogenic and genotoxic. Sources of fields and radiation include but are not limited to: power lines, navigational radar, cell phones, cordless phones [or Digitally Encoded Cordless Transmission Devices (D.E.C.T.) phones], cell towers, smart meters and their grids or infrastructure, ."smart." boards, meters and grids, WiMax and wireless internet (WI-FI).

35. FCC public RF/MW radiation exposure guidelines (and the similar Health Canada Safety Code no. 6 guidelines) are based on the height, weight and stature of a 6-foot tall man, not children or adults of smaller stature. The guidelines do not take into account the unique susceptibility of growing children to RF/MW radiation exposures. Since children are growing, their rate of cellular activity and division is more rapid, and they are at more risk for DNA damage and subsequent cancers. Growth and development of the central nervous system is still occurring well into the teenage years, such that the neurological impairments predictable by the extant science may have great impact upon development, cognition, learning, and behaviour.

36. Prenatal EMF exposure has been identified as a risk factor for childhood leukaemia, and is associated with miscarriage. Children are largely unable to remove themselves from exposures to harmful substances in their environments. Their exposure is involuntary.

37. When a smart meter is in operation inside a dwelling, persons in the immediate vicinity have no choice but to allow the meter to expose them to microwave radiation that is much higher than exists naturally on Earth.

38. The evidence for harm from RF radiation as a cause of cancer and other diseases continues to grow. And when we focus on MW radiation, particularly pulse-modulated radiation, on long, non-intermittent duration and on more vulnerable subgroups such as children, we see that the cancer outcome is being firmly established.

48 ....Nonionizing radiation on the other hand (with long wavelengths and low frequencies, which includes visible light as well as RF and other frequency bands with common applications) is assumed to have only thermal effects. However this view has been shown to not be correct by studies since the 1970s by an accumulation of epidemiological and laboratory research which had clearly demonstrated biological effects and, indeed, human health hazards, at RF/MW exposures that do not have sufficient energy to directly break chemical bonds.

Medical and biological research findings showing nonionizing radiation having non-thermal biological effects are therefore considered an anomaly under conventional theory.

49. Standards setting organizations aimed at regulating RF exposure have for a long time been dominated by physicists and engineers, often with close ties with the industry, with minimal input from biological and medical science.

51. Standards setting organizations have until now generally refused to accept epidemiological and laboratory research findings linking RF electromagnetic fields exposure with various non-thermal biological effects, as being inconclusive and requiring further research.

The difficulty stems from the fact that, although links have been demonstrated repeatedly between RF electromagnetic fields exposure and non-thermal biological effects, there is a lack of a comprehensive biological theory explaining why these effects take place, and therefore causality cannot, at the present time, be demonstrated with certainty."

Our health and wellbeing is being held hostage because science cannot adequately explain the biological effects RF has on the body and because science is used as the basis for creating health policy. It is only when our health system becomes overburdened and the costs of supporting those who are suffering becomes unbearable will people begin to act. It is a terrible tragedy in the making where our Government and ARPANSA appear to put the wealth of corporations ahead of the health of the general public. This is made worse by the fact our RF standards appear to be hobbled by vested interests without due care of the consequences.

"*One of the fundamental problems with EMR research has been the almost complete control by vested interests, where organisations developing, marketing and using the technology are the ones who have been allowed to control the research efforts into possible health hazards from their products. This is exampled in Australia where Telstra has been placed in effective control over the research into possible health impacts of its technologies.*" [14]

We have all become guinea pigs in this government sponsored scientific experiment. The precautionary principal has been ignored with the forced installation of RF transmitters into every home without consent from the householders. People seem to forget that the tobacco industry managed to cover up the dangers of smoking for 40 years with apparent backing from the various scientific and government establishments and it appears history is again repeating itself with respect to safety of wireless (RF) emissions. Can we afford to wait another 40 years to find out that we have damaged our genetic code to the point that it is beyond repair and future generations will be facing birth defects and an uncertain future?

What happened to taking the Precautionary Principle approach?

*The **precautionary principle** or precautionary approach states that if an action or policy has a suspected risk of causing harm to the public or to the environment, in the absence of scientific consensus that the action or policy is harmful, the burden of proof that it is not harmful falls on those taking the action.* [Wikipedia]

It is unfortunate that ARPANSA has not been more forceful in recommending a precautionary approach. Instead ARPANSA has twisted this principle to the benefit of commercial enterprises by focusing on the economic implications if a substitute technology is used that could make RF exposure unnecessary or incidental i.e. using a hard line (telephone or cable/optical fibre internet) communication. The exact wording from ARPANSA is as follows: *"In relation to the general public, the Standard, nevertheless, states the principle of minimising, as appropriate, radiofrequency exposure which is unnecessary or incidental to achievement of service objectives or process requirements, provided this can be readily achieved at reasonable expense."* It would seem that potential health issues took a back seat when it came to choosing the communication technology for Victorian smart meters especially when smart meters in other countries are available that use a hard line to communicate back to the utility company.

The symptoms I experience are real and not psychological.

In my case the biological effects attributed to Electromagnetic Hypersensitivity (EHS), which I am experiencing, are real and certainly not psychological as many doctors would have me believe. I have been able to demonstrate this link many times because as part of my job I need to do a lot of travel and when I am in locations that far away from mobile phone transmitters and have no smart meters my health improves. When I return to my neighbourhood my health begins to suffer. There is no doubt in my mind what is contributing to my severe headaches, chest pain and heart palpitations as they only started in earnest when smart meters were installed in large numbers in our street.

Some people claim a Nocebo effect maybe occurring where a person believes that they are sensitive to RF and experience symptoms every time a RF device is seen to be near them. I can state categorically and with certainty that this is not the case for me. I had no preconceived ideas about the health impacts of RF when I first used a mobile phone or turned on my wireless router so that I could connect to the internet. I was looking forward to the flexibility and freedom of movement that it provided me. When I felt the effects I was quite surprised and unsure what was happening. It was only after usage of these devices that a pattern began to develop. I can say without a doubt that EHS is real and that there is a direct correlation of these documented effects to usage of RF devices. I have taken actions to minimise my exposure by not using wireless devices or using them sparingly but the reality is with smart meter installation in my street I am exposed every day without a choice and my health is suffering as a direct result.

Do I have Wireless/Microwave devices in my home?

I expect that questions will be asked by you and others such as do I own a microwave oven, cordless phone, baby monitor, wireless home network or other wireless devices. The answer is yes I do although not all of the above. I have a microwave oven which I no longer use. I had an analogue cordless phone that operated on 900MHz frequency band which I seemed to be less sensitive too (it is not continually transmitting RF when not in use like DECT phone base units that are available today and it appeared to be using a continuous wave rather than pulses). I have corded phones in my office and bedroom. I do not have a wireless network installed, instead I have wired connections

in all living/bedrooms (this was a deliberate choice when I designed my house 5 years ago). Any device that has wireless features (printers, TV, amplifiers etc.) have the said feature disabled.

I recently had to get rid of a Nitendo Wii I had purchased for my children for Christmas (2010) as it was giving me headaches, chest pains and sore hands from the wireless (Bluetooth) communication between the controllers and the main unit.

I have a mobile phone because my job requires it but I use it sparingly and ask people to call me on a landline if one is available, or, I will call them back when I have access to a normal phone. I set my phone to flight mode most of the time now especially before I go to bed. My mobile phone affects me far more severely and quicker than using a wireless network on a computer such as when I am required to work on a customer's site and I have use my wireless card to receive my corporate emails. After receiving/sending mails I always disable my wireless card although recently I am finding that even turning off my laptop wireless does not help as the wireless access points are being used by others nearby.

When wireless networking first became available I thought it was innovative and would allow me the freedom to go anywhere within my house and surf the net, check my emails without worrying about Ethernet cables and finding a socket etc. It was not long after using my wireless card in my laptop that I began to feel the effects directly and realised I was sensitive to it. Symptoms included headaches, pressure and pain in my chest, heart palpitations, increased intolerance, prickling feeling over my skin. It was at this time I decided that a wireless network was not for me (around 2002).

Although I do have some wireless devices as mentioned above I have a personal choice of when I use them and how much exposure I am willing to put up with. However with a smart meter, my choice in this matter is compromised as I am exposed continuously and involuntarily.

What Experienced Researchers have to say on EHS

French researchers have recently demonstrated that electromagnetic fields (EMFs) substantially alter the physiology of the blood and brain of electrosensitive people and that the impact on these biological markers increases and decreases according to the intensity of EMF exposure. [15]

"We know with certainty that electromagnetic hypersensitivity is not psychosomatic", Dr Dominique Belpomme stated in a [November 2010] telephone interview. "EMFs provoke major effects in the brain. The most important of these is the opening of the blood-brain barrier. This allows mercury, organochlorines and other pollutants to enter the brain, where they cause various neurodegenerative diseases."

People with EHS are often incorrectly referred to psychiatrists while many experts such as Belpomme say the first treatment they require is reducing or eliminating their exposure to EMF's.

Dr. Belpomme's team has developed a diagnostic method based on blood tests and a special brain scan (pulsed Doppler echography) to visualize blood flow. "These patients clearly have vascular disorders in the brain, said the oncologist. In addition, our biological tests show that 30% of them have high levels of histamine, 50% have too much stress proteins, most have low levels of melatonin (an potent anti-cancer hormone), and 30% have levels of antibodies and proteins that are signs showing thermal shock and brain damage." He adds that half of his patients suffer from Multiple Chemical Sensitivity (MCS) and that MCS and EHS share the same brain abnormalities.

ARTAC's scientific council is chaired by virologist Dr. Luc Montagnier, 2008 co-Nobel Prize winner for discovery of the AIDS-causing human immunodeficiency virus (HIV).

ARTAC researchers are currently preparing five scientific papers on electrosensitivity. "It requires a lot of time", said Dr Belpomme. "They will be published in a year or two. But independent and immediate action is needed to reduce people's overexposure to EMFs."

In France, an estimated 5% of the population is already electrosensitive, and the proportion is constantly increasing with the ever-growing popularity of wireless technologies. "Studies show that 10 to 50% of the population may become very intolerant to EMFs over the next 25 to 50 years, Dr Belpomme said. I have two cases of multiple sclerosis triggered after overuse of cellphone, three cases of breast cancer – two relapses after exposure to EMFs and daily use of computers – and proof is building up against Autism and Alzheimer's disease whose risk is much higher than for cancer. Causal links with electromagnetic fields are highly possible."

Interphone Study – Shows increased Brain Cancer risk with mobile phone usage despite being seriously flawed

Why do we not see the details mentioned in the article below in any of the fact sheets? Instead ARPANSA tries to give comfort to the public by saying that "Pooled analyses of all the brain tumour and acoustic neuroma results have suggested no overall risk for moderate mobile phone use by adults for up to 10 years" without actually giving the definition of what moderate usage is. Most people reading this would assume that if they are not on the phone most of the day they are safe. The reality is this is incorrect as a moderate user as defined by this study would be considered very low usage by today's standards. The fact sheet then went on to say "…suggested the possibility of an increased risk of glioma and acoustic neuroma in the group representing individuals with the highest cumulative call time." What is important here is the heaviest users at the time the study was conducted would be considered normal users by today's standards. Why isn't this mentioned? The same fact sheet in a big bold heading says "no clear evidence of cancer" even when the Interphone study did show an increase for heaviest users and despite the fact that the IARC also indicated that mobile phone emissions are possibly carcinogenic!

This next set of prose was written by Dr Magda Havas PhD in response to an article, Brain tumour risk in relation to mobile telephone use: results of the INTERPHONE international case-control study which appeared in the International Journal of Epidemiology on May 18, 2010, (2010:1-20) the aforementioned article *"clearly demonstrated the **flaws** with the way we **fund**, **conduct**, **review** and **report** on science that deals with **products** that fetch **billions of dollars** and **place at risk**, at least potentially, **billions of lives**.*

*The **INTERPHONE study**, the largest (5,117 brain tumour cases) and most expensive ($25 million dollars) study on cell phones and brain tumours, involving scientists from 13 countries, was **flawed** from the very beginning. Whoever designed the protocol did it in such a way as to minimize finding any adverse effects. Despite this, adverse effects were reported — a **40% increased risk of glioma** (a type of brain tumour that affects the glial cells in the brain) for those who used a cell phone for at least **1,640 hours** with the highest risk for tumours in the **temporal lobe** and on the **same side of the head** that one exposes to the cell phone. In other words most of the tumours occurred in the part of the brain receiving the greatest radiation for those who had the longest exposure. And what did the authors do with this result?*

They attributed it to biases and error. Why?

Study designed to minimize finding adverse effects of cell phones

*First example: A **regular cell phone user** was defined as anyone who made **at least one call on their cell phone each week for at least 6 months**! Would you expect a person to develop lung cancer if s/he smoked at least one cigarette a week for at least 6 months? By setting the number of calls so low (at least 24 calls on a cell phone) it dilutes the effect and favours a "no-effect" result.*

*Second Example: People who use **cordless phones** are exposed to virtually the same type of radiation yet they were not identified as exposed in this study. The cigarette analogy is comparing those who smoked one brand of cigarettes with those who smoked a different brand but this second group is labelled as "non-smokers". This also favours a "no-effect" result. We must recognize that even those people who do not use mobile phones (cell and cordless phones) are exposed to the radiation from nearby users, from nearby cell phone antennas and now from wireless routers as well as city-wide WiFi in a growing number of communities. So the best we can do is compare users with those who are exposed to the equivalent of second-hand smoke. This also under estimates the real risk of microwave exposure.*

These two biases were so powerful that the final result showed that cell phones prevented brain tumours!

*Third example: **brain tumours take decades to develop** in adults yet only a small fraction (less than 10%) of those people in this study used cell phones for more than 10 years. Just as you wouldn't expect to find lung cancer in a smoker after 4 to 5 years, you would not expect to find a brain tumour for a cell phone user during this short period of exposure either.*

*Forth example: participants were restricted to those between the ages of 30 to 59. **Younger and more vulnerable participants were excluded** from this study. This flaw is now being addressed with a new study based on younger users.*

These experimental flaws and the obvious bias in the experimental design should have been caught early and corrected. But it wasn't. Why?

*How could so many of the leading scientists in this field allow this to happen? Were they lured by the funding, which came-in part-from the very industry whose product was being studied? There were so many flaws in the experimental design that this article in the International Journal of Epidemiology should not have been accepted for publication by a peer-reviewed journal. Indeed, the reviewers, whoever they were, should have recommended that this article be rejected or accepted only after major revisions. This demonstrates **problems with our peer-review process** that the scientific community values so highly but that process is deeply flawed, and this is just one example.*

*This study demonstrates that **funding** (25% of which was provided by the wireless industry) can have an effect on the outcome of a publication. This has been shown time and again (with microwave radiation and with other environmental toxins including cigarettes) so why would we expect this study to be different. Indeed several of the authors identified conflicts of interest and associations with the wireless industry that went beyond the funding of this study.*

*It shows that a **flawed experimental design produces unreliable results**. The two major results from the Interphone study are that short-term use of cell phones provides protection against brain tumours and long-term use increases the risk of gliomas. The authors attributed both of these findings to biases and error!*

*Why were Interphone related documents called **Appendix 1 and 2** published separately in the same journal? Why were these appendices not part of the original report? Was it because they showed higher levels of risk for both types of brain tumours? Or because it showed fundamental flaws in the study where low mobile phone usage appeared to provide protection against tumours?*

***Appendix 1 Interphone**: While the original INTERPHONE study stated there was a decreased risk of meningiomas or no effect with cell phone use, Appendix 1 showed an **84%** increase risk of meningiomas for those who used a digital phone for 1640 hours or more and those who used both*

*digital and analogue cell phones or if type of phone used was unknown had a **343% increased risk or meningiomas**!*

***Appendix 2 Interphone:** In an attempt to try to "correct" the "downward bias" a **mini report** entitled Appendix 2 was published as a separate document in the same journal. This appendix compares regular users who used cell phones for less than 2 years (as the reference population) with those who used cell phones for longer periods.*

***The table in Appendix 2 provides some disturbing results.** It shows that there is a statistically significant increased risk (**68%**) of developing gliomas for those who used a cell phone for as little as 2-4 years and **118%** increased risk for those who used a cell phone for 10+ years. In the original study these exposure categories were shown to reduce risk of gliomas! See the highlighted areas in this table with comments. Indeed the **40%** increased risk of glioma mentioned in the original study for those who used a cell phone for 1640 hours or more becomes an **82%** increase when compared with regular cell phone users.*

So what can we learn from this experience?

*We learn that **funding can influence the results** of a study no matter how much scientists attempt to be objective.*

*We learn that **bigger is not necessarily better**. Had the $25 million dollars been given to independent scientists in various disciplines to determine the biological effects of cell phone use we would have been much further ahead than with the INTERPHONE study.*

*We learn that a **flawed experimental design produces unreliable results**. Even the authors of this study claim it is inconclusive and unreliable (since they state that the effects are due to biases and error).*

*We learn that **compromise is necessary for setting standards and establishing policy but not for conducting science**. Science is not done by committee or by consensus and compromise. The majority is not always right and we have plenty of examples from various scientific disciplines to demonstrate this.*

Elizabeth Cardis, head of the INTERPHONE study, was quoted as stating:" In my personal opinion, I think we have a number of elements that suggest a possible increased risk among the heaviest users, and because the heaviest users in our study are considered to be low users today, I think that's something of concern. Until stronger conclusions can be drawn one way or another it may be reasonable to reduce one's exposure." [16]

I would be interested in understanding ARPANSA's take on Dr Havas findings and criticisms.

BioInitiative report review and criticisms

"*The BioInitiative report: 'A Rationale for a Biologically-based Public Exposure Standard for Electromagnetic Fields (ELF and RF)' was issued in 2007 by an independent group of scientists. The report offers conclusions and recommendations that are very different from those of IEEE/ICES, ICNIRP, and health agencies (e.g. World Health Organization) around the world, both in its assessment of the scientific evidence and in its policy recommendations. The BioInitiative report has been criticised for being selective, rather than a comprehensive, review of the RF bioeffects literature*." [Taken from ARPANSA's website]

It is unfortunate that the organisations listed i.e. IEEE and ICNIRP do not formally recognise non thermal effects, have been shown to be working closely with (corrupted by) the industry and have an inordinate number of electrical engineers and physicists. This last part is most important as non-

thermal effects appear to be related to biological mechanisms which I dare to say is not usually within the field of study for a physicist or an electrical engineer.

Referring to the table immediately below, is there any wonder why they chose to be selective? If they were to include studies that showed no effect and then provide rational as to why they shouldn't be considered another 650 pages would probably be required!

Tab

I think it is also of notable interest that a number of countries have a different opinion to Australia with regards to non-thermal effects and have significantly lower thresholds (around 100 times lower). See "Lack of International uniformity with respect to RF emission standards below." So who is right?

ARPANSA's website had posted 2 reviews to the BioInitiative report, one from the Health Council of Netherlands and one from ACRBR. I have reviewed both reports and have included some commentary below:

Health Council of the Netherlands

Apart from the statement below it appears to be a rehash of the ACRBR review or vice versa.

"*Several sections also contain a number of factual errors. All these deficiencies also do not add to the Committee's confidence in the quality of the BioInitiative report*."

2 deficiencies out of a 650 page report was all that was specified. This is hardly a significant number to lose confidence. I have noted a number of deficiencies in our RF standards but this did not stop me from looking at it more closely and providing a more detailed review response along with criticisms.

ACRBR review of the BioInitiative report includes

"…Independent experts are engaged because it is meant to provide an objective evaluation of the issue. This contrasts strongly with the BioInitiative Report, which is the result of the opinions of a self-selected group of individuals who each have a strong belief that does not accord with that of current scientific consensus..."

It would appear that the rebuttal from ACRBR (now a defunct organisation) is following the same paradigm i.e. it is a group of individuals who have a strong belief that appears to oppose some of the findings.

"This does not mean that what is written in the Report is invalid, but it means that we need to evaluate the content of the report itself…. The BioInitiative Report has not undergone such independent peer review, and so the conclusions that it reaches would normally be viewed more as views of some of the authors, rather than strong contributions to science."

Ditto for the ACRBR review.

It is my understanding that, although selective, many of the studies that were used to develop the report were peer reviewed. Additionally many of the contributors to the BioInitiative report also released much of the same findings in Pathophysiology (August 2009), which was peer reviewed and accepted. I see no comment from ARPANSA or ACRBR (when it was operational) on these peer reviewed and accepted studies that support the BioInitiative Report findings.

"Another issue is that there are statements that do not accord with the standard view of science, and the Report does not provide a reasonable account of why we should reject the standard view in favour of the views espoused in the Report."

What is defined as a reasonable account? There are a number points made by the report which clearly says why the standard view is inadequate. The standard view does not consider the stress response to emissions lower than what is necessary to result in heating. It does not take into consideration non thermal effects some of which have been shown by independent researchers to cause DNA breaks. The contributors to the BioInitiative report are noteworthy and recognised experts in their fields. David Carpenter one of the co-editors of the report is a Harvard trained physician. In the early 1980s Dr Carpenter headed the third largest public health laboratory in America and coordinated the 5-year, $5-million New York State Powerlines Project. This series of studies financed the second epidemiological study to link overexposure to domestic magnetic fields to a doubling of the risk of childhood leukaemia. Dr Carpenter was also founding dean of the University at Albany's School of Public Health. [17]

Martin Blank, PHD is a Former President and Full Member of Bioelectromagnetics Society Dept. of Physiology, College of Physicians and Surgeons Columbia University.

I could go and list all the members who contributed to the report with their credentials but the point I am trying to make here is that we have experts making critical statements that say our standards are far too lenient and that there are real health risks that need to be considered. What research in these areas is Australia doing to validate our standards? We appear to take direction from organisations like the WHO, IEEE, ICNIRP who appear to be not only blinkered but also tainted and compromised.

I also couldn't help but notice that funding for some of ACRBR's past projects were via the Australian Mobile Telecommunications Association who represents the wireless/mobile telecommunications industry. Which begs the question on how independent the research was and what influence, if any, the AMTA had on any findings/reports. I also noticed that at least one of the contributors to the ACRBR position statement, Ray McKenzie, also represents the industry.

From the ATMA website: “AMTA members represent an innovative industry with annual revenue of more than $12 billion, more than 20,000 employees and a direct economic impact of $5.8 billion a year. The mobile telecommunications industry has an even bigger indirect or spill-over effect on the broader economy of $6.4 billion because mobile telecommunications products and services make firms more productive.”

So we have an organization that represents a significant amount of investment and represents an industry that brings a lot of money in for the Government.

Who represents the public in this matter? Certainly it is not the Government and it’s agencies as they stand to lose too much if RF is determined to be dangerous to the public’s health in the long term?

“not an objective and balanced reflection of the current state of scientific knowledge”

Again this is at odds with what I am finding. It is unfortunate that we have an industry sponsoring the cult of “no effect” muddying the waters and creating uncertainty. That the media appears to be gagged when it comes to presenting to the public research findings from independent scientists that suggests possible dangers i.e. look at the Interphone study and what the public was told. I may be seen to be alarmist but we have a duty of care to ensure the public health is not put in unnecessary danger even if it is not likely to be shown until 20 years later. What is abundantly clear is that more independent research is urgently needed and more importantly it must be free from industry interference.

I couldn’t help but notice too that when it came to ACRBR including reference sites supporting its viewpoint that they were very selective in the same way that BioInitiative report was. A reference to powerwatch.org.uk would have at least shown consideration for non-industry aligned sources of the truth.

“*The BioInitiative Report has not undergone such independent peer review, and so the conclusions that it reaches would normally be viewed more as views of some of the authors, rather than strong contributions to science*.”

Many of the research studies (over 2000) that were used to create the BioInitiative report were peer reviewed.

I think that despite what I feel area few very minor short comings presented by the 2 critical reviews presented on ARPANSA’s website, it is important to note that the European Parliament and its member countries unanimously adopted a resolution in 2009 to address public health risks from EMF and wireless technologies, which are in line with the BioInitiative Report. The European Environmental Agency director has given high visibility to the issue and recommended health agencies review and act to implement precautionary measures, particularly for children. The Report has been highly praised around the world by public health experts. It has been presented to the EU Director of Public Health, the EEA and EEAC expert committees, to more than a dozen Prime Ministers and Ministers of Health around the world from Europe to Brazil to Taiwan, and at the scientific conferences convened at the Royal Society of London in 2007 and 2008. It has provided a basis for precautionary advice and actions limiting cell and wireless exposures in France, Belgium. Liechtenstein, Switzerland, Germany, Austria, and Finland, among other countries of the world. Courts in Belgium and France have directed the use of the BioInitiative Report recommendations limiting wireless emissions around new cell towers and as a judicial basis for removal of existing cell

towers, and to prevent construction of new cell towers near schools and pre-schools. It is also provided a public health basis for new international recommendations to limit cell phone use, and to prohibit use of cell phones by children, and ban advertising of them to children in France. [18]

Lack of International uniformity with respect to RF emission standards

The table below demonstrates how varied the standards are internationally proving that science has yet to come to an agreement on a safe target and that there is a lack of harmonisation between nation states. Of course we need to be careful that if we do come to an internationally agreed level it must be based on sound science that is all encompassing with respect to thermal and non-thermal interactions. It should not be sabotaged by forcing nation states to adopt higher levels to satisfy the agendas of the wireless industry and the various defence agencies. That research performed by the Soviet Union era particularly around non thermal effects should not to be ignored by Western scientists.

Selected International Guidelines for General Population Exposure

Country or Organization	Thermal	Non-thermal	Regulatory	Advisory	Power Density uW/cm²	Field Strength V/m
US FCC - OET Bulletin 65 (1900 MHz)	X		X		1000	61.4
Canada - Canadian Safety Code 6 (1900 MHz)	X		X		1000	61.4
ICNIRP[1] Much of Western Europe, other countries (1900 MHz)	X		X		950	59.8
Italy[2]		X	X		9.5	6.0
Russia, China, Poland[3]		X	X		10	6.1
Switzerland[4]		X	X		4.3 - 9.5	4.0 - 6.0
Salzburg Resolution[5] (non-pulsed signals)		X		X	10	6.1
Salzburg Resolution[5] (pulsed signals)		X		X	0.1	0.6
Ecolog-Institut[6] (Germany, 2000)		X		X	1	1.9
The BioInitiative Working Group[7]		X		X	0.1	0.6

Our standards, being based on the ICNIRP guidelines, do not consider non-thermal effects and are very generous (to the wireless industry) with respect to Power Density levels when compared to countries like Italy, China, Russia and Switzerland where we have a 100 times difference. I understand that our standards are a modified version of ICNIRP guidelines but they are far too high especially for people like myself who are sensitive to RF emissions. My quality of life is only going to get worse as we have essentially an uncontrolled and unregulated market. Where Telecommunication companies advertise the next generation of wireless like it some sort of confectionary, to treat ourselves to the latest and fastest wireless gadgets meanwhile people like me are left suffering without any consideration or protection.

Conclusion

What happens when, 24 hours around the clock, we allow ourselves and our children to be whole-body-irradiated by new, man-made electromagnetic fields for the entirety of our lives? How can our standards, which measure transmissions for 6 minutes exposure only, possibly afford a level of

protection and assurance of safety? It would seem that we are all participating in a non-consensual experiment.

The IARC decision followed in the wake of multiple warnings, mostly from European regulators, about the possible health risks of RF-EMFs. In September 2007, Europe's top environmental watchdog, the EU's European Environment Agency, suggested that the mass unregulated exposure of human beings to widespread radiofrequency radiation "could lead to a health crisis similar to those caused by asbestos, smoking and lead in petrol."

We now live in a wireless-saturated normality that has never existed in the history of the human race. Our health and wellbeing is held hostage by conflicts of interest and Industry interference with concerned scientists and doctors like Dr. George Carlo, Chairman, Science and Public Policy Institute saying:

"Prompted by some early work by Dr. Henry Lai, we have continued to array the published studies in terms of funding source – i.e. as either independent or industry funded or otherwise influenced. Data shows that mobile phone industry funded/influenced work is six times more likely to find "no problem" than independently funded work. The difference is statistically significant. The industry thus has significantly contaminated the scientific evidence pool, with the clear purpose of making sure that a general "weight of evidence" analysis would always tilt in the favour of their position."

These are the very same tactics that were used by the Tobacco Industry with research on smoking.

Given that ARPANSA's RF standards have not changed in the last 10 years, do not take into consideration the latest scientific findings by independent scientist and cannot provide any assurances for protection against long term exposures. ARPANSA's RF Standards are used by the Government, wireless device manufacturers, Telecommunication providers etc. to state "RF is safe" are in fact of little use except for research purposes and certainly should not be used for providing public health assurances.

I believe it is high time that the Governments (both Federal and State), ARPANSA and Australian Health bodies act in a morally responsible way by taking urgent steps to update policies and standards to be in alignment with what is being done around the rest of the world. I also believe that ARPANSA needs to review recent scientific research literature in this field without prejudice including updating the RF standards with a response that satisfactorily addresses the BioInitiative report and the recent classification by IARC/WHO that RF is classified as class 2B possible carcinogen. This review should be performed transparently and devoid of industry (telecommunications, wireless manufactures etc.) interference and by recognised experts that are not limited to the field of electrical engineers and physicists i.e. it demands the involvement of people from the medical and biological sciences as well. The ARPANSA RF Standards need to urgently address the issue of non-thermal affects which have been shown to exist repetitively by many "independent" researchers. 10 years on and the standards remain unchanged with many comments of "further research being required". This is disgraceful and cannot continue as the health of current and future generations are at stake.

Since the installation of smart meters in my street I have been suffering daily headaches. I can no longer work in my home office or sleep in my bedroom, both of which are located at the front of the house. This is an unacceptable situation I am finding myself in yet I am supposed to feel satisfied that because smart meters emissions are well below our standards that I should be fine. This is not the case for me and many others. I expected I will be branded an alarmist yet not one of the health

professionals I have visited nor is the Government health department, chief medical officer or the energy minister able to adequately explain why I am suffering constant headaches since smart meters were installed in my street. Pain is a mechanism by which the brain tells you that you are in danger or already in the process of being damaged. It is a powerful motivator to get you to move away from the cause to prevent further injury/damage. In my case I have been given no options. It is like forcing a non-smoker into a room full of smokers. It is criminal. I want to know what is going to be done about this serious issue as I should not be made to suffer in my own home!

I would like to finish off with a few pertinent quotations:

“This is the largest technological experiment in the history of our species and we’re trying to bury our head in sand about the potential risks to cells, organs, reproduction, the immune system, behaviour, risks we still know next to nothing about.” - Joel Moskowitz, director of the Centre for Family and Community Health at the University of California.

'The health effects of smoking alcohol and air pollution are well known and well talked about, and it's entirely reasonable we should be openly discussing the evidence for this, but it is not happening (in relation to Mobile Phones and Cancer). We want to close the door before the horse has bolted.' - Professor Denis Henshaw, emeritus professor of human radiation effects at Bristol University.

Leukaemia, testicular, laryngeal, prostate and uterine cancer rates have gone up nearly exponentially. The tissue in the larynx is particularly sensitive to microwave radiation (Goldberg 2006), as are the testicles. Goldberg says “Regardless of the type of exposure, the effects of the radiation are cumulative. That is if you received a large exposure over a short period of time, or if you received a low dose exposure over a longer period of time, the results are the same. The total exposure is cumulative; in essence there is no safe dose.” Gerald Goldberg, MD

“Laboratory studies point to significant interactions of both power frequency and RF with cellular components, especially DNA. The epidemiological studies point to increased risk of developing certain cancers associated with long term exposure to RF. Overall, the scientific evidence shows that the risk to health is significant, and that to deny it is like being in free-fall and thinking ‘so far’ so good’. We must recognize that the is a potential health problem, and that we must begin to deal with it responsibly as individuals and as a society” Martin Blank PhD EMF Researcher

“It’s not age, it’s too fast to be genetic, and it isn’t all down to lifestyle, so what in the environment can it be? We now live in an electro-smog and people are exposed to wireless devices that we have shown in the lab to have a biological impact. It makes sense that kids are more sensitive – they have smaller heads and thinner skulls, so EMFs get into deeper, more important structures.

“It is totally unethical that experimental studies are not being done very fast, in big numbers, by independently funded scientists. The industry is just doing their job, I am more preoccupied with the so called independent scientists and institutions saying there is no problem.” Dr Annie Sasco President of HealthCam and is an internationally known epidemiologist.

Yours Sincerely,

s 47F [redacted]

Special note: I have included a question sheet with this letter that I request a written response for from your organisation. I have also included a number of papers with this letter and I would like some objective feedback from your scientists. I can also make myself available to discuss any of the issues I have raised in this letter, commentary sheet and question sheet.

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Irrelevant

[redacted]

From: s 47F [redacted]
Sent: Monday, 17 December 2012 10:30 AM
To: Carl-Magnus Larsson
Cc: Martin Reynolds; Stephen Solomon
Subject: ARPANSA RF Standards Public health and safety concern

Dear Dr Larsson, I am writing this email to you to highlight a very serious concern that I have in regards to the mandated roll out of smart meters in Victoria that uses wireless communications to send power usage data back to the power utilities. The Energy Minister, Hon. Michael O'Brien and the Department of Primary Industries are saying that the emissions are safe and within the limits specified in ARPANSA'a RF standards. I do not believe ARPANSA's RF standards are fit for purpose for government ministers to make such claims of safety particularly when the RF standards cannot provide the general public health assurances against long term chronic exposures to a range of different Radio Frequency (microwave) radiation. ARPANSA's website states "ARPANSA is the Australian Government agency charged with responsibility for protecting the health and safety of people, and protecting the environment from the harmful effects of radiation." This does not appear to be the case and I have gone to great lengths in the attached letter and critical review documents to demonstrate this.

I have included a letter that is addressed to you, a critical review of our RF standards and a question sheet. I will be sending the same documentation along with supporting evidence to you by certified mail as I am not sure whether an email can be considered a legal document. I have copied people from your legal department as I expect I will have no recourse but to take legal action in order to protect myself
and my families health.

Should you or anyone wish to contact me to discuss this issue I can be reached on 03 9395 5859 (during business hours).

s 47F [redacted]

***ARPANSA Radiation Protection Standard Maximum Exposure Levels to Radiofrequency Fields - 3kHz to 300 GHz Standard* and selected Fact Sheet quotations (key points) along with my concerns.**

"The possibility of carcinogenic effects of exposure to RF fields has received considerable attention in the last 20 years. Studies have examined the possibility that RF energy may cause DNA damage or influence tumour promotion. The balance of evidence suggests that exposure to RF fields is not mutagenic and therefore unlikely to act as an initiator or promoter of carcinogenesis (IEGMP 2000)."

This is at odds with research performed before and after these standards were published. I would suggest that ARPANSA personnel who are responsible for investigating research papers to take a look at this website http://www.powerwatch.org.uk/ which has categorised a large number research articles on Radio Frequencies effects or lack thereof based on the research findings. Some people have gone further to analyse RF studies to determine whether the researchers were independent or funded by the industry. A very interesting picture developed and should be taken into consideration when forming any position on RF safety and the relevance of our current standards. Collusion between the industry and researches are noted with manipulation of data to support a "no effect". Refer to the included article from Microwave News ""Radiation Research" and The Cult of Negative Results"

There are plenty of research papers dating back 70 years showing biological effects with some showing health implications. There is evidence that research showing positive effects with potentially significant biological implications are being swept under the carpet and proponents of microwaves lobbying to have funds cut to stop research. [1] [2]

Other examples of collusion include the recent Interphone study where crucial annexures were not included in the initial report released to the public, where a statement was made to the effect that there was no observable increase in cancers with respect to mobile phone usage which is misleading and incorrect. Where the EPA (US) was going to release a report (Jun 1990) that suggested RF be categorised as a Class B-1 probable carcinogen but was stopped by Agency officials who overruled this assessment, but they still allowed that EMFs were a "possible, but not proven, cause of cancer in humans". [2]
Also take a look at this article [1] in New Scientist where a group at Brooks Air Force Base (AFB) was tasked with reassuring residents when the Air Force wanted to install radar (microwaves) in their neighbourhood. To meet that responsibility, the Brooks group hired contractors to write Environmental Impact Statements to justify the placing of the radars—an obvious conflict of interest. Even worse, when a scientist did publish findings that might indicate a risk, Brooks selected other contractors to do experiments that suggested the scientist's research was invalid or not relevant to the safety of Air Force radar.
If I had the time and energy I am sure I could fill pages with examples of documented interference by the industry (like Motorola, DoD etc.)

DNA Damage how can this occur?

All Scientist agree that the energy levels of microwaves are far too low to break hydrogen bonds directly and certainly incapable of breaking covalent bonds found in DNA so theoretically we should never see DNA breaks. The problem is we do and this has been verified many times using a single Cell Gel Electrophoresis assay (also known as *comet assay*) even at levels of emissions typically found from mobile phones. Singh et al. Cells exposed to mobile phone microwaves over 2-3 hours show both single stranded and double stranded breaks. How is this possible? Some Scientists are suggesting that Microwaves cause an elevation of reactive oxygen species (ROS) which is both reactive and noted for its capability to damage biological molecules.

"*The mechanism by which microwaves induce DNA damage is still unclear. As is well known, ROS are reactive and readily damage biological molecules, including DNA. ROS are generated as a by-product of normal mitochondrial activity in aerobic cells. The overproduction of ROS reportedly causes severe damage to cellular macromolecules, especially the DNA. Stopczyk et al. found that oxidative stress after exposure to microwaves may be the reason for many adverse changes in cells. The study of Moustafa et al. indicated that acute exposure to the radiofrequency fields of commercially available cellular phones may modulate the oxidative stress of free radicals by enhancing lipid peroxidation and reducing the activation of SOD and GSH-Px, which are free radical scavengers. Balci et al. reported that mobile phone radiation leads to oxidative stress in corneal and lens tissues. We also detected elevated intracellular ROS levels of hLECs after mobile phone radiation at the SAR of 3 W/kg and 4 W/kg. We speculate that the surplus ROS produced by microwaves disturbs the balance between the oxidation and reduction systems, leading to DNA damage indirectly. The DNA lesions caused by ROS include oxidized bases, sugar lesions, abasic sites, DNA–protein cross-links, SSBs, and DSBs. In addition, the oxidation of proteins and lipids may also generate intermediates that attack DNA.*

These bioeffects of microwave radiation may be attributed to nonthermal mechanisms" [3]

As one can see from the research above, the pathway suggested is most likely biological and something I doubt Physicists and Electrical Engineers, who are the ones who have a lot of sway on RF Standards, have the necessary qualifications to argue against.

Motorola Funded Counter Research on Microwave DNA Damage

Dr Henry Lai and Dr Narendra Singh used a DNA Comet Assay developed by Dr Singh to determine the microwaves damaged DNA-strands. They found that nonthermal microwave exposures significantly caused single and double DNA stranded breakage in living mice brains. The cell phone company Motorola wanted to prove that these studies were wrong and that microwaves and cell phone radiation do not cause DNA strand breakage. They funded Dr Roti at Washington University, St Louis to replicate the Lai and Singh studies to try to show that they do not produce these effects. Dr Roti used a different, much less sensitive assessment method and used a cell-line not living mice. Hence it is not a replicate study. They claimed not to show any DNA strand breakage from radiation exposures. The analysis of their own published data shows that they actually did show that microwaves and cellphone non-thermal radiation significantly damages DNA strands and enhances significant repair rates in human cells. [4]

"Although there is some data indicating that biological effects could occur in various species at exposure levels marginally below the ICNIRP Guidelines, none of the data could be used to establish that exposure within the ICNIRP Guidelines would lead to an adverse health effect in humans."

This is at odds with what recent research has found particularly with respect to the Bioinitiative Report and what independent analysis of more than a 1300 research papers have found (refer to http://www.powerwatch.org.uk/). In fact a number of reports suggest that effects that can lead to adverse health effects can occur 100's to 1000's times lower than the recommended reference levels advised by ARPANSA and the ICNIRP guidelines as opposed to the "marginally below" comment specified above.

"There is insufficient data to establish that adverse health effects would result from low-level exposures, although it cannot be unequivocally stated that such effects do not exist."

"The current scientific evidence clearly indicates that there are RF exposure thresholds for the adverse health effects of heating, electro-stimulation and auditory response. The basic restrictions of this Standard are derived from these thresholds and include safety margins."

I would **not** consider 14 year old guidelines on which our 10 year old standards were developed are based on current scientific evidence. Our standards are woefully out of date and in urgent need of complete overhaul and revision. I would even go so far as to say they are irrelevant when it comes to providing long term health assurances (Local Government is using ARPANSA RF standards to claim devices are safe). An urgent review is required that not only considers latest research findings but must adequately deal with recognised non thermal effects which currently are mentioned as a possibility but not fully considered. It is time for ARPANSA to get off the fence and take action. There needs to be formal recognition by your organisation and the Government about the possibility if real dangers posed by non-ionising radiation (not limited to thermal effects). Like our more enlightened friends in the European Union, please refer to European Council documents that I included with this letter i.e. document 12608 and Resolution 1815.

"There is some debate as to whether RF causes any effects below the threshold of exposure capable of causing heating and electro-stimulation, and in particular whether any effects occur at or below the exposure levels of the limits. If any low level RF effects occur, they are unable to be reliably detected by modern scientific methods, but a degree of uncertainty remains. The data of long term exposure is limited. It was considered that the evidence for possible low-level effects is so weak and inconsistent, that it does not provide a reason to alter the level of the limits. The limits specified in this Standard are designed to protect against known health effects and may not prevent possible or unknown low-level effects, although the safety margin within the limit may provide some protection against such low-level effects."

"The scientific literature has on many occasions considered the possibility that RF could cause adverse effects by mechanisms other than electrostimulation or heating, including possible effects on cell membranes, and also by other unknown mechanisms. The existence of this literature is acknowledged and has been reviewed, however data from it is unsuitable for use in standards setting."

Why was the data considered to be unsuitable? Is it because adequate exposure information is often lacking? We continue to focus only on the heat effects because thermal effects of microwaves are known and demonstrable. Non thermal effects although known cannot be fully explained adequately by scientists and I assume making it difficult to work out a level of emission that can afford personal and environmental safety. The side effect of this oversight of not including latest non thermal research in developing our RF standards is that the health and wellbeing of the current and future generations is being held hostage to poor science and closed minded attitudes. It is only when our health system becomes overburdened and the costs of supporting those who are suffering becomes unbearable will people begin to act. This same paradigm was witnessed some 20 – 30 years ago when researchers were trying to determine whether smoking cigarettes were carcinogenic. It is a terrible tragedy in the making where the wealth of corporations appears to be being placed ahead of the health and wellbeing of the general public.

"However, it is reasonable to hypothesise that any effects of unknown mechanism would be related to energy transfer by the mechanisms of absorption which are understood and quantifiable and for which this standard provides limits.

Therefore, the only residual concern is the possibility of effects of an unknown mechanism occurring at levels below the thresholds for electrostimulation or SAR heating, which might not therefore be afforded the same factor of protection as those intended by the standard in respect of the established mechanisms of tissue interaction. However, it is considered that the large safety factors which are applied, together with the absence of any confirmation of any other low-level mechanisms provide support for the ICNIRP basic restrictions giving adequate protection against any established or conceivable hazard."

How can you assure the public that the basic restrictions provide adequate protection when people such as myself are suffering due to exposure levels 1000's of times below the ICNIRP guidelines, that scientists have demonstrated through epidemiological and in-vitro studies that biological effects do occur below reference levels and include genotoxic events? I am not alone in claiming that I am affected by microwave radio frequencies. There are more and more people around the world who are showing symptoms of microwave sickness yet nothing is being done about it. The WHO describes all the non-specific symptoms with great accuracy then goes on to say that that there is no evidence that it is related to exposure to EMF which is most bizarre! Unfortunately EHS suffers are a misunderstood minority that are made to suffer in silence or face ridicule when they announce their plight to their associates and members of the local public including local doctors and government representatives.

Epidemiological Studies

"The epidemiological evidence does not give clear or consistent results which indicate a causal role of RF field exposures in connection with any human disease. On the other hand, the results cannot establish the absence of any hazard, other than to indicate that for some situations any undetected health effects must be small."

There are plenty of research papers showing effects that are repeatable which also include epidemiological evidence. The wireless industry is behaving very much the same way as the cigarette manufacturing industry by interfering with research, encouraging industry sponsored "no effect" results to be published and threatening researchers or cutting funding for those that show an effect. It appears that the industry naively believes that if a large number of research papers show inconclusive results are seeded into the research result pool that this should "balance" those showing effects resulting in confounding evidence. I am sure you are well acquainted with Don Maisch Phd who has written quite extensively on conflicts of interest between the wireless industry and Domestic and International RF standards bodies. Refer to his dissertation "The Procrustean Approach" and A Machiavellian Spin: Political and corporate involvement with cell phone research in Australia, Sept. 2010. [5]

"Cancer is the disease that has been studied most extensively, and although there are many individual associations seen, there is little overall consistency in the results. None of these studies give good information on individual levels of exposure. The studies of general populations living near radio or television transmitters relate to radiofrequency exposures likely to be well below currently accepted standards."

A number of RF studies have found that microwaves appear to be capable of causing breaks to double stranded DNA and include levels of exposure. If this is true then one can assume with some confidence that such actions would be random and could lead to many forms of disease states and not limited to a specific type. This could explain why we are seeing year on year increases in several types of cancers (leukaemia, breast and prostate cancer etc.) as RF exposure is not just limited to the head. Whole body exposure occurs daily due to Mobile Phone towers, Wireless networks both at home and public places, DECT phone base stations and more recently, smart meters being installed in every home.

It is also important to take into consideration that the Human body/cells have natural DNA repair mechanisms. This could explain why we do not see statistically significant increased detrimental health effects immediately or in the short term when people are exposed to RF. However people who face various chronic health issues will likely find their susceptibility to be more pronounced and the effects more acute as is my case. The effects of radiation damage both ionising and non-ionising is accumulative. All these parts of the puzzle when looked at holistically begin to create an alarming picture. But when selective vision is applied the picture remains conveniently vague. We are already starting to see the ravages of being exposed continuously to MW radiation with the Danish Cancer Society recently reporting that the number of men diagnosed with glioblastoma —the most malignant type of brain cancer— has nearly doubled over the last ten years [6] and figures from ONS show 50 per cent increase in brain tumours since 1999 in the UK [7]. Dr Annie Sasco, from the Epidemiology for Cancer Prevention unit at Bordeaux Segalen University highlighted at recent conference in the UK that there has been a one to two per cent annual increase in brain cancers seen in children [8]. We cannot afford to wait until there is significant number of cases because it can affect the present and future generations. Precautionary action needs to be taken now!

It is most unfortunate that ARPANSA does not measure and keep historical records of how the levels of human engineered EMF in the environment is ever increasing otherwise we could do some holistic analysis using pattern matching techniques that look at the correlation between the increasing incidences of many types of cancer such as childhood leukaemia, brain and breast cancers as well as mental issues such as autism and Alzheimer's with the level of manmade RF permeating the environment. All of these disease states have been attributed by different scientists to RF emissions.

Some real facts below:

Prevalence of Brain tumours

"Prevalence of primary brain tumours is estimated at 221.8 per 100,000 people in 2010, compared with 209 per 100,000 in 2004.1 In 2012, an estimated 66,290 new primary brain tumour diagnoses will be made in the U.S., 24,300 malignant and 41,980 nonmalignant."

http://www.braintumor.org/news/press-kit/brain-tumor-facts.html

"Brain cancer is the leading cause of cancer death in people aged 0-39 years with an average of 120 deaths per year.

Each year about 1400 cases of malignant brain cancer are diagnosed in Australia and about 1100 people die from the disease each year.

This year it's estimated that about 1600 people will be diagnosed with brain cancer and 1300 people will die from the disease in Australia."

http://www.cancercouncil.com.au/30904/news-media/latest-news-news-media/media-releases-news-room-news-media/brain-cancer-is-leading-cause-of-cancer-death-in-young-people/?pp=30904

"The incidence of breast cancer in Australia is increasing: the number of new cases of breast cancer diagnosed in women has increased from 5,310 in 1982 to 13,567 in 20081"

http://canceraustralia.gov.au/affected-cancer/cancer-types/breast-cancer/breast-cancer-statistics

"Incidence rates for prostate cancer have increased in recent years, from 79.7 cases per 100,000 men in 1982 to 189.5 cases per 100,000 men in 2008". Men carry their mobile phones in trouser pockets or on their belts. When connected to blue tooth, emissions are much higher than when in standby mode.

http://canceraustralia.gov.au/affected-cancer/cancer-types/prostate-cancer/prostate-cancer-statistics

Autism statistics

- 1 percent of the population of children in the U.S. ages 3-17 have an autism spectrum disorder
- Prevalence is estimated at 1 in 88 births
- 1 to 1.5 million Americans live with an autism spectrum disorder
- Fastest-growing developmental disability; 1,148% growth rate
- 10 - 17 % annual growth
- $60 billion annual cost

http://www.autism-society.org/about-autism/facts-and-statistics.html

How do we account for these increases? Selecting microwaves as being the only culprit for all of the above would be naïve at best but certainly it cannot be rule out as being a possible contributor especially since so many of them exhibit growth rates that are similar to the rate of deployment of RF in our environment.

"The exposures to the head in users of mobile phones are considerably higher, and although experimental evidence shows no evidence of carcinogenic mechanisms or clearly abnormal cellular effects, recent research raises the possibility of biological or psychological effects. These experimental results are unconfirmed and inconsistent, and where effects have been shown their importance in terms of health is unclear; however the possibility of a detrimental effect is difficult to dismiss completely. Epidemiological studies concerning mobile phone users are proceeding, particularly in regard to tumours of the central nervous system."

Who wrote this particular section? Did they by any chance have affiliations with the Mobile phone industry or the purveyors of this dangerous technology? Again there are plenty of research papers that say otherwise. It appears that the writer is trying to be suggestive that some effects may be psychological which is disingenuous to people such as myself who are clearly aware of the source of their headaches, heart palpitations, lethargy etc. It also flies in the face of what some researchers are finding and what has been clearly documented by the World Health Organisation in great detail for the description of EHS (even though they fail to recognise the cause). Regarding the comment "shows no evidence of carcinogenic mechanisms or clearly abnormal cellular effects" is clearly not correct. The recent Interphone study, despite being full of flaws, showed increases in certain types of brain cancers amongst heavy users – Heavy users at the time the study was conducted would now be classified as normal users by today's standards. More recently a study (Cardis Study), published January 2, 2012 in Occupational and Environmental Medicine (available online since June 2011), concludes that there is an increased risk of glioma (a type of brain tumour) in long-term mobile phone users with high RF exposure and a lower risk for meningioma (a tumour of the membrane surrounding the brain).[9]

"Definition (from ARPANSA RF Standards) Epidemiology is 'the study of the distribution and determinants of disease inhuman populations' (MacMahon & Pugh 1970, p.1). It is the science which studies the causes of disease in human free-living populations, in contrast to studying causal mechanisms in experimental animals or cell systems.

Very occasionally, where a particular causal agent is the only (or almost the only) cause of a specific disease and has a very clear and strong effect, a causal relationship can be established on the basis of one, or only a few, well-conducted studies; examples include occupational studies of asbestos exposure, and the studies of those affected by radiation from the atomic bombs in Japan in 1945.

Much more commonly, however, the causes of a disease are established by the cumulative evidence provided by a large number of different studies, rather than by one particular study. If an association is seen between a possible causal factor and a disease (for example, between exposure to radiofrequencies and the development of cancer) a careful evaluation of the extent and quality of the studies showing that association is necessary, before concluding that there is likely to be a cause and effect relationship, or whether the associations seen are more likely to be due to other factors.

The best possible studies to assess potential hazards are studies in which individuals are selected for a study and specific information is collected on the suspected causal factor, the disease outcome, and (most importantly) other relevant factors which could be related to the disease outcome. Studies comparing health outcomes in two or more groups with different exposures are cohort studies (for example, comparing smokers with non-smokers). Studies comparing subjects with a particular disease to an unaffected control group are case-control studies (for example, studies of lung cancer patients and unaffected persons assessing differences in past smoking). These are the methods by which most recognised causes of human cancer have been identified (such as smoking, asbestos, ionizing radiation, and so on)."

I remember many years ago that Scientists had data from analysis of smokers compared to non-smokers but at the time the evidence was said to be inconclusive with the industry muddying the waters with their own half-baked research. The same is happening today with RF research leading to organisations such as yours to claim there is "no conclusive evidence" or "further research is needed". It is also unfortunate that based on the suggested study criteria mentioned above we can never truly fulfil the requirements of case controlled studies because we are ALL exposed continuously to manmade RF frequencies every day, I discount natural EMF because it is millions of times lower that what we are living in today and it is something humans would have evolved over time to handle. It is also very unlikely that scientists will be able find areas where we have exposure levels low enough and contains a sufficient population to provide a useful sample of "control subjects". To create a controlled study, people would need to live in shielded buildings and refrain from going outside unless they are wearing protective clothing/covering at all times, which would be highly impractical. People who live in rural areas are also unlikely candidates if they have mobile phone access as distances to towers are likely to be greater resulting in phones working at maximum power for transmission.

"Usually, a large number of such studies needs to be completed before a consensus can be reached on a particular causal situation."

How many studies showing an effect are considered enough before consensus is reached? 10? 100? 1000? There is plenty of evidence from independent researchers showing that radio frequencies are genotoxic (carcinogenic). Whenever a potential cancer cluster is brought to the attention of scientists any RF sources are automatically discounted especially if they are determined to be within stated RF guidelines. Instead when the cause cannot be found (by overlooking RF as a possible contributor) it is usually then closed off as a "result of some unknown environmental factor".

In 2006, the top two floors of an RMIT building in Melbourne where a number of employees had various forms of brain tumours. A number of epidemiology studies concluded it was not a cancer cluster. "The diversity of tumour types indicates that there is no single cause. There is, therefore, no evidence for a work-related brain cancer or other cancer cluster on levels 16 and 17". I find this quite disturbing considering that RF which has shown to cause DNA breaks would occur in a random fashion and thereby could be used to explain the cause of this phenomenon. Obviously if researchers restrict their criteria to existing RF standards that do not consider non thermal effects, ignore the possibility that DNA breaks may be caused through biological pathways rather than direct interactions and only looks at short term exposures, it is easily seen how the original conclusion was made. There appears to be a general reluctance to admit that RF could be the potential cause because the implications would be enormous and a 4 trillion$ industry (global) having an uncertain future.

"Cluster studies should be regarded as raising a hypothesis, which can then be tested in further studies."

Why? If we find clusters of cancers around transmission towers that are at level not seen in the general population who are not located near towers doesn't this provide some credibility? A number of studies have been performed that do show a rise in the incidence of cancers around transmissions towers yet I do not see this mentioned in any of your fact sheets or mentioned in the standards. Again I ask the question. How many studies need to be done showing a link before your organisation will consider that the evidence is sufficient to recognise there is a real and significant danger posed?

* Radio/TV towers (Michelozzi 2002, Cherry 2000, Dolk 1997, Hocking 1996),
* Mobile phone base stations (Eger 2004, Wolf and Wolf 2004)
* Electricity towers (Ahlbom et al, 2000, Greenland et al, 2000, Michael Kundi)

"**Biological Plausibility:**

Cancer is biologically plausible if the disease agent is genotoxic. RF/MW radiation significantly enhances chromosome aberrations in many studies (14-32). Four of these studies show dose response relationships (20, 21, 26, 30), and seven show significant micronuclei formation (18, 20, 21, 23, 26, 30, 32). Nine studies from five independent laboratories show direct DNA strand breakage (34-42). One of these studies shows a dose-response (35) and another shows an extremely significant DNA strand breakage, $p<0.0001$, at a very low exposure level, 0.0024 W/kg, (40). Two of the DNA studies (38, 39) claim that their data does not show that RF/MW radiation produces DNA-strand breakage. However, their data shows significant DNA breakage followed by significantly enhanced DNA repair. There is highly substantial evidence that RF/MW is genotoxic and is therefore carcinogenic."[10]

The example studies provided in the standards are too short term to discover significant effects. Also note that number of mobile towers and handsets in the 90's is significantly lower than what has been deployed today. People often move houses so this can also create uncertainty should tumours be found later in people who originally lived near a tower and then moved to a location where there towers are not in close vicinity. Cancers can take 20+ years to materialise.

The levels of RF in the environment are unprecedented especially with the ever increasing complexity of the modulated frequencies that carry the information we transmit on our cell phones, smart phones and wi-fi systems. These EMFs are largely untested with respects to their effects on human beings. We live in bizarre and irrational regulatory world where controlled medical tests of EMR on humans are unacceptable but uncontrolled exposure is accepted and unregulated.

Research into RF Bio-Effects at Low Levels of Exposure

"A further and more vexing question is whether there may exist a form of RF energy absorption that may not manifest itself in a measurable increase in tissue temperature, but could nevertheless be linked to bio-effects. These have been termed athermal or non-thermal effects, but since there is still the possibility of these being due to a local thermal mechanism, the term 'low-level effects' is preferred. These reported effects could be due to a) a differential uptake of RF energy by specific cell types or cellular components; b) non-uniformities in energy absorption patterns within an exposure system; c) a resonant absorption mechanism which is non-thermal in nature; d) experimental artefact or statistical anomaly. Whether the mechanism is actually thermal or not, or whether these reported bio-effects are real or artefactual, those effects suggesting statistically significant biological interactions at SAR levels well below 1 W/kg need to be replicated satisfactorily, particularly if they are suggestive of harm, before they can form the basis of standard setting.

Whilst these low-level effects have not been established, they cannot be ruled out and so more research is needed."

The Standards in several places provide examples where some health impacts were noted but in nearly all cases were indifferently brushed aside by saying more studies are needed. How many studies are needed before there is consensus? Who is doing these studies? ARPANSA? It appears the RF standards are trying to show balance by presenting both what appears to be evidence of health risks as well as confounding arguments. But ultimately the impression given is one of reluctance to accept that people's health could be impacted or that the standards may not be sufficient.

Unanswered Questions

"There are a number of issues that still need to be clarified in terms of their possible implications for health and welfare. Although the overwhelming majority of studies in experimental animals have failed to show a link between RF exposure and cancer, the repeat of the study by Repacholi et al. (1997) showing an excess lymphoma rate in genetically engineered mice, (referred to as the 'Adelaide Study') is awaited with interest."

I assume Repacholi mentioned above is referring to Michael Repacholi who was once head of the EMF project at the WHO? Do a Google on Michael Repacholi and one finds evidence of conflict of interests with ties to the industry. Does ARPANSA take consideration of sources of funding and potential conflicts of interest and potential industry interference when it reviews candidate studies?

"Michael Repacholi Former head of WHO's EMF project and ICNIRP chairman. Just months after leaving his post as the head of the EMF project at the World Health Organization (WHO), Mike Repacholi is now in business as an industry consultant. The Connecticut Light and Power Co., a subsidiary of Northeast Utilities, and the United Illuminating Co. have hired Repacholi to help steer the Connecticut Siting Council away from a strict EMF exposure standard. Repacholi was often accused of favouring the mobile phone and electric utility industries at the expense of public health.

Others see Repacholi's consulting work as the closing of a circle. Industry provided financial support for the EMF project and Repacholi is now using the materials he prepared at the WHO with industry money to support their policy positions." [11]

"Alterations in blood-brain barrier permeability could lead to inappropriate exposure of neural tissue to blood-borne pathogens, thus it is important to discover whether this alteration is a consequence of tissue heating at SAR levels above the basic restrictions. Similarly, changes in gene expression may also be a consequence of thermal effects, but it is important to continue to refine methods for determining local SAR and to evaluate whether any changes have any serious health implications. Neuropsychological and neurophysiological testing may suggest that altered human responsiveness may result from RF levels just below the basic restrictions, but it remains to be unambiguously demonstrated that this is the case, and that any alterations would have serious implications in terms of well-being. "

My headaches, insomnia, chest pain, digestive disturbances are occurring well below (more than a 1000 times) your basic restrictions. I am a statistical anomaly that is upsetting the apple cart so to speak. I am also not the only one. What is ARPANSA going to do to address this issue? We are not going to go away and it is likely that our numbers will increase as has been predicted by a number of scientists. Some have suggested up to 50% in the next 50 years will be suffering from EHS. [12].

Swedish neuro-oncologist Leif Salford and team have exposed thousands of laboratory rats to microwave radiation from mobile phones since the late 1990's. Their results have been consistent and alarming: not only does radiation from a cell phone damage the blood-brain barrier, but it does so at even when the exposure level is reduced a thousandfold. Even more disturbingly, and contrary to what was expected, the damage to the blood-brain barrier worsened when the experimenters reduced the exposure level. This implies that SAR ratings for cell phones may be worthless and that it may not be possible to make cell phones safer by reducing their power. [13]

"In summary, it would appear that although non-thermal effects or mechanisms cannot be ruled out, the evidence for them is inconsistent and further confirmatory studies need to be carried out, particularly in relation to SAR estimations."

So it is acknowledged that non thermal effects may exist and cannot be ruled out yet the Standards do not consider them or provide protection against them. That we need to wait until more research is done, this is a problem in itself because most of the research appears to be sponsored by the industry with little commitment by the government to provide funds for independent research. To me it appears our priorities are completely misplaced. Rather than taking a precautionary approach and limiting the deployment of RF in our environment we are encouraging the proliferation of wireless devices and will only stop if the evidence comes in showing conclusively and repetitively that it is harmful. It is shameful that we place more emphasis on protecting revenues of the purveyors of this technology rather than the health and wellbeing of the general public.

A Public Health Precautionary Approach to RF Fields

"The limits are designed to prevent established health effects of heating, electro-stimulation and auditory response, and are set at a level that includes a safety margin."

Yet there is mounting evidence that people are actually suffering from tinnitus (ringing in the ears) since the installation of smart meters on or near their homes. Smart meter RF emissions are described by the DPI as being lower than mobile phones, baby monitors etc. and that the maximum RF EMF Power Density levels were well below the ARPANSA General Public Limit, even when the meter was forced to transmit continuously (100% Duty Cycle) so how do you explain these claims of tinnitus? I am also feeling their effects and it isn't pleasant especially when my sleep is continually being disturbed and I am waking up with severe headaches. As I stated in my letter, I am sensitive to all the devices listed above and I consider them to be all dangerous despite them also being well below the ARPANSA General Public Limit.

"An annex of the Standard discusses a public health precautionary approach to RF fields."

Unfortunately it appears to be a discussion offering several views from 3rd parties without making a firm commitment to implementing one.

“In the public health field there is a movement to adopt precautionary (sometimes called cautionary) approaches for management of health risks in areas of scientific uncertainty. The philosophy of the precautionary approach is that ‘where there are reasonable grounds for concern about a risk and there is uncertainty, decision makers should be cautious’.

Since the concept of the precautionary approach was first developed there has been considerable controversy as to what the precautionary approach actually consists of, what triggers it and how it is to be applied. Over time the concepts have been refined, the issues and elements have become clearer, and as a more structured formulation, the term precautionary principle has been used.

One example where the precautionary principle was enshrined was at the Rio Conference on the Environment and Development 1992, during which the Rio Declaration was adopted, whose principle 15 states that: ‘in order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost effective measures to prevent environmental degradation’ (United Nations General Assembly 1992).

On 2 February 2000, the European Commission approved an important communication on the precautionary principle providing guidelines for its application (Commission of the European Communities 2000). The EC document indicated that even though scientific data may be limited, there needs to be as complete assessment as possible of the risk. Judging what is an acceptable element of risk for society is a political responsibility. The concerns of the public have to be considered and the decision making process should be transparent and involve all interested parties. To trigger the precautionary principle there needs to be reasonable grounds for concern about a possible hazard.

That document indicated that where action is deemed necessary, measures based on the precautionary principle should be:

- proportional to the chosen level of protection,
- non-discriminatory in their application,
- consistent with similar measures already taken in equivalent areas in which all scientific data are available,
- based on examination of potential benefits and costs of action or lack of action (not just economic costs),
- subject to review in the light of new scientific evidence,
- capable of assigning responsibility for producing scientific evidence for a more comprehensive risk assessment.

Those guidelines could be applied to a variety of situations of varying risk.”

When is ARPANSA going to take a stand on this issue and recommend a precautionary approach to the Government? To date it appears that the application of a precautionary approach as advised by ARPANSA verbiage “could be applied” is very noncommittal. It appears that by making such a statement your department is giving flexibility of whether to apply such a principle to the Government which has more often not been shown to be inept when it comes to making correct decisions that are in the best interest of the public. Politicians should be guided by good science and not those with vested (commercial) interests.

“This is not a simple matter – there are costs involved in adopting precautions and the science does not at all establish even indicative parameters on which a precautionary approach might be based. In relation to the general public, the Standard, nevertheless, states the principle of minimising, as appropriate, radiofrequency exposure which is unnecessary or incidental to achievement of service objectives or process requirements, provided this can be readily achieved at reasonable expense. Any such precautionary measures should follow good engineering practice and relevant codes of practice.”

So this means that commercial interests of saving costs are a higher priority than public health. Instead we should be looking at adopting one of the following versions of the precautionary principle:

“if an action or policy has a suspected risk of causing harm to the public or to the environment, in the absence of scientific consensus that the action or policy is harmful, the burden of proof that it is not harmful falls on those taking the action.” [Wikipedia].

The most important Australian court case so far, due to its exceptionally detailed consideration of the precautionary principle, is Telstra Corporation Limited v Hornsby Shire Council. The case was heard in the New South Wales Land and Environment Court under Justice CJ Preston (24 April 2006).

The Principle was summarised by reference to the NSW Protection of the Environment Administration Act 1991, which itself provides a very good definition of the principle:
"If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reasoning for postponing measures to prevent environmental degradation. In the application of the principle... decisions should be guided by:

(i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment; and
(ii) an assessment of risk-weighted consequence of various options".

The most significant points of Justice Preston's decision are the following findings:

- The principle and accompanying need to take precautionary measures is "triggered" when two prior conditions exist: a threat of serious or irreversible damage, and scientific uncertainty as to the extent of possible damage.
- Once both are satisfied, "a proportionate precautionary measure may be taken to avert the anticipated threat of environmental damage, but it should be proportionate."
- The threat of serious or irreversible damage should invoke consideration of five factors: the scale of threat (local, regional etc.); the perceived value of the threatened environment; whether the possible impacts are manageable; the level of public concern, and whether there is a rational or scientific basis for the concern.
- The consideration of the level of scientific uncertainty should involve factors which may include: what would constitute sufficient evidence; the level and kind of uncertainty; and the potential to reduce uncertainty.
- The principle shifts the burden of proof. If the principle applies, the burden shifts: "a decision maker must assume the threat of serious or irreversible environmental damage is... a reality [and] the burden of showing this threat... is negligible reverts to the proponent..."
- The precautionary principle invokes preventative action: "the principle permits the taking of preventative measures without having to wait until the reality and seriousness of the threat become fully known".
- "The principle should not be used to try to avoid all risks."
- The precautionary measures appropriate will depend on the combined effect of "the degree of seriousness and irreversibility of the threat and the degree of uncertainty... the more significant and uncertain the threat, the greater... the precaution required". "...measures should be adopted... proportionate to the potential threats".

I understand that in this specific court case Telstra won because the Judge had not been made aware of all of the issues. Genotoxic effects are significant and can lead to irreversible damage to our genes. These damaged genes can be passed onto future generations creating a huge burden on our health system as well as a potential degradation in the quality of life for those affected. Scientific research has shown microwaves have genotoxic effects in a number of studies which need to be taken seriously

"*101 publications are exploited which have studied genotoxicity of radiofrequency electromagnetic fields (RF-EMF) in vivo and in vitro. Of these 49 report a genotoxic effect and 42 do not. In addition, 8 studies failed to detect an influence on the genetic material, but showed that RF-EMF enhanced the genotoxic action of other chemical or physical agents.*)[14].

Surely this constitutes a serious threat that warrants the adoption of the precautionary principle particularly with respect to the rollout of smart meters which puts at least 2 wireless transmitters in every home, many being located right next to main living areas and bedrooms. I guess the other question that begs to be answered is why fixed line communication was not considered, even as an alternative at the consumer's expense? I would have happily paid.

"The incorporation of arbitrary additional safety factors beyond the exposure limits of the Standard is not supported."

So there is no consideration for non-thermal effects, no consideration for sensitive people or those who have medical implants. I would say this is criminal and is likely to leave ARPANSA open to litigation when science finally catches up to what many of us already know. Particularly when ARPANSA's RF standards are used by device manufacturers, government and the deployers of said technology to say that their wireless devices are safe because emissions are within ARPANSA's stated limits.

"Further scientific research should provide data that helps reduce the degree of uncertainty about the effects of exposure to RF. Hence the Standard and Codes of Practice will need review in the light of new scientific evidence. Codes of Practice also have an important educational role, which can help reduce individual exposure, both public and occupational, to radiofrequency radiation. They do this by identifying potential areas of RF exposure, and giving advice on measures that individuals can take to reduce exposure to radiofrequency radiation."

When was the last time the Standards were reviewed? What measures can I take to protect myself from exposure to RF from mobile phone towers and smart meters? Can I expect compensation from the companies that install these towers and devices for the cost of shielding I will need to apply to my home in order to protect myself and my family? What about when I am shopping or walking in the neighbourhood? I am suffering daily from headaches, chest pain and lethargy ever since smart meters were installed in my neighbourhood. Complaining to Powercor gives me no satisfaction as they are denying any accountability. Instead they quote that their device emissions are below the stipulated RF standards and that they are mandated by the State Government to install them. I raised a complaint to the DPI and the Energy Minister and I am given the same drivel stating smart meter emissions are less than a mobile, less than a baby monitor etc. I say all of these devices are unsafe when exposed over a lifetime. Nobody listens or seems to care. I am at a loss of what I can do short of moving interstate or to some remote location to escape the daily torture that I am forced to face as I am being exposed continually to manmade RF emissions without my consent.

Below are a number of comments extracted from what your Organisation calls fact sheets. Unfortunately the facts do not actually stand up to scrutiny especially when one considers the mounting evidence that is in opposition to pretty much all that has been written in them.

From Fact Sheet 2 The ARPANSA Radiofrequency Radiation Exposure Standard
"The health implications of biological effects below limits specified in the RF Standard are not known. Accordingly, there is no established data for bio-effects below the limits that could be used for setting the levels of basic restrictions. There is an extensive worldwide research program into the possible health effects of low level RF exposure. ARPANSA will review the limits of the Standard if evidence does emerge of a causal link between low level RF exposure and adverse health effects in humans."

I would argue that there is a lot known about the biological effects microwaves have below and above the limits. There is over 70 years of research data available that accurately describes theses effects. What is unclear is the mechanism by which some of these effects occur, which creates a level of uncertainty. But rather erring on the side of caution we pander to the industry to allow them to foist their dangerous wares upon us and risk suffering the consequences in the future when it will be too late for many.

"As far as is currently known, RF radiation, for example, can only cause the molecules in biological material to vibrate and thereby generate heat."

This is nonsense and is the message that is continually delivered by those who hold fast to the principle that microwaves (RF) only exhibit heat effects and is typically the understanding of most electrical engineers and physicists. It is certainly not something that quite a few scientists with a background in biological sciences and medical professionals subscribe to.
This is has been disproved by many studies if you care to do some real research. Please also refer to included paper on BRIEF HISTORY OF SOVIET VS. WESTERN RADIO FREQUENCY & MICROWAVE (RF/MW) RESEARCH by Don Maisch (included with this letter) as to why we have diverging thinking on the effects of microwaves.

There are many reports in the literature of research on non-thermal effects, usually of a subjective nature. Studies that have investigated if RF radiation affects biological cells, other than by heating them, are inconclusive. In addition, the exposure levels used in these studies are higher than those mentioned above.

And also lower. Again there seems to be a reluctance to accept that non thermal effects are real. Inconclusive from what perspective? That there are quite a few studies showing no effect or not able to reproduce a result? More often or not this is due to poor or deliberately constrained research often sponsored by the industry. Refer to Microwave news and Interphone criticisms documentation included with this letter.

Mobile Telephone Communication Antennas and Health Effects Fact Sheet 4

Health Effects
"Current research indicates that, at the exposure levels indicated above, RF radiation is not known to have any adverse health effects.

The present concern that people have about RF exposure is whether these non-thermal effects also include cancer. While human studies to assess the possibility that RF exposure increases the risk of cancer are few in number, laboratory studies do not provide evidence to support the notion that RF fields cause cancer. Review groups evaluating the state of knowledge about possible links between RF exposure and excess risk of cancer have concluded that there is no clear evidence for any links. ARPANSA continues to closely monitor the research being conducted in this field.

Conclusion
No adverse health effects are expected from continuous exposure to the RF radiation emitted by the antennas on mobile telephone base station towers."

This is not true. Refer to studies performed by Dr Neil Cherry and others. Given more time I probably could dig up quite a few more recent ones than what I have listed below.
* Radio/TV towers (Michelozzi 2002, Cherry 2000, Dolk 1997, Hocking 1996),
* Mobile phone base stations (Eger 2004, Wolf and Wolf 2004)
* Electricity towers (Ahlbom et al, 2000, Greenland et al, 2000, Michael Kundi)

Mobile Telephones and Health Effects Fact sheet 13

"There is no clear evidence in the existing scientific literature that the use of mobile telephones poses a long-term public health hazard (although the possibility of a small risk cannot be ruled out)."

The statement above appears to be a common re-occurring theme in all the Mobile phone fact sheets and is clearly not true.

In response, a major project, INTERPHONE, has been organised. The INTERPHONE project is a multi-national series of epidemiological studies testing whether using mobile phones increases the risk of various cancers in the head and neck. The project comprises national studies from 13 different countries, which are coordinated by the International Agency for Research on Cancer (IARC), an agency of the World Health Organization (WHO). A pooled analysis of all the brain tumour results has suggested no overall risk for moderate mobile phone use by adults for up to 10 years."

This was reported in the media and is based on the initial report that was released for public consumption. It is however grossly incorrect as mentioned in several places in my commentary. Please refer to the included PDF on the interphone study. The Interphone study received funding from the industry and there have been comments by scientists who performed peer reviews of the said study that clearly show that the research was faulty and that the Interphone study protocol has flaws, which results in an underestimation of brain tumour risk. Yet, in spite of the design flaws and underestimated risk of brain tumours, the Interphone studies still found that there was a risk of brain tumours for heavy users. Perhaps if these flaws did not exist they would find the

same elevated risks as the industry independent studies have found? Or, could it be that the Interphone protocol was designed to not find any risk at all?

"On the specific issue of brain cancer occurring in users of these telephones, it is important to note that such cancers existed before the introduction of mobile telephones. It is simply not possible to identify the cause of any single case of cancer. Long-term studies to investigate whether mobile telephone users have a greater incidence of, say, brain cancer than the general population have not been completed."

Yes this is true but RF from other sources has been around for many years too and could be the contributors for brain cancers prior to the introduction of mobile phones. Mobile phone RF frequencies are not the only RF frequencies that have been linked to cancer. AM/FM transmitters, CB Radios, UHF/VHF 2 way radios have been around for many years t0o, just like brain cancer. Of course my Bachelor degree in Science has shown me that radiation is not the only source of mutagenic/genotoxic effects, chemicals, bacteria and viruses also have a role to play.

"There is no clear evidence in the existing scientific literature that the use of mobile telephones poses a long-term public health hazard (although the possibility of a small risk cannot be ruled out).
Users concerned about the possibility of health effects can minimise their exposure to the RF emissions by: limiting the duration of mobile telephone calls, making calls where reception is good, using a 'hands-free' attachment or speaker options, or by texting. Given the lack of any data relating to children and long term use of mobile phones, and their potentially long life-time use of them, ARPANSA recommends that parents encourage their children to limit their exposure by reducing call time, by making calls where reception is good, by using hands-free devices or speaker options, or by texting. "

There is plenty of evidence available if you look for it. Case studies to date have only looked at mobile phone usage for 10 – 15 years and cancer can take 20+ years to appear yet we are already seeing many types of cancers on the increase, as discussed earlier and it is only likely to get worse. Maybe someone should talk to Dr Tao a leading Australian Neurosurgeon because he certainly has some thoughts on this issue [15]. I do however acknowledge that the suggested techniques to minimise exposure will reduce the intensity in most situations except if in a car where reflection can occur and in situations where phones will boost output signal if reception is poor. The problem with the hands free solution is that people usually just place the phone near a different body part rather than the head, the phone maybe put in a pocket thereby irradiating different body parts and organs. DNA breaks resulting in cancer are not just limited to the brain. Another concern is that RF does not recognise boundaries and can affect people in close vicinity even though they themselves may not be using a wireless device. How do these people minimise the exposure if they are surrounded by it everywhere they go?

How is scientific evidence substantiated?
"The criteria that have to be satisfied for substantiating scientific evidence are:
a. the publication of research results in a reputable international scientific journal that includes peer review by appropriately qualified scientists and academics. This ensures that research conforms to high standards of scientific practice and that conclusions may reasonably be drawn from the work undertaken which take into account relevant considerations; and

b. the independent verification of research results. If a research result cannot be repeated by other independent researchers, doubts are raised about the original finding. "

So we have scientific studies that show biological effects lower than our current standard, have been peer reviewed and repeated yet our standards remain unchanged. What else has to happen for ASPARNA to accept that there are real health concerns?

"There is no substantiated evidence in the existing scientific literature that living close to a base station or using a mobile telephone poses a long-term public health hazard (although the possibility of harm cannot be ruled out). "

This is a repeating theme with the "possibility of harm cannot be ruled out" added to what looks like a measure to protect APPANSA or the wireless industry from potential future litigation.

"ACMA, adopted the ARPANSA limits into the Radiocommunications (Electromagnetic Radiation - Human Exposure) Standard 2003 and the licence conditions for radiocommunications transmitters."

I see this as a significant conflict of interest as ACMA who appears to be the enforcer of the standards also makes revenue from access to RF bands by telecommunications bodies.

Has a precautionary approach been adopted?
Throughout the world there has been a growing movement to adopt a precautionary approach. The WHO defines the Precautionary Principle as a risk management concept that provides a flexible approach to identifying and managing possible adverse consequences to human health even when it has not been established that the activity or exposure constitutes harm to health.
It is the WHO's view that scientific assessments of risk and science-based exposure limits should not be undermined by the adoption of arbitrary cautionary approaches.

As well as setting conservative exposure limits, the ARPANSA Radiofrequency Standard incorporates a requirement to minimise public exposure to RF fields where this is unnecessary or incidental to achievement of service objectives, provided this can be readily achieved at reasonable cost.

Is the last paragraph a WHO directive or ARPANSA's? Revenue protection for the industry, Wifi in most schools, shopping centres, airports, homes, smart meters in every house. This rapid and extensive deployment of wireless transmitters does not appear to be following the precautionary principle.

About the ARPANSA radiofrequency radiation exposure Standard fact sheet 4
The Standard making process
In choosing the members of the Working Group, ARPANSA consulted widely with a range of organisations so as to achieve a spread of relevant expertise. There were also representatives with appropriate interests from the community, unions and the telecommunications industry. The Radiation Health & Safety Advisory Council was also consulted on membership of the working group.

Now it is clear why our standards are hobbled especially with representation of the telecommunications industry being involved. Any recommendation that is likely to show effects will obviously be watered down if said companies revenues are going to be impacted. It is sort of like having Tobacco companies participating in the development of laws for cigarettes.

The basic restrictions, are fundamental limits designed to ensure that known adverse health effects do not arise from exposure to RF fields.

This is an incorrect statement. It is true from the perspective of known thermal effects. It provides no confidence for protection against long term exposure effects in a multi modal wireless environment or non-thermal effects which have been documented in a multitude of studies [16]. The fact that Scientist have indicated that RF effects may be accumulative, a 6 minute exposure does not give any confidence of what happens when continually exposed over a life time.

Are adverse health effects at levels below the limits of the Standard possible?
Significant safety factors are incorporated into the exposure limits – that is, the limits are set well below the level at which adverse health effects are known to occur. The Working Group developing the Standard reviewed research at low levels of exposure published since after the ICNIRP review to ensure that more recent research did not reveal problems. Furthermore, there is an extensive worldwide research effort to investigate any adverse low-level effects. The research aims to address the World Health Organization's research agenda. However, if evidence of any adverse effects does come to hand, ARPANSA will certainly review the limits of the Standard.

I have cited research articles and papers that show effects including genotoxicity. Can you advise me whether your organisation is going to review them and if the findings can be shared with the public?

Fact Sheet 4 Mobile Telephone Communication Antennas and Health Effects

Health Effects
"Current research indicates that, at the exposure levels indicated above, RF radiation is not known to have any adverse health effects.
It is considered that rises in tissue or body temperature of about 1.0oC or more are required before any adverse effects will occur. In cases of pregnancy, rises in the temperature of the foetus of 2.5 to 5oC are necessary before defects are seen in the newborn. These temperature rises will not occur unless the exposure level is greatly in excess of the ARPANSA RF Standard mentioned above."

Yes and what about non thermal effects?

Are mobile phone base stations a health risk?
The weight of national and international scientific opinion is that there is no substantiated evidence that living near a mobile phone antenna causes adverse health effects.

In a review of 14 studies collected from the WHO database and put together by Drs. Michael Kundi and Hans-Peter Huttera, **10 out of the 14 presently existent peer-reviewed studies analysed found significant increases in ill health effects from cell tower exposures**. (Kundi, 2008 at the London EMF International Conference) [17]. Populations close to cellular antennas show an increase in the effects of health problems in those closest to the antennas with the risk factors dropping off as distance and RFR levels decrease. Symptoms range from sleep disturbances and headaches to breast and brain cancers. Refer to included document. Of course ARPANSA and ACMA continue to be in a state of denial. I really do wonder whether your organisation has our best interests at heart or whether protecting the industry is your goal?

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My questions to ARPANSA in relation to the ARPANSA Radiation Protection Standard Maximum Exposure Levels to Radiofrequency Fields - 3kHz to 300 GHz Standard and Fact Sheets

1. "ARPANSA *Radiation Protection Standard Maximum Exposure Levels to Radiofrequency Fields – 3 kHz to 300 GHz* Standard also sets limits for pulsed radiation that are intended to eliminate possible effects where heating is not evident (non-thermal effects)." Source ARPANSA's webpage on Mobile Telephones and Health Effects - http://www.arpansa.gov.au/mobilephones/index.cfm

Question: How can the standard eliminate possible effects where heating is not evident when the standards only acknowledge non thermal effects in passing and indicating that they "cannot be ruled out", that the evidence for them is inconsistent and further confirmatory studies need to be carried out, particularly in relation to SAR estimations?

Answer: <ARPANSA representative to respond>

2. In regards to non-thermal effects: "The review of scientific literature and consideration of possible low-level effects in the ICNIRP Guidelines (ICNIRP 1998) was noted. Around 80 studies relevant to the question of low-level interactions were identified in published peer reviewed journals after the ICNIRP cut-off date (1997) … those effects suggesting statistically significant biological interactions at SAR levels well below 1 W/kg need to be replicated satisfactorily, particularly if they are suggestive of harm, before they can form the basis of standard setting."

Question: Has ARPANSA conducted any further studies in the subsequent years since this standard was written? Only studies up to 1997 were considered in the ICNIRP Guidelines on which our standard was developed and the latest date that I could find for other studies noted in the RF standards was the year 2000. Our standards are hardly current are they when they do not take into account latest research findings?

Answer: <ARPANSA representative to respond>

3. The effects of radiation both ionising and non-ionising appear to be accumulative. Additionally the only measurements that our standards appear to suggest are performed with respect to heating effects (SAR) and RMS Electric and Magnetic Field strength for a short period of time (6 minutes). An arbitrary reduction to the reference values has been made without any scientific justifications. Biological effects have been shown to occur 1000's times lower than our standards as suggested by many International scientists e.g. Bio-initiative report, Donald I. McRee National Institute of Environmental Sciences etc.

Question: Why is 6 minutes all that is used for the measurement for both SAR and RMS electric and Magnetic fields for frequencies used by mobile phones, smart meters and wireless networks? More importantly how can long term health assurances be given for such a short testing duration?

Answer: <ARPANSA representative to respond>

4. From Dr Karl Maret's Commentary on the California Council on Science and Technology Report "Health Impacts of Radio Frequency from Smart Meters" published January 2011. http://sagereports.com/smart-meter-rf/?p=368 "*There is considerable difference between the biological impact of pulsed microwaves, as produced by Smart Meters, compared to continuous waves, such as those produced by microwave ovens. No distinction is made in the safety criteria between continuous and pulsed waves because of the narrow-minded focus on thermal damage alone.*
Many scientific studies have pointed out that radio frequency radiation with different modulations and pulse characteristics produce different biological effects even though they may produce the same pattern of different specific absorption rate distribution and tissue heating (Levitt &Lai, 2010).
The potential health effects from chronic exposure to pulsed, low power density level electromagnetic fields might take several years to appear. These types of radiations produced by Smart Meters are of concern for their potential health impacts on the electrically hypersensitive part of the population.

The ICNIRP, IEEE and ANSI standards that are currently in effect consider only thermal effects of microwave radiation where the energy absorption is fairly linear and thus the protective guidelines are logical. However these energy absorption guidelines would not be appropriate when frequency-specific amplitude windows are involved leading to adverse biological effects that can depend on modulation patterns, pulse repetition rates, duty cycles, and other frequency spectrum characteristics."

Question: As our RF standards are based on ICNIRP Guidelines and only provide a level of protection against known thermal effects, I would like to know whether ARPANSA is planning to address concerns made by credible scientists such as Dr Karl Maret that our standards are not appropriate for providing assurances for smart meter emissions because they do not consider adverse biological effects that may occur below the thermal threshold nor do they take into consideration long term chronic exposures to pulsed non-ionizing radiation?

Answer: <ARPANSA representative to respond>

5. From Mobile Telephones and Health Effects (fact sheet 13) "Some research has indicated that non-thermal effects resulting from low-level RF exposure may also occur. However, the existence of these effects and their implications has not been sufficiently established to allow for them in the Standard."

Question: This statement appears to be contradicting the previous statement made in point 1 above. In one breath the standard is saying that non thermal effects are considered and then here (point 5) it implies they are not. Which is it?

Answer: <ARPANSA representative to respond>

6. There are many scientific studies that show consistent evidence that clearly demonstrate the existence of non-thermal biological effects. Peer review studies referenced by the BioInitiative report, Powerwatch.org.uk, US Navy Research Papers, pathophysiology journal etc.

Question: How many reports showing unequivocal evidence of Biological effects such as DNA breaks, Calcium Efflux, Increased production of histamines and mast cell count etc. before ARPANSA will recognise that non thermal effects exist and that there is a real health crisis looming because of manmade Radio Frequency emissions?

Answer: <ARPANSA representative to respond>

7. From ARPANSA *Radiation Protection Standard Maximum Exposure Levels to Radiofrequency Fields - 3kHz to 300 GHz* Standard. "There are a number of issues that still need to be clarified in terms of their possible implications for health and welfare.
While much of the basis for the limits recommended in this standard are derived from the SAR limits, the measurement of SAR may be impractical for other than device compliance testing or scientific research."

Question: This appears to be advising that SAR is to be used to verifying a single device compliance only. So what about environments that have existing multiple RF sources?

Answer: <ARPANSA representative to respond>

Question: Given that SAR and Electro Magnetic fields from a device are only measured for a period of 6 minutes (i.e. RF frequencies used by communication devices) how do you test long term effects to verify safety?

Answer: <ARPANSA representative to respond>

Question: How do you verify that in a multimodal RF environment adding a new RF source is not going to cause health issues particularly when the standards clearly say the combined effects of exposure to multiple frequency exposure sources may be additive [rps3 p26]?

Answer: <ARPANSA representative to respond>

Question: I think as scientists you would know that EMF demonstrates both particle and wave properties and we know what happens when we have multiple wave sources – go to a beach with a cliff and watch what happens when waves reflect back into oncoming waves (a perfect analogy of what happens in a typical home that has multiple wireless emitting devices and reflective surfaces). How do our standards cater for these scenarios?

Answer: <ARPANSA representative to respond>

Question: When can we expect the RF standards to be updated to take into account the latest (independent) scientific findings? Will a review be performed without undue influence from Telecommunication giants and wireless manufactures to avoid conflict of interest scenarios?

Answer: <ARPANSA representative to respond>

Question: Does ARPANSA engage in studies itself to prove or disprove findings made by independently funded and conducted research or does your organisation simply sit on the fence and act as passive observers waiting for advisement from International bodies such as WHO, IEEE or ICNIRP ?

Answer: <ARPANSA representative to respond>

8. When there is a reasonable chance that wireless could be carcinogenic then deployment of such technology should be stopped until it is proven to be safe. IARC classified Wireless as a Class 2B carcinogen " i.e. a causal association is considered credible, but when chance, bias or confounding cannot be ruled out with reasonable confidence."

ARPANSA released the following statement "ARPANSA will consider the implications of the IARC decision and the underlying scientific evidence and, if necessary, review the current standard and other means of protecting the public."

Question: I have yet to observe any tangible findings or recommendations from ARPANSA in relation to what this announcement has on our 10 year old RF Standards and neither have I seen any new suggested protective measures for the public. What actions has ARPANSA taken since this announcement over 12 months ago apart from releasing some commentary along with the above statement?

Answer: <ARPANSA representative to respond>

Question: Despite the categorisation by the IARC that wireless is a class 2b Carcinogen your organisation has created more recent fact sheets on mobile phones safety that do not explicitly mention this announcement and still suggest there is no concern. Why?

Answer: <ARPANSA representative to respond>

Question: In relation to smart meters that are being rolled out in Victoria and New South Wales did ARPANSA have a role to play when wireless was chosen as the mechanism for relaying customer data back to the utilities as part of the Advanced Metering Infrastructure (AMI)? If yes why wasn't wired communication considered?

Answer: <ARPANSA representative to respond>

Question: How can you assure the public that the basic restrictions provide adequate protection when people such as myself are suffering due to exposure levels 1000's of times below the ICNIRP guidelines, that scientists have demonstrated through epidemiological and in vitro/in vivo studies that biological effects with potential health implications do occur below reference levels and in some studies genotoxic events were found?

Answer: <ARPANSA representative to respond>

9. The Standards in several places provide examples where some health impacts were noted but in nearly all cases were indifferently brushed aside by saying more studies are needed. How many are needed before there is consensus? Who is doing these studies? ARPANSA?

Answer: <ARPANSA representative to respond>

Question: What do you do with the complaints? Are they shared with other departments including the health department? Are there follow up actions taken to consult with those who suffer? I haven't been contacted yet except by letter to acknowledge the receipt of my complaint.

Answer: <ARPANSA representative to respond>

Question: What is the point of the complaint register if there is no investigation of the matter? Are we just being used as measure for statistical analysis and that's all?

Answer: <ARPANSA representative to respond>

Question: Why has ARPANSA included in its fact sheet the Interphone Study initial report that showed "analysis of all the brain tumour results has suggested no overall risk for moderate mobile phone use by adults for up to 10 years" and not mention that brain tumour increase was found for heavy users at the time the study was conducted and that heavy users would be classified as normal users by today's standards? It appears that ARPANSA has selectively taken statements to validate its Standards and Fact Sheet position statements and ignored what is clearly evidence to the contrary. Moderate usage in the interphone study are users who hardly use the phone and are NOT representative of the average user today.

Answer: <ARPANSA representative to respond>

Question: Does ARPANSA take into consideration the sources of funding, potential conflicts of interest and potential industry interference when it reviews candidate studies?

Answer: <ARPANSA representative to respond>

Question: Given that our standards are over 10 years old and are based on guidelines from the INCRP which are 14 years old how many research papers have been looked at since the standard was released? Where are the reports on these studies that were reviewed and details of who the reviewers were along with their associations/affiliations?

Answer: <ARPANSA representative to respond>

Question: How does ARPANSA avoid conflict of interest scenarios when it appears to be working closely with the industry?

Answer: <ARPANSA representative to respond>

10. It would appear that wireless industry is self-regulated without any real oversight being provided by Government bodies. All they need to do is test their devices against the ARPANSA standard for 6 minutes and show that they are lower than the guidelines to be able to claim their devices are safe.

Question: Who actually conducts these tests to confirm the devices are within the limits?

Answer: <ARPANSA representative to respond>

Question: Have there been any studies that look at diseases (Autism, Alzheimer's, Cancer etc.) holistically (increases) and also look at the proliferation of RF emitting towers and devices or the level of ambient microwaves increase over the last 20 years? It might be interesting to see if there is a pattern especially when many of the recent epidemiological studies link RF to many of these disease states? Of course the problem is ARPANSA does not take regular RF readings in our community does it?

Answer: <ARPANSA representative to respond>

11. ARPANSA's mission statement (on page 4 of the pdf for the RF standard, just before the Foreword), states that the 'mission of ARPANSA is to provide the scientific expertise and infrastructure necessary... to protect the health and safety of people, and to protect the environment, from the harmful effects of radiation'

Question: Which publication in the Radiation Publication Series provides RF radiation standards for the environment, such as for plants, trees, bees, birds and amphibians? What is ARPANSA doing by way of researching or monitoring of research into the effects of radiation on the environment such as from smart meter rollouts in Victoria?

Answer: <ARPANSA representative to respond>

Question: Why have a number of countries and/or states within foreign countries (i.e. UK and US) created moratoriums on smart meter rollout programs including the provision of opt-out clauses for previously mandated rollouts? Why has ARPANSA not made any statements relating to these overseas actions on their website?

Answer: <ARPANSA representative to respond>

12. There has been a shift in perception on the health and safety of smart meter globally. A number of countries have announced opt out programs such as in Canada (in Quebec), in the USA including California (PG&E, San Diego Gas and Electric, and Southern California Edison consumers have all now won this right), Maine, Vermont, Louisiana, Michigan, and Connecticut. Smart meters were made voluntary in the Netherlands in 2009 and in the UK earlier this year.

Question: Has ARPANSA investigated the health and safety issues raised by the likes of the Santa Cruz Health department and reports of health issues by affected individuals which resulted in a moratorium on smart meter rollouts in that county to see if they are appropriate or relevant to the rollout occurring in Victoria?

Answer: <ARPANSA representative to respond>

13. There appears to be a serious lack of information on the ARPANSA website on smart meters. Instead your website suggests that people look at a Victorian Government website to get further facts.

Question: Since when has the Victorian Government become a recognised authority on smart meter safety and why isn't ARPANSA taking a lead role?

Answer: <ARPANSA representative to respond>

Australian Government
Australian Radiation Protection and Nuclear Safety Agency

Z12003658

15 January 2013

s 47F [redacted]

Thank you for your email of 6 December 2012 regarding your health concerns with the electromagnetic emissions from smart meters, and the subsequent further documents and information you provided.

ARPANSA, as the primary advisor to the Australian Government on radiation protection, is aware of the large quantity and diversity of scientific research that has been carried out in recent years. ARPANSA monitors this research for any new information that would indicate a need to adjust the exposure standard or to provide other forms of protection from harmful effects.

It is the view of ARPANSA, consistent with that of the World Health Organization and of health authorities in most countries around the world, that the existing exposure limits are suitable for providing protection from any of the established adverse health effects of exposure to radiofrequency (RF) electromagnetic radiation (EMR). There remains some uncertainty as to the absolute safety and whether there is a complete absence of any risk from such exposure, but current scientific research provides little information that would indicate a need for, or could guide health authorities in, the setting of revised exposure limits.

Some of your criticisms of the current RF exposure standard appear to relate to a misunderstanding of its basis and intention. The standard takes into account all known harmful effects of RF exposure, and the most critical repeatably demonstrated harmful effects of on-going microwave exposure, i.e. those occurring at the lowest exposure level, are those that can be attributed to heating of the tissue from the deposition of RF energy as heat. This is not to say that many other harmful effects do not occur at higher exposure levels or in other frequency ranges.

In some frequency ranges, the exposure standard specifies that for comparison with exposure limits exposures should be averaged over a period of six minutes. In setting the limits, the standard does not restrict itself to effects that can be observed within six minutes nor does it specify that periods of six minutes be used in characterising an exposure. Much of the evidence on which the standard is based comes from exposures lasting hours, months or years.

It is of particular note that the levels of exposure from smart meters that are giving rise to your immediate concerns are already far below current exposure limits and lower than many other sources of RF EMR in the environment. The symptoms you report are associated with a large number of conditions of varying degrees of seriousness and ARPANSA would encourage anyone experiencing such symptoms to seek professional medical advice.

E-mail: info@arpansa.gov.au
Web: www.arpansa.gov.au
Freecall: 1800 022 333 (a free call from fixed phones in Australia)

PO Box 655, MIRANDA NSW 1490
Phone: +61 2 9541 8333, Fax: +61 2 9541 8314
619 Lower Plenty Road, YALLAMBIE VIC 3085
Phone: +61 3 9433 2211, Fax: +61 3 9432 1835
3-5 National Circuit, BARTON ACT 2600

The application of the ARPANSA exposure standard to the regulation of radiocommunication and the deployment of radiotransmitting devices is a matter for the the Commonwealth regulator, the Australian Communication and Media Authority, and for the State governments concerned. Matters of policy in regard to the deployment of smart meters into private residences are entirely a matter for the relevant State government .

ARPANSA works independently of industry in its examination of the harmful effects of exposure to RF EMR. ARPANSA does engage in discussions with all relevant stakeholders, including industry and scientists (particularly on developments and new technologies), on what exposures are likely to occur and on how exposures can be most practically controlled. Funding of medical research within Australia is primarily the responsibility of the National Health and Medical Research Council and it has strict procedures in place to address possible conflicts of interest.

ARPANSA is currently completing a review of the scientific literature published since the exposure standard was prepared and will, if the evidence indicates a need, undertake a review of the standard in the light of any significant findings. ARPANSA will examine the most recent report by the Bioninitiative group, along with new scientific publications as they appear. It will continue to work with the WHO International EMF Project and to liaise with government health authorities in other countries in order to provide the Australian public with the highest standard of radiation protection.

I hope these comments are able to address your concerns.

Yours sincerely

Carl-Magnus Larsson
CEO of ARPANSA

16/03/2013
Attention: Dr Carl-Magnus Larsson
Chief Executive Officer
ARPANSA

s 47F [redacted]

Dear Dr Larsson, I would like to thank you for taking the time to respond to my recent letter (sent 17/12/2012). Whilst I find ARPANSA's commitment to look further into the dangers of wireless RF as commendable, the statement in your most recently published fact sheet 14 that "***Overall, the evidence suggests that the radiofrequency (RF) electromagnetic energy (EME) emissions of mobile phone handsets are not harmful to the user***[i] is of genuine concern and I hope that you would consider rephrasing it especially if ARPANSA adheres to a code of ethics that is based on responsible science. There is no scientific basis for making such a statement especially if one considers the mounting evidence that is in direct opposition to it. It would appear that ARPANSA has not taken into consideration the IARC/WHO announcement in 2011 that RF EMR is a group 2B carcinogen (the announcement was deliberately designed to cover all types of wireless emissions). There is also a credible explanation of why such a statement is no longer valid and is provided in the 2012 Bioinitiative Report. Care needs to be taken when making such a public statement without due consideration for all available evidence as this could be seen as taking part in fraudulent misrepresentation and making false statements under Commonwealth Law. Of course the primary purpose of this letter is to inform you how very disappointed I was with the lightweight response I received from you to my letter I sent on December 2012. Your response letter only skirted around the periphery of my concerns and did not address any of the questions I provided in a separate question sheet. You may not be aware of this, but I spent a considerable amount of time researching and crafting my letter (over 6 months). I deliberately created a separate question sheet in order to have key questions answered, questions the public has a right to have answers to. Yet to my disbelief, no attempt was made to directly answer any of the questions posed. I would very much appreciate this time around if you or your organisation could take the time to provide a written response that answers each and every question that I am including (again) with this letter.

You mention "***It is the view of ARPANSA, consistent with that of the World Health Organisation and of health authorities in most countries around the world, that the existing exposure limits are suitable for providing protection from any established adverse health effects of exposure to RF EMR***." This statement is starting to wear very thin and is at odds with the IARC/WHO announcement in May 2011 that RF EMR is a group 2B carcinogen. There are sworn court statements and affidavits by independent and prominent epidemiologists, physicians, and physicists such as David Carpenter, Magda Havas, Barrie Trower, Olle Johansson, to name a few who would also claim such a statement is incorrect. The above statement is also at odds with the health services officer of the county of Santa Cruz who viewed the relationship of AMI technology to existing usage of wireless devices in an entirely different light to that of ARPANSA and Victoria's Department of Primary Industries (DPI). Dr Namkung stated 'Additionally, exposure is additive and consumers may have already increased their exposures to radiofrequency radiation in the home through the voluntary use of wireless devices such as cell and cordless phones, personal digital assistants (PDAs), routers for internet access, home security systems, wireless baby surveillance (baby monitors) and other emerging devices. It would be impossible to know how close a consumer might be to their limit, making safety an uncertainty with the installation of a mandatory Smart Meter'. In her concluding remarks she stated '**there is no scientific data to determine if there is a safe RF exposure level regarding its non-thermal effects'** (Namkung, 2012). Another interesting point to note is that India, whose RF guidelines were originally adopted based on the ICNIRP 1998 Guidelines like Australia, has recently (September 2012) revised their standards to be 90% lower than what they had been previously. Would you care to explain why they would make such a deep cut if the ICNIRP guidelines are considered safe? Would you also care to explain why countries like Russia and China have RF standards far more conservative than our own?

The WHO, particularly the EMF project, has a very close working relationship with ICNIRP whose guidelines were used as the foundation to create Australia's current RF standards. The late Dr Neil Cherry in 1999 wrote a report called "**CRITICISM OF THE PROPOSAL TO ADOPT THE ICNIRP GUIDELINES FOR CELLSITES IN NEW ZEALAND**". [1] In this report Dr Cherry stated "*The ICNIRP assessment of effects, ICNIRP (1998) has been reviewed and found to be seriously and fatally flawed, with a consistent pattern of*

bias, major mistakes, omissions and deliberate misrepresentations. Adopting it fails to protect public health from known potential and actual health effects and hence is unlawful according to the requirements of the Resource Management Act. Public health protection should be the objective of this process and this should be based on the identification of the Lowest Observed Adverse Effect Level, (LOAEL) and a reasonable safety factor to take into account the uncertainties and vulnerable members of the community."

You mention that it appears I may have misunderstood the "***basis and intention of our standards***". There is certainly no misunderstanding on my part. When we take a closer look at basic restrictions Table 2 on page 7 and the "surrogate parameters" or reference levels, Table 7 page 12 both clearly say for frequencies between 100KHz and 6 GHz (for measurement of SAR) and 100Khz to 10GHz (for the measurement of RMS) it clearly says measurements should be averaged over any six minute period. Yes, a device could be tested for days but any 6 minute window can be used to verify compliance. Additionally, our laws do not permit testing on humans so how do you validate your claim that the basic restrictions and/or reference levels are safe and support lifetime exposures and how do you actually test thermal increases given this limitation? Can you also explain why only 6 minutes and not shorter or longer durations? How do these 6 minute measurements map back to long term exposures? What consideration is made for children whose bodies are smaller and so SAR is likely to be higher? Where can I find the independent studies and reports that validate your claim that the standards provide protection against long term chronic exposures? Where is the data that adequately covers typical home scenarios where occupants are exposed to RF from multiple sources simultaneously such as mobile/smart phones, cordless digital phones, digital baby monitors, smart meters, mobile phone towers, AM and FM radio waves, wireless routers, computers and other blue tooth/wireless devices? Our standards do not appear to be complete because they only consider one half of the picture (they consider thermal interactions only).

You then went on to say **"***…those occurring at the lowest exposure level are those that can be attributed to heating of the tissue from the disposition of RF energy as heat…This is not to say that many other harmful effects do not occur at higher exposure levels or in other frequency ranges*." What about lower exposure levels and what about non-thermal interactions? It would appear that ARPANSA is still very much holding fast to the idea that microwaves can only damage cells through thermal effects despite the fact that there is a huge body of evidence that is increasing year on year that says otherwise. You have not made any effort to refute my claims that microwaves have been reported to have deleterious effects to cells below the thermal threshold via-non thermal interactions. You also indicate that "***the standard takes into account all known effects of on-going microwave exposure***", yet I see no mention of non-thermal effects in your letter despite the fact that our RF standards in many places hint that non thermal/athermal effects may exist. I do note that our RF standards say "*In summary, it would appear that although non-thermal effects or mechanisms cannot be ruled out, the evidence for them is inconsistent and further confirmatory studies need to be carried out* [page 101]. How many studies do you need to see before ARPANSA will act, especially if you consider that there are at least 46 studies that I mentioned in my critical review document I sent with my December 2012 letter that showed DNA breaks occur below the thermal threshold and were repeatable?

The ICNIRP, in relation to non-thermal effects, '*prejudices rejection of such effects on the basis either that they are artefacts, or because there is (in their view) no established theory of the effects, which, in any case, already appear to violate common sense; for example, they typically become more pronounced as the intensity of the microwaves is reduced!'* In my previous letter I cited an example where the effect of microwaves were shown to have a more pronounced impact on reducing the integrity of the blood-brain barrier as the intensity of the microwaves is reduced. *'Such counter-intuitive behaviour reflects the non-linear nature of the effects, which depend not only on the external electromagnetic to which the living organism exposed, but also on the state of the organism. Invariably, the most negative possible 'spin' is put on these non-thermal effects, and they are often dismissed as 'false positives', because acceptance of them would entail the conclusion that the technology is potentially less than safe – a market unfriendly situation; by contrast, the better understood heating effect of MWR does not pose the same threat to health, since permitted exposure levels are restricted by the Safety Guidelines precisely to ensure that the technology is at least thermally safe!*' [2]

Other concerns I have relate to you failing to provide a response that addresses the WHO/IARC announcement in 2011 that RF EMR (microwaves) are a group 2B carcinogen. Nor did you adequately explain what research ARPANSA does to verify or offer counter claims against research findings made by independent scientists that clearly show mobile phone RF emissions can cause DNA breaks after several hours of continuous exposure. Once again I have to ask the question (which you did not previously answer), does ARPANSA actually conduct any research on microwaves itself or does it simply sit on the fence and wait to be advised by international bodies such as WHO, ICNIRP or IEEE who appear to be blinkered and refuse to consider the multitude of research that shows microwaves are not limited to thermal effects but also exhibit non thermal effects that include genotoxic events? Instead, these international bodies and the telecommunications industry require proof that microwaves have non-thermal effects before they will consider them. This is of course at odds with ARPANSA's statement on page 80 of the standards that says "***Scientific studies are designed not to give 'proof', but are designed to disapprove or 'falsify' the current hypothesis or accepted viewpoint on an issue***". There is a huge body of evidence with the likes of the Bioinitiative report (2007) reviewing more than 2000 papers that showed effects and the more recent updated version of the same report in 2012 which reviewed a further 1800 papers showing effects! How many more does ARPANSA need to see before they will acknowledge that the standard view may not be correct? It would appear that most of the information of public interest, including the vast volume of independent scientific evidence attesting to serious potential that EMF-RF radiation has on human health, is withheld or intentionally misrepresented. As I mentioned in my letter previously, this is not the first time mainstream science has got it wrong – refer to the handling of Smoking, Asbestos, Agent Orange and Thalidomide etc. If we do not learn from our past mistakes we are doomed to repeat them and a lot of people will have to suffer unnecessarily.

You have not acknowledged the discrepancies and flaws that I have identified in your "fact sheet" and website i.e. your website says the standard provides protection against non-thermal effects - "***ARPANSA Radiation Protection Standard Maximum Exposure Levels to Radiofrequency Fields – 3 kHz to 300 GHz Standard also sets limits for pulsed radiation that are intended to eliminate possible effects where heating is not evident (non-thermal effects)***." while fact sheet 13 for mobiles says "***Some research has indicated that non-thermal effects resulting from low-level RF exposure may also occur. However, the existence of these effects and their implications has not been sufficiently established to allow for them in the Standard***." Nor have I seen anything in any of the existing facts sheets on mobile phone safety that reference the interphone study clearly saying that heaviest users of mobile phones from the Interphone study are regular users by today's standards. People need to be informed with clear and concise facts instead of playing upon people's perceptions using misleading language (heaviest users in early 2000 are regular users by today's standards – people need to know this when they weigh up the risks).

You also have not addressed my concerns that ARPANSA's RF standards do not provide any protection to sensitive people. It would appear that we do not exist in ARPANSA's eyes – it must be psychological or something else environmental that is the cause – of course such statements that are being made by others is disingenuous to sensitive people who know very obviously what the cause is.

I do however appreciate your sensible suggestion to seek professional medical advice regarding the health issues that I have been claiming to experience as a direct result of smart meter emissions. But therein lies the problem. The medical profession as a whole is inadequately trained to deal with this issue. Neither the AMA nor AMC (Australian medical association and council respectively) showed understanding of what some people call "Microwave Syndrome" or EHS when contacted. They are guided by organisations such as yours who advise that EHS is not a recognised syndrome and that EMR in our environment which is shown to be within the RF guidelines advised by our RF standards are safe. I have been to the doctors numerous times and they are at a loss to explain or offer suitable treatments for my symptoms. Initial consultation with my local doctor resulted in him making a diagnosis that I was simply suffering a migraine possibly due to stress being a possible cause. Medication containing ibuprofen was then suggested but taking said medication offered no real solution to the symptoms or the cause. Only after repeated visits to the same doctor and because my condition was not improving I was referred to a neurologist, who by the way indicated he did not understand the technology (wireless) and so could not provide any medical opinions on this topic. He also indicated that he has never heard of what I am saying regarding wireless effects and said if it is true then I am pretty well and truly stuffed because the amount

of wireless in our environment is only going to increase. All he could do was offer evidence that I did not have a brain tumour by suggesting I have an EEG and an MRI. Both of course came back with negative results. I am at a loss as to whom I should now be seeing. I feel I am going around in circles here with nobody including ARPANSA, AMA, Victorian Health Department or the Victorian Chief Health Officer willing to investigate my claims. It is also interesting to note that the symptoms I am claiming are very clearly described by the WHO (but they refuse to link it to EMF) and also fits very neatly with the symptoms associated with "microwave sickness". Of course, through my own experiences, such as a recent trip overseas and a camping trip to a location interstate far away from RF emissions, has proven to me what the cause is. It is without a doubt that my symptoms are directly related to RF emissions occurring within my environment that is setting me off. It would also appear I am not the only one suffering these so called "non-specific" effects. I would like an informed opinion from the so called experts at ARPANSA as to why people such as myself and those whose stories I have include below are suffering what appears to be EMR health related issues.

You will find immediately below evidence of other people claiming pretty much the same symptoms as me:

http://stopsmartmeters.com.au/2013/01/15/i-burst-into-tears-because-i-cant-sleep/

http://stopsmartmeters.com.au/2012/11/18/i-have-been-suffering-from-severe-headaches-at-night/

http://stopsmartmeters.com.au/2012/10/19/the-same-health-issues-experienced-by-others-is-happening-to-me/

http://stopsmartmeters.com.au/2012/10/10/former-smart-meter-installer-suffers-from-electro-hypersensitivity-ehs/

http://stopsmartmeters.com.au/2012/08/23/i-honestly-thought-the-concern-about-smart-meters-was-over-rated/

http://stopsmartmeters.com.au/2012/06/29/i-am-now-getting-pulsating-headaches-at-night/

http://stopsmartmeters.com.au/2012/06/04/i-wake-up-with-headaches-every-single-morning/

http://stopsmartmeters.com.au/2012/03/27/headaches-severe-head-pressure-palpitations-insomnia/

http://stopsmartmeters.com.au/2012/01/24/i-wake-up-with-headaches-every-morning/

http://stopsmartmeters.com.au/2013/03/03/what-is-it-about-smart-meters-that-i-believe-is-making-me-very-sick-with-headaches-and-nausea/

This sample only represents the people who knew what the source of their symptoms was and have made a conscious decision to write on the subject as a topic on the www.stopsmartmeters.com web site. There are countless other examples in the stopsmartmeters forum and in response to these topics. How many people are suffering similar effects but have no idea that smart meters are the source? We are seeing a consistent and repetitive pattern here so I don't think it is reasonable to dismiss this issue offhandedly as some people in our Government are doing. I have included a recent ruling made in Melbourne at the Administrative Appeals Tribunal in regards to a compensation case that validates the existence of EHS. You may want to consider this in relation to your ongoing research and investigations.

I stand by my claim that ARPANSA is hobbled by vested interests particularly when your website used materials provided by ACRBR to challenge the validity of the original Bioinitiative. Materials created by people who worked for the Telecommunications industry, and the organisation in question, ACRBR, which is now a defunct organisation, regularly received direct sponsorship for many research projects from AMTA, a body that represents the Australian Telecommunication Industry. AMTA have billions of dollars at their disposal to lobby the government and the government pays your salaries. Who is acting on behalf of the public to balance this significant and powerful corporate influence? Nobody that I am aware of. We the public are at the mercy of greedy companies and what appears to be a corporatized Government. Any reductions to the standards would be faced with significant costs to industry if reductions meant many RF emitting devices would need to be replaced to be compliant. Any changes to the standards would have to be justified to the government of the day. The costs and potential legal implications are potentially enormous and therefore likely to create a significant roadblock for change. Status quo seems to be order of the day until the mounting evidence can no longer be ignored and by then it will be too late for many. There is also evidence, which I have presented previously in my critical review comments that I sent with my first letter in December 2012 that there has been falsification of research results. Scientific falsification is against everything that the scientific method stands for. It is unethical, immoral and

dangerous. It is one of the worst acts that anyone in research can commit. Falsifying evidence is very rarely accidental. Fabricating data is literally making up data. Fabricating evidence is also literal; the researcher makes up evidence that does not exist. Money is a huge motivator as funding is based on results. If the researcher feels that funding may be cut if the results cannot be proven in the favour of the financier of the project (in many cases funding is via direct or indirect industry sponsorship) - this promotes dishonesty in reporting. The researcher may perceive that falsifying data may not impact the overall study, which seems to be the case with much of the research used to claim microwave emitting technologies are safe and also used to try to reassert obsolete safety standards.

Consequently, I trust that ARPANSA would accede that the claims there is no evidence of harm are scientifically flawed and driven by unscientific motives - if there were to be a thorough investigation and disclosure of the full profiles and links with the industry (through funding or otherwise) of the scientific panel behind the advice that there is no evidence of harm, and comparing them with international panels of independent scientists pointing to the evidence of harm. The latter will cite well over 3,000 properly independent and peer-reviewed studies with no political motivation, and the former will be shown to lack transparency and partaking or using research to back their position on EMF safety that does not constitute what is recognised internationally as proper independent research!

I am aware ACMA has responsibility to regulate the standards maintained by ARPANSA and have written to them of my concerns (letter included) but am yet to receive a response. Of course the biggest issue I have with ACMA is that they not only regulate the standards but also make billions of dollars from licensing and other fees for the industry to gain access to the various RF bands. This is a huge conflict of interest and is likely to put additional pressure on ARPANSA when considering potential changes to the standards especially if government revenue is going to be severely impacted in a negative manner.

To conclude I would be very grateful if the questions that are included with this letter (provided as a separately attached document) are answered this time around. I would also very much appreciate ARPANSA's guidance of who I should now be seeing to investigate the health issues I am being faced with. As I mentioned previously, my local doctor has not been able to successfully diagnose the cause nor was a specialist in neurology. Emails to Victorian Health Department and Chief Health Officer are greeted with silence. I am suffering daily from the effects and my employment in the IT industry is seriously under threat especially if I am not able to perform my duties effectively because of the ongoing and worsening health issues. Finally, I would like to know who is to be officially held accountable for not only my health issues but those of thousands of other people like me? Who is liable financially and all-inclusively for the loss of health, wages, qualify of life, and career prospects of people affected by EMF-RF radiation? No one in the scientific community, government, government agencies, medical organisations, and other institutions could possibly ever know what is a safe level for each individual to throw around claims how smart meters are safe – which is precisely why I have been requesting the ACMA, the Victorian Minister of Energy and the DPI to exercise precaution when it comes to the deployment of wireless devices/transmitters in our environment as a requirement of good governance and duty of care.

Yours Sincerely

s 47F [redacted]

Should you wish to contact me I can be reached on s 47F [redacted] during business hours

PS Included with this letter are:

1. A modified version of my original question sheet – removed duplicate questions and re-clarified others
2. A document that provides a ruling from a recent Australian compensation case (Administrative Appeals Tribunal) that appears to recognise Electromagnetic Hypersensitivity (EHS).
3. Letter to the CEO of Australian Communications and Media Authority (ACMA)

References:

[1] Criticism of the proposal to adopt the ICNIRP guidelines for cellsites in New Zealand – Dr Neil Cherry

[2] The Price paid for 'blowing the whistle' in the Area of Mobile Phone Safety – G J Hyland

My questions to ARPANSA in relation to the ARPANSA Radiation Protection Standard Maximum Exposure Levels to Radiofrequency Fields - 3kHz to 300 GHz Standard and Fact Sheets

"ARPANSA *Radiation Protection Standard Maximum Exposure Levels to Radiofrequency Fields – 3 kHz to 300 GHz* Standard also sets limits for pulsed radiation that are intended to eliminate possible effects where heating is not evident (non-thermal effects)." Source ARPANSA's webpage on Mobile Telephones and Health Effects -http://www.arpansa.gov.au/mobilephones/index.cfm

Question 1: How can the standard eliminate possible effects where heating is not evident, given -

a. the standards only acknowledge non-thermal effects in passing and indicate that they "cannot be ruled out",
b. that the evidence for them is inconsistent, and
c. further confirmatory studies need to be carried out, particularly in relation to SAR estimations before they can be considered?

Answer: <ARPANSA representative to respond>

From Mobile Telephones and Health Effects (fact sheet 13) "Some research has indicated that non-thermal effects resulting from low-level RF exposure may also occur. However, the existence of these effects and their implications has not been sufficiently established to allow for them in the Standard."

Question 2: This statement appears to be directly contradicting the previous statement made on your website in point 1 above. In one breath the ARPANSA is saying that non thermal effects are considered and then here (point 2) it implies they are not. Which is it?

Answer: <ARPANSA representative to respond>

In regards to non-thermal effects: "The review of scientific literature and consideration of possible low-level effects in the ICNIRP Guidelines (ICNIRP 1998) was noted. Around 80 studies relevant to the question of low-level interactions were identified in published peer reviewed journals after the ICNIRP cut-off date (1997) … those effects suggesting statistically significant biological interactions at SAR levels well below 1 W/kg need to be replicated satisfactorily, particularly if they are suggestive of harm, before they can form the basis of standard setting."

Questions 3: Given that our standards are over 11 years old and are based on guidelines from ICNIRP which are almost 15 years old –

a. How many research papers have been looked at since the standard was released?
b. Where are the reports on these studies that were reviewed and details of who the reviewers were along with their associations/affiliations?
c. Only studies up to 1997 were considered in the ICNIRP Guidelines on which our standard was developed and the latest date that I could find for other studies noted in the RF standards was the year 2000. Therefore, our standards are hardly current when they do not take into account latest research findings are they?

Answer: <ARPANSA representative to respond>

From Dr Karl Maret's Commentary on the California Council on Science and Technology Report "Health Impacts of Radio Frequency from Smart Meters" published January 2011. http://sagereports.com/smart-meter-rf/?p=368 "*There is considerable difference between the biological impact of pulsed microwaves, as produced by Smart Meters, compared to continuous waves, such as those produced by microwave ovens.* ***No distinction is made in the safety criteria between continuous and pulsed waves because of the narrow-minded focus on thermal damage alone****.*
Many scientific studies have pointed out that radio frequency radiation with different modulations and pulse characteristics produce different biological effects even though they may produce the same pattern of different specific absorption rate distribution and tissue heating (Levitt &Lai, 2010).
The potential health effects from chronic exposure to pulsed, low power density level electromagnetic fields might take several years to appear. These types of radiations produced by Smart Meters are of concern for their potential health impacts on the electrically hypersensitive part of the population*.*
The ICNIRP, IEEE and ANSI standards that are currently in effect consider only thermal effects of microwave radiation where the energy absorption is fairly linear and thus the protective guidelines are logical. However these energy absorption guidelines would not be appropriate when frequency-specific amplitude windows are involved leading to adverse biological effects that can depend on modulation patterns, pulse repetition rates, duty cycles, and other frequency spectrum characteristics."

Question 4: As our RF standards are based on ICNIRP Guidelines and only provide a level of protection against known thermal effects, I would like to know whether ARPANSA is planning to address concerns made by credible independent scientists such as Dr Karl Maret that our standards are not appropriate for providing assurances for pulsed microwave emissions (i.e. smart meters, mobile phones etc.) because they do not consider adverse biological effects that may occur below the thermal threshold?

Answer: <ARPANSA representative to respond>

There are over 3000 scientific studies that show consistent evidence dating back to 1920s with most recent being released this year that clearly demonstrate the existence of non-thermal biological effects. Some of these studies were once confidential reports created by military doctors and have now been published and are publicly available. We also have many peer review studies referenced by the BioInitiative report (2007) and (2012), Powerwatch.org.uk, US Navy Research Papers, peer reviewed research papers found in pathophysiology journals and the US national library of medicine etc. I am more than happy to post you copies if required.

Question 5: How many more reports showing unequivocal evidence of biological effects such as DNA breaks, calcium efflux, increased production of histamines and mast cell count plus a host of other effects that have potential health effects etc. before ARPANSA will recognise that non-thermal effects do exist and that there is a real potential health crisis looming because of the ever increasing incidence of manmade Radio Frequency emissions in our environment?

Answer: <ARPANSA representative to respond>

As I described in the included letter, ICNIRP only acknowledges the existence of thermal effects for RF EMR. ICNIRP's opinion is that the non-thermal effects are not proven and that they are unlikely to exist. However, the IARC classification contradicts this opinion and indicates that non-thermal effects do exist. The decision to classify RF EMR as possible carcinogen was based predominantly on the results of the Interphone study and studies performed by the Swedish group working under Professor Lennart Hardell, which showed that long time use of a cell phone might increase the risk of development of brain cancer.

What this means is that there are possible health effects (cancer) developing in people who are using regular cell phones which are compliant with current ICNIRP radiation emission safety limits. Radiation emitted by such phones should not cause thermal effects or be associated with thermal based health risks. Given that mobile phones are supposed to be below the ICNIRP guidelines then any induced health effects must be non-thermal in nature which as a consequence has led to scientists observing an increased health risk – that there is a risk of developing of brain cancer if you use a mobile phone for 10 years or more. This is of course is what a lot of independent scientists have been saying all along and yet ICNIRP, WHO and ARPANSA hold fast to the thermal paradigm and ignore mounting evidence that says otherwise.

Question 6: How do our standards protect us when -

a. They do not consider non-thermal interactions when research described above, which was used by the IARC to make a statement that RF EMR is a group 2B carcinogen and thereby validating the real possibility of non-thermal effects and show an elevated risk of getting a brain tumour for mobile phone users who use the phone for around 30 minutes a day for 10 years (This is now the norm for today's users)?
b. Please justify the grounds for ignoring this finding?

Answer: <ARPANSA representative to respond>

ARPANSA Mobile fact sheet 13 includes details of the Interphone Study initial report which showed "analysis of all the brain tumour results has suggested no overall risk for moderate mobile phone use by adults for up to 10 years". It appears that ARPANSA has selectively taken (cherry picked) statements to validate its Standards and Fact Sheet position statements and ignored what is clearly evidence to the contrary. Moderate usage in the interphone study would be classified as users who hardly use the phone and are NOT representative of the average user today.

Question 7: Why didn't the fact sheet mention that brain tumour increases were found for heavy users at the time the study was conducted and that heavy users would be classified as normal users by today's standards?

Answer: <ARPANSA representative to respond>

Measurement of SAR has some serious deficiencies. Firstly it is based on a human model that does not represent the majority of humans. It also has loopholes by not specifying the distance at which SAR must be measured (some providers are measuring at approximately 1 inch from the head.)

Question 8: Does ARPANSA disagree with the above statement and if so why? Please direct me to the page in our RF Standard which explains measurements of SAR must be performed at a set distance.

Answer: <ARPANSA representative to respond>

In regards to measurement of SAR there are no known recipes for fluids that are representative of body tissue at all frequencies. As such, different tissue simulant fluids are required for different frequencies (e.g., 900 MHz for GSM 900 and 1800 MHz for 1800 products). The brain simulant must be calibrated to ensure that the permittivity and conductivity are correct for the frequency being tested. Fluids are often made from

a mixture of distilled water, sugar, and salt. Some frequencies, however, require other chemicals to obtain the required properties. Source: http://www.ce-mag.com/archive/03/01/miller.html

Question 9: How can ARPANSA give long term health assurances to the public when –

a. Testing does not appear to be biologically based or representative of the majority of people?
b. It is a simulation using fluids that represent the body's tissues conductivity and thermal properties only. It does not contain real cells nor does it measure the impact on cell wall properties or cellular internal processes.
c. How does ARPANSA provide assurances that biological damage is not occurring when a person is exposed to microwaves at or below what the guidelines consider safe when there are no biologically based tests conducted to validate this?
d. Given that SAR and RMS Electromagnetic fields from a transmitting device are only measured for a period averaged over 6 minutes (i.e. RF frequencies between 100KHz to 6GHz for measurement of SAR and 100KHz to 10GHz for RMS E&M Fields) - How do you verify safety to chronic long term exposures?
e. What consideration is made for children whose bodies are smaller and so SAR is likely to be higher?
f. Where is the data that adequately covers typical home scenarios where occupants are exposed to RF from multiple sources simultaneously such as mobile/smart phones, cordless digital phones, digital baby monitors, smart meters, mobile phone towers, AM and FM radio waves, wireless routers, computers and other blue tooth/wireless devices?

Answer: <ARPANSA representative to respond>

The Bioinitiative report release in (2007) reviewed more than 2000 papers that showed effects and the more recent updated version of the same report in 2012 reviewed a further 1800 papers showing effects that have biological health implications.

Question 10: Does ARPANSA engage in studies itself to prove or disprove findings made by independently funded and conducted research or does your organisation simply sit on the fence and act as passive observers waiting for advisement from International bodies such as WHO, IEEE or ICNIRP ?

Answers: <ARPANSA representative to respond>

Question 11: The Standards in several places provide examples where some health impacts were noted but in nearly all cases were indifferently brushed aside by saying more studies are needed.

a. How many are needed before there is consensus?
b. Who is doing these studies? ARPANSA?
c. When can we expect the RF standards to be updated to take into account the latest (independent) scientific findings?
d. Will a review of these studies be performed without undue influence from Telecommunication giants and their agents as well as wireless manufactures to avoid conflict of interest scenarios and will it be done in a transparent manner?
e. Does ARPANSA take into consideration the sources of funding, potential conflicts of interest and potential industry interference when it reviews candidate studies?
f. Where can I find the independent studies and reports that validate your claim that the standards provide protection against long term chronic exposures?

Answers: <ARPANSA representative to respond>

When there is a reasonable chance that wireless could be carcinogenic then deployment of such technology in an uncontrolled manner should be stopped until it is proven to be safe. IARC classified Wireless RF EMR as a Group 2B carcinogen "i.e." a **causal association is considered credible**, but when chance, bias or confounding cannot be ruled out with reasonable confidence."

ARPANSA released the following statement "ARPANSA will consider the implications of the IARC decision and the underlying scientific evidence and, if necessary, review the current standard and other means of protecting the public."

Question 12: I have yet to observe any tangible findings or recommendations from ARPANSA in relation to what this announcement has on our 11 year old RF Standards and neither have I seen any new suggested protective measures for the public.

a. What actions has ARPANSA taken since this announcement almost 2 years ago? Apart from releasing some commentary along with the above statement and a fact sheet 14 which irresponsibly claims "***evidence suggests that the radiofrequency (RF) electromagnetic energy (EME) emissions of mobile phone handsets are not harmful to the user***"?
b. Despite the categorisation by the IARC that wireless is a Group 2B Carcinogen your organisation has created more recent fact sheets on mobile phones safety that do not explicitly mention this announcement and still suggest there is no concern. Why?

Answer: <ARPANSA representative to respond>

Question 13: India's RF guidelines were originally adopted based on the ICNIRP 1998 Guidelines like Australia. However recently (September 2012) India revised their standards to be 90% lower than what they had been previously.

a. Would you care to explain why they would make such a deep cut if the ICNIRP guidelines are considered safe?
b. Would you also care to explain why countries like Russia and China have RF standards far more conservative than our own?

Answer: <ARPANSA representative to respond>

It would appear that wireless industry is self-regulated without any real oversight being provided by Government bodies such as ACMA. All they need to do is test their devices against the ARPANSA standard for 6 minute period and show that they are lower than the guidelines to be able to claim their devices are safe.

Question 14: Who actually conducts these tests to confirm the devices are within the limits?

Answer: <ARPANSA representative to respond>

Question 15: ARPANSA provides a complaints register for people claiming to be sensitive or suffering from nearby microwave emissions. This register allows a person to raise a complaint indicating what they think the source of their complaint is and what symptoms they are experiencing.

a. What does ARPANSA do with the complaints?
b. Are the complaints shared with other departments including the health department?

c. Are there follow up actions taken to consult with those who suffer? I haven't been contacted yet except by letter to acknowledge the receipt of my complaint and most recently in correspondence to a previous letter to Dr Larsson (CEO) suggesting I seek medical advice.
d. What is the point of the complaint register if there is no formal investigation of the matter? Are we just being used as measure for statistical analysis and that's all?
e. How can you assure the public that the basic restrictions provide adequate protection when people such as myself are suffering very similar health ailments due to exposure levels 1000's to tens of 1000's or more times below the ICNIRP guidelines, that scientists have demonstrated through epidemiological and in vitro/in vivo studies that biological effects with potential health implications do occur below reference levels and in some studies genotoxic events were found?

Answer: <ARPANSA representative to respond>

Question 16: ARPANSA's mission statement (on page 4 of the pdf for the RF standard, just before the Foreword), states that the 'mission of ARPANSA is to provide the scientific expertise and infrastructure necessary... to protect the health and safety of people, and to protect the environment, from the harmful effects of radiation'.

a. Which publication in the Radiation Publication Series provides RF radiation standards for the environment, such as for plants, trees, bees, birds and amphibians?
b. What is ARPANSA doing by way of researching or monitoring of research into the effects of radiation on the environment such as from smart meter rollouts in Victoria?

Answer: <ARPANSA representative to respond>

There has been a shift in perception on the health and safety of smart meter globally. A number of countries have announced opt out programs such as in Canada (in Quebec), in the USA including California (PG&E, San Diego Gas and Electric, and Southern California Edison consumers have all now won this right), Maine, Vermont, Louisiana, Michigan, and Connecticut. Smart meters were made voluntary in the Netherlands in 2009 and in the UK earlier this year. A number of countries and/or states within foreign countries (i.e. UK and US) created moratoriums on smart meter rollout programs including the provision of opt-out clauses for previously mandated rollouts because of potential health concerns.

Question 17: Has ARPANSA reviewed these potential health issues? And -

a. Why has ARPANSA not made any statements relating to these overseas actions on their website?
b. Your smart meter fact sheet directs people to the Victorian government website which claims that smart meter emissions are below stated RF guidelines and that "*there is no substantive evidence to suggest that exposure to radiofrequency radiation such as from Smart Meters can increase the risk of chronic health effects*" so how do you explain my symptoms and those that I provided with the included letter which would most definitely be classified as "chronic health effects" that only have developed since the rollout of smart meters in our street?

Answer: <ARPANSA representative to respond>

Question 18: From your Smart Meter Fact Sheet – "*Victoria's Chief Health Officer has endorsed the advice of the Committee that, 'there is no substantive evidence to suggest that exposure to radiofrequency radiation such as from Smart Meters can increase the risk of chronic health effects, such as cancer'*.

Victoria's Chief Health Officer has also endorsed the advice of the Australian Radiation Protection and Nuclear Safety Agency that "*the overall exposure from Smart Meters is very low and well below exposure limits, even when a number of devices are communicating simultaneously*".

a. Does the Victorian Chief Health Officer have credentials in non-ionising radiation to be making such an endorsement?
b. If you were going to respond that she has been advised by the Radiation Advisory Committee then you would be aware that there is only one member on that committee who has a background in non-ionising radiation, i.e. Dr Ken Joiner who also happened to previously work for Motorola. Does it not concern you that industry interests have potentially infiltrated positions of trust on advisory committees?
c. Please provide a definition of "no substantive evidence"

Answer: <ARPANSA representative to respond>

Question 19: There appears to be a serious lack of information on the ARPANSA website on smart meters. Instead your very thin fact sheet directs people to look at a Victorian Government DPI website to get further facts. I would like to know -

a. Since when has the Victorian Government become a recognised authority on smart meter health and safety, particularly in regards to wireless emissions?
b. Why isn't ARPANSA taking a lead role? When the DPI is challenged about safety of wireless emissions against the RF standards they refer people to ARPANSA. Reciprocal buck-passing can only mean that no agency is taking responsibility and that the issue of whether wireless smart meters have the potential for adverse health consequences is simply being ignored. This is the very issue which has been recently successfully represented in the supreme court in Maine, USA, by concerned citizens (see: www.mainecoalitiontostopsmartmeters.org/2013/01/maine-supreme-court-proceedings-now-online/)

Answer: <ARPANSA representative to respond>

Question 20: From our RF standards "*A working group was established under the auspices of ARPANSA's Radiation Health Committee (RHC) to draft a set of maximum exposure levels for radiofrequency fields in the frequency range 3 kHz to 300 GHz. In choosing the members of the working group, ARPANSA consulted widely with a range of relevant groups to achieve a spread of relevant interests and expertise. The working group included expertise on electromagnetic radiation bio-effects, dosimetry and measurement techniques, medical expertise on epidemiology and occupational health and safety aspects, and knowledge of technical standards*."

a. Did this working group consist of people who represented the industry and their interests directly or indirectly?
b. Can you provide me with a list of the working group members and their associations please?

Answer: <ARPANSA representative to respond>

Independence and objectivity are key ingredients of scientific credibility. Credibility, in turn, is essential to the utility of scientific information in socio-political processes. Biased research could confuse public discussion of health issues and policy options. Conflicts of interest can be viewed as disqualifying factors in scientific papers and research with some academics reaching the conclusion that industry-funded science and projects/programs are inherently biased. The recognition of potential conflicts of interest is important, as this bias exists outside the formal research process. Authors of scientific reviews may search and interpret the literature selectively, in ways consistent with their personal and professional interests. In that regard, and reflecting on the personal and professional interests and affiliations of some of the members on the Radiation Health and Safety Advisory Council as well as those who participated in the generation of the EMC report on smart meter safety, information that is publicly available on their background and industry connections as follows:

Radiation Health and Safety Advisory Council

Chair: Ms Sylvia Kidziak AM (NSW), occupational health, safety and environment consultant.

Ms Kidziak started her career as a nuclear physicist in Canada, working for a nuclear power company and then electrical power company. Upon arriving in Australia she became involved in occupational health and safety and was the employer representative on the asbestos victims' compensation board known as the Dust Diseases Board. She also co-owns and manages SL Engineering.

Person to represent the interests of the general public: Em Professor Ian Lowe. Prof Ian Howe has a private company with his family, which was formed 50 years ago, originally in the business of electrical fields.

Ms Melissa Holzberger (Qld), energy and resources law specialist. Has tentacles in many parts of the world, and some close family in US; has a private law firm exclusively specializing in representing interests of the energy industry, including mining, oil, and gas companies, and businesses, and is on Colins Robert company board, also in many other firms. Received a Telstra Business Women Award.

EMC Technologies Report

Chris Zombolas (a co-author of the EMC Technologies report with Prof Andrew Wood, both also managing directors of the same company): can be traced back to Telstra, involved in many companies including Comtest Laboratories (again from Telstra) and EMC Engineering where he worked with the current Jemena's media and communications director, and where Andrew Wood worked too.

Question 21: Would ARPANSA confidently attest to the scientific independence and unbiased findings/claims of its advisors if there were to be a public inquiry tracing back their links to the industry, personal businesses, sources of funding and affiliations?

Answer: <ARPANSA representative to respond>

Question 22: Why didn't ARPANSA find it necessary to have advisors who are neurosurgeons, physiologists, epidemiologists, and physicians, from non-industry related organizations, preferably from independent hospitals and non-industry or non-government funded medical research?

Answer: <ARPANSA representative to respond>

s 47F [redacted]

Mr Chris Chapman, CEO and Chairman of

Australian Communications and Media Authority (ACMA)

PO Box Q500, Queen Victoria Building, NSW, 1230

Dear Mr Chapman,

You are receiving this letter because it is my understanding that ACMA is responsible for regulating the Australian RF standards maintained by ARPANSA. In practice however, this does not appear to be happening with the deployment of microwave emitting devices in the environment occurring in an uncontrolled and unprecedented manner. We have Airlines looking at enabling Wi-Fi on aircraft, local government creating Wi-Fi access points that blanket the city and our community 24x7, wireless smart meters, mobile phone towers etc. all being deployed without proper due consideration to long term health risks that have been identified by leading independent scientist and doctors. What happened to applying a precautionary principle? It appears to have been thrown out the window in favour of corporate wealth and so called technological advancement. Meanwhile the incidence of many cancers and mental disorders are on the increase without any adequate explanations. Sure life styles and diet have a role to play but it cannot be fully explained by these 2 factors alone. The only thing that is changing rapidly and correlates to observable increases in a number of disease states is the ever increasing RF exposure that the population is being subjected to. With the announcement in May 2011 by the IARC that microwaves (RF) are a class 2B carcinogen I am yet to see a satisfactory statement from the Federal Government, ARPANSA and ACMA that adequately addresses this issue.

Included with this letter is a review of the current RF standards managed by ARPANSA and how they fall dismally short of offering long term health assurances. These RF "cooking standards" do not address non thermal effects, chronic exposure to pulsed radiation, or of sensitive populations, nor of people with metal and medical implants that can be affected by both localized heating and by electromagnetic interference (EMI). I am expected to feel safe because devices are tested against a standard that is at best useful for research purposes only. I am being made suffer in my own home because of the forced rollout of smart meters in my state and I have no say.

As a regulatory body responsible for development and enforcement of public policy, I wonder how do you maintain independence, transparency and avoid conflict of interest scenarios when the Government makes money by providing access to the various bands within the RF spectrum for industry use? I am also interested in knowing what involvement does ACMA have in controlling what our Media reports on RF emission health and safety because I see a lot of spin being used in reports that relate to mobile phone safety?

Your organisation has a moral responsibility to ensure that regulations are enforced, that health and safety of the community is not compromised in pursuit of increasing revenues. It is imperative that the latest scientific research, free from industry influence, needs to be taken into consideration when regulating the deployment of microwave technologies in our community. Where possible doubt remains with regards to the risks, a precautionary principle must be adopted and enforced. The consideration of potential health risks must be put ahead of short term economic costs especially when alternate non wireless technologies are available as is the case for smart meters.

Yours Sincerely,

s 47F [redacted]

The following organisations/persons are recipients of this set of materials:

- ARPANSA
- Prime minister - Julia Gillard
- Opposition Leader – Tony Abbott
- Federal Senator - Nick Xenophon
- Department of Primary Industries (Victoria)
- News Agencies
- Energy Ombudsman (Victoria)
- My Lawyer

Australian Government

Australian Radiation Protection and Nuclear Safety Agency

Z13000539

12 April 2013

s 47F [redacted]

Dear s 47F [redacted]

Thank you for your further email and list of questions of 16 March 2013 regarding your health concerns with the electromagnetic emissions from smart meters.

In relation to smart meters and the health issues you have raised, our advice remains the same as in our previous correspondence. I note that the scientific evidence regarding possible health effects from radiofrequency (RF) electromagnetic radiation (EMR) has been considered by health authorities from around the world, including the World Health Organization (WHO), who have concluded that the weight of evidence does not demonstrate the existence of health effects below current exposure limits. The most recent review of RF and health by the Health Protection Agency in the United Kingdom concluded that "although substantial research has been conducted in this area, there is no convincing evidence that RF field exposure below guideline levels causes health effects in adults or children".

As previously advised, some research has reported the possibility of non-thermal effects resulting from low-level RF exposure. However, the evidence for the existence of non-thermal effects is ambiguous and unproven and cannot currently be used to set standards.

ARPANSA acknowledges the decision by the International Agency for Research on Cancer (IARC) to classify RF EMR as possibly carcinogenic. It is noted that this classification is based on limited evidence from human epidemiology of an increased risk of brain tumours among heavy mobile phone users. The classification by IARC corresponds to the current ARPANSA advice, including its advice on practical ways in which people can reduce their exposure to the electromagnetic fields produced by wireless telephones. ARPANSA has also recommended parents encourage their children to use these methods of reducing exposure from wireless phones.

While the IARC classification decision provides an impetus for research, ARPANSA is not aware of any change of position by the WHO in regard to the likelihood of health risks from the low exposures produced by smart meters. The WHO is currently undertaking a comprehensive assessment of the potential health impact of RF EMR exposures and this will take into account the IARC decision.

ARPANSA maintains continual oversight of emerging research into the potential health effects of the RF emissions from smart meters and other devices in order to provide accurate and up-to-date advice. Should scientific evidence indicate that the current ARPANSA Standard does not adequately protect the health of Australians then appropriate regulatory changes would be recommended.

E-mail: info@arpansa.gov.au
Web: www.arpansa.gov.au
Freecall: 1800 022 333 (a free call from fixed phones in Australia)

PO Box 655, MIRANDA NSW 1490
Phone: +61 2 9541 8333, Fax: +61 2 9541 8314
619 Lower Plenty Road, YALLAMBIE VIC 3085
Phone: +61 3 9433 2211, Fax: +61 3 9432 1835
3-5 National Circuit, BARTON ACT 2600
Phone: +61 2 6181 2888

ARPANSA has considered in detail all the arguments and documentary evidence that you have provided in relation to the issues. Please find attached our comprehensive scientific advice which is based on past and current research and internationally recognised health standards.

I trust that this advice and our completed answer sheet, addresses your concerns.

Yours sincerely

Carl-Magnus Larsson
CEO of ARPANSA

Encl

Z13000539 – Responses to Questions

[ARPANSA responses are in blue text]

Question 1: "ARPANSA *Radiation Protection Standard Maximum Exposure Levels to Radiofrequency Fields – 3 kHz to 300 GHz* Standard also sets limits for pulsed radiation that are intended to eliminate possible effects where heating is not evident (non-thermal effects)." Source ARPANSA's webpage on Mobile Telephones and Health Effects - http://www.arpansa.gov.au/mobilephones/index.cfm

How can the standard eliminate possible effects where heating is not evident, given:

a) the standards only acknowledge non-thermal effects in passing and indicate that they "cannot be ruled out",

b) that the evidence for them is inconsistent, and

further confirmatory studies need to be carried out, particularly in relation to SAR estimations before they can be considered?

The limits in the Standard are designed to protect against all known adverse health effects and to prevent unwanted nuisance effects that may arise through heat stress but also electrical stimulation and auditory responses (i.e. the microwave hearing effect which is associated with pulsed fields). The later effects (for pulsed fields) is what the statement that you have cited from the ARPANSA fact sheet refers to as 'non-thermal' effects.

Question 2: From Mobile Telephones and Health Effects (fact sheet 13) "Some research has indicated that non-thermal effects resulting from low-level RF exposure may also occur. However, the existence of these effects and their implications has not been sufficiently established to allow for them in the Standard." **This statement appears to be directly contradicting the previous statement made on your website in point 1 above. In one breath the ARPANSA is saying that non thermal effects are considered and then here (point 2) it implies they are not. Which is it?**

This statement refers to continuous RF exposure at low levels, whereas the previous statement refers to pulsed fields at levels above the limits of the Standard. As indicated above in our response to question 1, the Standard provides limits for pulsed fields which are not based on thermal models.

Question 3: In regards to non-thermal effects: "The review of scientific literature and consideration of possible low-level effects in the ICNIRP Guidelines (ICNIRP 1998) was noted. Around 80 studies relevant to the question of low-level interactions were identified in published peer reviewed journals after the ICNIRP cut-off date (1997) … those effects suggesting statistically significant biological interactions at SAR levels well below 1 W/kg need to be replicated satisfactorily, particularly if they are suggestive of harm, before they can form the basis of standard setting." **Given that our standards are over 11 years old and are based on guidelines from ICNIRP which are almost 15 years old –**

a) How many research papers have been looked at since the standard was released?

b) Where are the reports on these studies that were reviewed and details of who the reviewers were along with their associations/affiliations?

c) Only studies up to 1997 were considered in the ICNIRP Guidelines on which our standard was developed and the latest date that I could find for other studies noted in

the RF standards was the year 2000. Therefore, our standards are hardly current when they do not take into account latest research findings are they?

ARPANSA is unable to specifically comment on the number of papers examined, nor can we comment on the affiliations or associations of reviewers of papers.

Since the publication of the Standard, ARPANSA has continued to monitor the research and considers that the Standard continues to provide a high level of protection. It is also noted that in 2009, ICNIRP issued a statement confirming the validity of their guidelines taking into account scientific advances in the 10 years since they were published (http://www.icnirp.de/documents/StatementEMF.pdf).

ARPANSA has established an Expert Panel to formally assess the scientific literature to determine whether there are any significant changes to the science underpinning the Standard and whether it continues to provide adequate protection. A report on the assessment of the literature is currently being prepared.

Question 4: As our RF standards are based on ICNIRP Guidelines and only provide a level of protection against known thermal effects, I would like to know whether ARPANSA is planning to address concerns made by credible independent scientists such as Dr Karl Maret that our standards are not appropriate for providing assurances for pulsed microwave emissions (i.e. smart meters, mobile phones etc.) because they do not consider adverse biological effects that may occur below the thermal threshold?

As mentioned in our response to Question 3 above, ARPANSA has established an Expert Panel to assess the scientific literature published since the publication of the Standard.

Question 5: How many more reports showing unequivocal evidence of biological effects such as DNA breaks, calcium efflux, increased production of histamines and mast cell count plus a host of other effects that have potential health effects etc. before ARPANSA will recognise that non-thermal effects do exist and that there is a real potential health crisis looming because of the ever increasing incidence of manmade Radio Frequency emissions in our environment?

The health implications of biological effects below limits specified in the RF Standard are not known. Accordingly, there is no established data for bio-effects below the limits that could be used for setting the levels of basic restrictions. There is an extensive world-wide research program into the possible health effects of low level RF exposure. ARPANSA will review the limits of the Standard if evidence does emerge of a causal link between low level RF exposure and adverse health effects in humans.

As previously mentioned ARPANSA has established an Expert Panel to assess the scientific literature published since the publication of the Standard.

Question 6: How do our standards protect us when -

a) **They do not consider non-thermal interactions when research described above, which was used by the IARC to make a statement that RF EMR is a group 2B carcinogen and thereby validating the real possibility of non-thermal effects and show an elevated risk of getting a brain tumour for mobile phone users who use the phone for around 30 minutes a day for 10 years (This is now the norm for today's users)?**

The IARC classification of RF EMR as a group 2B carcinogen is based on limited epidemiological evidence showing a possible association between heavy use of wireless phones (mobile and cordless phones) and glioma and acoustic neuroma. IARC found that the evidence for occupational and environmental exposures (such as exposures from mobile phone base stations and smart meters) were inadequate. IARC's assessment does not discuss what level of risk might be associated with a particular level of exposure. IARC found inadequate evidence for biological mechanisms causing carcinogenesis which is directly related to standard setting.

b) **Please justify the grounds for ignoring this finding?**

ARPANSA welcomes the IARC decision and considers that the current ARPANSA advice, including ARPANSA advice on practical ways in which people can reduce their exposure to the RF fields produced by wireless telephones, is consistent with the IARC classification. The Expert Panel set up by ARPANSA to assess the scientific literature on RF will also consider the evidence mentioned in the IARC report.

Question 7: ARPANSA Mobile fact sheet 13 includes details of the Interphone Study initial report which showed "analysis of all the brain tumour results has suggested no overall risk for moderate mobile phone use by adults for up to 10 years". It appears that ARPANSA has selectively taken (cherry picked) statements to validate its Standards and Fact Sheet position statements and ignored what is clearly evidence to the contrary. Moderate usage in the interphone study would be classified as users who hardly use the phone and are NOT representative of the average user today. **Why didn't the fact sheet mention that brain tumour increases were found for heavy users at the time the study was conducted and that heavy users would be classified as normal users by today's standards?**

ARPANSA's fact sheet does mention the possible association between 'heavy' mobile phone use and glioma and acoustic neuroma (specifically "The pooled analyses suggested the possibility of an increased risk of glioma and acoustic neuroma in the group representing individuals with the highest cumulative call time"). The reference to 'heavy' use in the Interphone study relates to the highest decile of cumulative call time amongst the subjects recruited in the study.

Question 8: Measurement of SAR has some serious deficiencies. Firstly it is based on a human model that does not represent the majority of humans. It also has loopholes by not specifying the distance at which SAR must be measured (some providers are measuring at approximately 1 inch from the head.) **Does ARPANSA disagree with the above statement and if so why? Please direct me to the page in our RF Standard which explains measurements of SAR must be performed at a set distance.**

The ARPANSA RF standard specifies limits of exposure which at certain frequency ranges are expressed in terms of the SAR. The derivation of the SAR limits in the Standard are explained in the Rationale section (page 43). It is not the purpose of the ARPANSA RF Standard to explain the measurement of SAR. The methodology of SAR measurements is explained in other international Standards, for example:

> IEC 62209-2—Human exposure to radiofrequency fields from hand-held and body mounted wireless communication devices – Human models, instrumentation, and procedures – Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz).

Question 9: In regards to measurement of SAR there are no known recipes for fluids that are representative of body tissue at all frequencies. As such, different tissue simulant fluids are required for different frequencies (e.g., 900 MHz for GSM 900 and 1800 MHz for 1800 products). The brain simulant must be calibrated to ensure that the permittivity and conductivity are correct for the frequency being tested. Fluids are often made from a mixture of distilled water, sugar, and salt. Some frequencies, however, require other chemicals to obtain the required properties. Source: http://www.ce-mag.com/archive/03/01/miller.html
How can ARPANSA give long term health assurances to the public when –

a) **Testing does not appear to be biologically based or representative of the majority of people?**
b) **It is a simulation using fluids that represent the body's tissues conductivity and thermal properties only. It does not contain real cells nor does it measure the impact on cell wall properties or cellular internal processes.**
c) **How does ARPANSA provide assurances that biological damage is not occurring when a person is exposed to microwaves at or below what the guidelines consider safe when there are no biologically based tests conducted to validate this?**

As indicated above the ARPANSA RF standard is an exposure standard and not a measurement standard. You may wish to refer to the reference provided above in Question 8 (IEC 62209-2) for details on the methodology of SAR testing.

d) **Given that SAR and RMS Electromagnetic fields from a transmitting device are only measured for a period averaged over 6 minutes (i.e. RF frequencies between 100KHz to 6GHz for measurement of SAR and 100KHz to 10GHz for RMS E&M Fields) - How do you verify safety to chronic long term exposures?**

The averaging time specified for measurement must be the same as, or shorter than, time scales associated with the relevant established injury process. In the event where a potentially harmful effect is not clearly understood, a conservative approach may be taken through the adoption of the shortest practical measurement averaging time where the averaging time chosen is likely to be shorter than the time constant associated with the injury process. For

frequencies below 10 GHz where heat stress is the established injury process a measurement averaging time of around six minutes is chosen as adequate. Measurement averaging considerations are described in detail in the ARPANSA website at http://www.arpansa.gov.au/Publications/Codes/mw_averaging.cfm

e) **What consideration is made for children whose bodies are smaller and so SAR is likely to be higher?**

Research in this area has shown that the determination of age-related changes in energy absorption in the brain from RF EME exposure depend critically on the assumptions made in specifying the analytical models of adults and children. There are age-dependent changes in the electrical properties of tissue that influence the penetration and absorption of RF EME. The SAR limits of the ARPANSA RF Standard are applicable to all individuals of different sizes and tissue properties, including children.

f) **Where is the data that adequately covers typical home scenarios where occupants are exposed to RF from multiple sources simultaneously such as mobile/smart phones, cordless digital phones, digital baby monitors, smart meters, mobile phone towers, AM and FM radio waves, wireless routers, computers and other blue tooth/wireless devices?**

There have been various studies that have measured RF exposure from multiple sources in domestic environments. The former Australian Centre for Radiofrequency Bio-effects Research performed such a study and the results are available at http://acrbr.org.au/Research/ACRBR_Devices_In_Homes_Final_Report.pdf

Question 10: The Bioinitiative report release in (2007) reviewed more than 2000 papers that showed effects and the more recent updated version of the same report in 2012 reviewed a further 1800 papers showing effects that have biological health implications. **Does ARPANSA engage in studies itself to prove or disprove findings made by independently funded and conducted research or does your organisation simply sit on the fence and act as passive observers waiting for advisement from International bodies such as WHO, IEEE or ICNIRP ?**

ARPANSA is aware of the 2012 Bioinitiative Report and the views presented by Dr Cherry at the Australian Senate Inquiry into Electromagnetic Radiation. Our view is that the statements made in regard to the evidence of harm from low-level exposures to RF fields are not consistent with the expert opinions of national and international bodies such as the International Commission for Non-Ionizing Radiation Protection (ICNIRP), the World Health Organization, the European Union Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR), the European Health Risk Assessment Network on Electromagnetic Fields Exposure (EFHRAN), or most recently, the 2012 report of Independent Advisory Group on Non-ionising Radiation (AGNIR) of the UK Health Protection Agency.

ARPANSA does not conduct studies since it is more appropriate for studies to be conducted by tertiary institutions and research centres. ARPANSA is actively involved in the WHO International Electromagnetic Fields Project through its role as a WHO Collaborating Centre for Radiation Protection.

There is an Australian research program managed by the National Health and Medical Research Council (NHMRC) to conduct research into EME issues of relevance to Australia and to complement overseas research activities. The former Australian Centre for RF Bioeffects Research, formerly funded by the NHMRC, conducted various research programs including human neurobiology with specific studies investigating cardiovascular and other physiological effects and electro-hypersensitivity. The NHMRC is currently funding the Australian Centre for Electromagnetic Bioeffects Research over five years (2012-2017) to investigate various areas of RF research based on recommended priorities identified by the WHO.

Question 11: The Standards in several places provide examples where some health impacts were noted but in nearly all cases were indifferently brushed aside by saying more studies are needed.

a) **How many are needed before there is consensus?**

The Standard considered all of the research that was available at the time however there was no established data for bio-effects below the limits that could be used for setting the levels of basic restrictions.

b) **Who is doing these studies? ARPANSA?**

There is an international effort lead by the WHO International EMF Project to assess the health and environmental effects of exposure to electromagnetic fields. As mentioned earlier, ARPANSA supports the Project in its role as a WHO Collaborating Centre for Radiation Protection. WHO published a research agenda for RF fields in 2010 (http://whqlibdoc.who.int/publications/2010/9789241599948_eng.pdf) which identified gaps in the knowledge for future research.

c) **When can we expect the RF standards to be updated to take into account the latest (independent) scientific findings?**

As mentioned above, ARPANSA has established an Expert Panel to assess the scientific literature to determine whether there are any significant changes to the science underpinning the Standard and whether it continues to provide adequate protection.

d) **Will a review of these studies be performed without undue influence from Telecommunication giants and their agents as well as wireless manufacturers to avoid conflict of interest scenarios and will it be done in a transparent manner?**

The Expert Panel is comprised of Australian academics and ARPANSA staff. Industry is not involved in this process in any capacity.

e) **Does ARPANSA take into consideration the sources of funding, potential conflicts of interest and potential industry interference when it reviews candidate studies?**

ARPANSA considers studies on their scientific merit. ARPANSA is aware that the industry is a significant contributor to the funding of research in this field and notes that much of the research would not be implemented if funding by industry was not available. However ARPANSA is not aware of any industry interference in the research being funded. Studies

are required to disclose their sources of funding and conflicts of interest. In Australia the research into EME is funded by a $1 million dollar levy paid annually by radio communication licensees and collected by the Australian Communications and Media Authority (ACMA). The Australian research program is managed by the National Health and Medical Research Council with no involvement from industry.

f) **Where can I find the independent studies and reports that validate your claim that the standards provide protection against long term chronic exposures?**

The research into RF and health has been extensively reviewed by various health authorities including the International Commission for Non-Ionizing Radiation Protection (ICNIRP), the European Union Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR), the European Health Risk Assessment Network on Electromagnetic Fields Exposure (EFHRAN). The most recent review of RF and health by the Health Protection Agency in the United Kingdom concluded that "although substantial research has been conducted in this area, there is no convincing evidence that RF field exposure below guideline levels causes health effects in adults or children". (www.hpa.org.uk/webc/hpawebfile/hpaweb_c/1317133827077)

Question 12: I have yet to observe any tangible findings or recommendations from ARPANSA in relation to what this announcement has on our 11 year old RF Standards and neither have I seen any new suggested protective measures for the public.

a) **What actions has ARPANSA taken since this announcement almost 2 years ago? Apart from releasing some commentary along with the above statement and a fact sheet 14 which irresponsibly claims "evidence suggests that the radiofrequency (RF) electromagnetic energy (EME) emissions of mobile phone handsets are not harmful to the user"?**

As mentioned earlier ARPANSA has established an Expert Panel to assess the scientific literature to determine whether there are any significant changes to the science underpinning the Standard and whether it continues to provide adequate protection.

b) **Despite the categorisation by the IARC that wireless is a Group 2B Carcinogen your organisation has created more recent fact sheets on mobile phones safety that do not explicitly mention this announcement and still suggest there is no concern. Why?**

Both the "EME Series No. 5: About mobile phones" (http://www.arpansa.gov.au/pubs/eme/fact5.pdf) and the "Mobile telephones and health effects" (http://www.arpansa.gov.au/mobilephones/index.cfm) fact sheets mention the IARC classification. The IARC classification is also mentioned in the fact sheet "EME Series No. 1: Electromagnetic energy and its effects" (http://www.arpansa.gov.au/pubs/eme/fact1.pdf) which is not on mobile phones per se.

As mentioned earlier ARPANSA welcomes the IARC decision and considers that the classification corresponds to the current ARPANSA advice of minimizing exposure to RF, including its advice on practical ways in which people can reduce their exposure to the RF fields produced by wireless telephones.

Question 13: India's RF guidelines were originally adopted based on the ICNIRP 1998 Guidelines like Australia. However recently (September 2012) India revised their standards to be 90% lower than what they had been previously.

a) **Would you care to explain why they would make such a deep cut if the ICNIRP guidelines are considered safe?**
b) **Would you also care to explain why countries like Russia and China have RF standards far more conservative than our own?**

ARPANSA cannot comment on the government policies of other countries.

Question 14: It would appear that wireless industry is self-regulated without any real oversight being provided by Government bodies such as ACMA. All they need to do is test their devices against the ARPANSA standard for 6 minute period and show that they are lower than the guidelines to be able to claim their devices are safe. **Who actually conducts these tests to confirm the devices are within the limits?**

Wireless devices are regulated by ACMA so any questions regarding compliance should be directed to ACMA.

Question 15: ARPANSA provides a complaints register for people claiming to be sensitive or suffering from nearby microwave emissions. This register allows a person to raise a complaint indicating what they think the source of their complaint is and what symptoms they are experiencing.

a) **What does ARPANSA do with the complaints?**

The complaints that are gathered by ARPANSA in the Electromagnetic Radiation Health Complaints Register are used to produce statistical summaries for the public, and the Commonwealth Government, on the nature and level of complaints received.

b) **Are the complaints shared with other departments including the health department?**

The Register allows for information to be disclosed to the National Health and Medical Research Council for its consideration where permission is given by people making a complaint.

c) **Are there follow up actions taken to consult with those who suffer? I haven't been contacted yet except by letter to acknowledge the receipt of my complaint and most recently in correspondence to a previous letter to Dr Larsson (CEO) suggesting I seek medical advice.**

ARPANSA does not investigate or attempt to resolve individual complaints.

d) **What is the point of the complaint register if there is no formal investigation of the matter? Are we just being used as measure for statistical analysis and that's all?**

Information could be used to help identify future areas of research into the effects of electromagnetic fields on people and the environment.

e) **How can you assure the public that the basic restrictions provide adequate protection when people such as myself are suffering very similar health ailments due to exposure levels 1000's to tens of 1000's or more times below the ICNIRP guidelines, that scientists have demonstrated through epidemiological and in vitro/in vivo studies that biological effects with potential health implications do occur below reference levels and in some studies genotoxic events were found?**

Health authorities around the world, including ARPANSA and the World Health Organization (WHO), have examined the scientific evidence regarding possible health effects and have concluded that the weight of evidence does not demonstrate the existence of health effects below current exposure limits. The health implications of biological effects below limits specified in the RF Standard are not known. Accordingly, there is no established data for bio-effects below the limits that could be used for setting the levels of basic restrictions and reference levels. Nevertheless ARPANSA has established an Expert Panel to assess the scientific literature to determine whether there are any significant changes to the science underpinning the Standard and whether it continues to provide adequate protection.

Question 16: ARPANSA's mission statement (on page 4 of the pdf for the RF standard, just before the Foreword), states that the 'mission of ARPANSA is to provide the scientific expertise and infrastructure necessary... to protect the health and safety of people, and to protect the environment, from the harmful effects of radiation'.

a) **Which publication in the Radiation Publication Series provides RF radiation standards for the environment, such as for plants, trees, bees, birds and amphibians?**

b) **What is ARPANSA doing by way of researching or monitoring of research into the effects of radiation on the environment such as from smart meter rollouts in Victoria?**

Much of the research that ARPANSA has examined in order to provide advice has been performed on animals and cells (often extracted from plants). Smart meters are a new form of technology and, as stated above, ARPANSA is currently completing a review of the scientific literature published since the RF standard was prepared and will undertake a review of our advice in the light of any significant findings, including, if necessary, the Standard itself. ARPANSA continue to examine new scientific publications as they appear including those relating to potential health effects from smart meters.

Question 17: There has been a shift in perception on the health and safety of smart meter globally. A number of countries have announced opt out programs such as in Canada (in Quebec), in the USA including California (PG&E, San Diego Gas and Electric, and Southern California Edison consumers have all now won this right), Maine, Vermont, Louisiana, Michigan, and Connecticut. Smart meters were made voluntary in the Netherlands in 2009 and in the UK earlier this year. A number of countries and/or states within foreign countries (i.e. UK and US) created moratoriums on smart meter rollout programs including the provision of opt-out clauses for previously mandated rollouts because of potential health concerns.

Has ARPANSA reviewed these potential health issues? And -
Why has ARPANSA not made any statements relating to these overseas actions on their website?

a) **Your smart meter fact sheet directs people to the Victorian government website which claims that smart meter emissions are below stated RF guidelines and that "*there is no substantive evidence to suggest that exposure to radiofrequency radiation such as from Smart Meters can increase the risk of chronic health effects*" so how do you explain my symptoms and those that I provided with the included letter which would most definitely be classified as "chronic health effects" that only have developed since the rollout of smart meters in our street?**

ARPANSA does not regulate smart meters and cannot comment on the policies of other responsible jurisdictions.

Question 18: From your Smart Meter Fact Sheet – "*Victoria's Chief Health Officer has endorsed the advice of the Committee that, 'there is no substantive evidence to suggest that exposure to radiofrequency radiation such as from Smart Meters can increase the risk of chronic health effects, such as cancer'*. Victoria's Chief Health Officer has also endorsed the advice of the Australian Radiation Protection and Nuclear Safety Agency that "*the overall exposure from Smart Meters is very low and well below exposure limits, even when a number of devices are communicating simultaneously*".

a) **Does the Victorian Chief Health Officer have credentials in non-ionising radiation to be making such an endorsement?**
b) **If you were going to respond that she has been advised by the Radiation Advisory Committee then you would be aware that there is only one member on that committee who has a background in non-ionising radiation, i.e. Dr Ken Joiner who also happened to previously work for Motorola. Does it not concern you that industry interests have potentially infiltrated positions of trust on advisory committees?**
c) **Please provide a definition of "no substantive evidence"**

ARPANSA does not regulate smart meters and cannot comment on the policies of other government departments – state, territory or Commonwealth.

(c) The criteria that have to be satisfied for substantiating scientific evidence are:

- the publication of research results in a reputable international scientific journal that includes peer review by appropriately qualified scientists and academics. This ensures that research conforms to high standards of scientific practice and that conclusions may reasonably be drawn from the work undertaken which take into account relevant

considerations; and

- the independent verification of research results. If a research result cannot be repeated by other independent researchers, doubts are raised about the original finding.

In ARPANSA's view, "no substantive evidence" would mean the absence of the two conditions mentioned above.

Question 19: There appears to be a serious lack of information on the ARPANSA website on smart meters. Instead your very thin fact sheet directs people to look at a Victorian Government DPI website to get further facts. I would like to know -

a) Since when has the Victorian Government become a recognised authority on smart meter health and safety, particularly in regards to wireless emissions?

b) Why isn't ARPANSA taking a lead role? When the DPI is challenged about safety of wireless emissions against the RF standards they refer people to ARPANSA. Reciprocal buck-passing can only mean that no agency is taking responsibility and that the issue of whether wireless smart meters have the potential for adverse health consequences is simply being ignored. This is the very issue which has been recently successfully represented in the supreme court in Maine, USA, by concerned citizens (see: www.mainecoalitiontostopsmartmeters.org/2013/01/maine-supreme-court-proceedings-now-online/)

ARPANSA does not regulate smart meters and cannot comment on the policies of other government departments – state, territory or Commonwealth.

The Commonwealth Government has a role in providing scientific advice on radiation protection and in facilitating uniformity of health standards throughout Australia. The state and territory governments, in turn, are generally responsible for the planning and regulation of infrastructure, including the provision of electrical power. Generally, the assessment of environmental impact of electrical infrastructure, including possible health effects, and decisions about whether installations are optional, is undertaken by state and territory authorities.

Question 20: *From our RF standards "A working group was established under the auspices of ARPANSA's Radiation Health Committee (RHC) to draft a set of maximum exposure levels for radiofrequency fields in the frequency range 3 kHz to 300 GHz. In choosing the members of the working group, ARPANSA consulted widely with a range of relevant groups to achieve a spread of relevant interests and expertise. The working group included expertise on electromagnetic radiation bio-effects, dosimetry and measurement techniques, medical expertise on epidemiology and occupational health and safety aspects, and knowledge of technical standards."*

a) Did this working group consist of people who represented the industry and their interests directly or indirectly?

In choosing the members of the working group, ARPANSA consulted widely with a range of relevant groups to achieve a spread of relevant interests and expertise. The working group included expertise on electromagnetic radiation bio-effects, dosimetry and measurement techniques, medical expertise on epidemiology and occupational health and safety aspects, and knowledge of technical standards. Community, industry and union representation was also included.

b) Can you provide me with a list of the working group members and their associations please?

A list of the members of the Working Group is provided on page 123 of the Standard (http://www.arpansa.gov.au/pubs/rps/rps3.pdf)

Question 21: Independence and objectivity are key ingredients of scientific credibility. Credibility, in turn, is essential to the utility of scientific information in socio-political processes. Biased research could confuse public discussion of health issues and policy options. Conflicts of interest can be viewed as disqualifying factors in scientific papers and research with some academics reaching the conclusion that industry-funded science and projects/programs are inherently biased. The recognition of potential conflicts of interest is important, as this bias exists outside the formal research process. Authors of scientific reviews may search and interpret the literature selectively, in ways consistent with their personal and professional interests. In that regard, and reflecting on the personal and professional interests and affiliations of some of the members on the Radiation Health and Safety Advisory Council as well as those who participated in the generation of the EMC report on smart meter safety, information that is publicly available on their background and industry connections as follows: **Would ARPANSA confidently attest to the scientific independence and unbiased findings/claims of its advisors if there were to be a public inquiry tracing back their links to the industry, personal businesses, sources of funding and affiliations?**

We refer to our response to Question 20 above.

Question 22: Why didn't ARPANSA find it necessary to have advisors who are neurosurgeons, physiologists, epidemiologists, and physicians, from non-industry related organizations, preferably from independent hospitals and non-industry or non-government funded medical research?

We refer to our response to Question 20 above.

Irrelevant

[redacted]

From: [redacted]
Sent: Wednesday, 5 June 2013 12:34 PM
To: Ken Karipidis
Subject: RE: Please pass attached report to "Expert Panel" [SEC=UNCLASSIFIED]

Hi Ken, I am not sure whether the RF Expert Panel regularly checks this website for updates on the latest RF research findings http://www.emf-portal.de/ . The site typically has a new article every 1-2 days and covers a large range of the EM spectrum. i.e. Low frequencies (50 Hz) to High Frequencies (Ghz). It is interesting to see the number of recent articles that show effects below

the thermal threshold. I would be much obliged if you could pass this information onto the expert panel too.

Investigation of the Effects of 2.1 GHz Microwave Radiation on Mitochondrial Membrane Potential (ΔΨ m), Apoptotic Activity and Cell Viability in Human Breast Fibroblast Cells.

http://www.ncbi.nlm.nih.gov/pubmed/23723005?dopt=Abstract

Effect of low level microwave radiation exposure on cognitive function and oxidative stress in rats.

http://www.ncbi.nlm.nih.gov/pubmed/23720885?dopt=Abstract

Evaluation of the cytogenotoxic damage in immature and mature rats exposed to 900 MHz radio frequency electromagnetic fields.

http://www.ncbi.nlm.nih.gov/pubmed/23718180?dopt=Abstract

In recent correspondence from Dr Larsson he indicated that ARPANSA does not investigate individual complaints. I understand this may be due to the fact that it would tie up limited resources for something that could potentially be due to an unrelated cause. What about if the complaint came from an organisation that represents a group of people (more than 80) all suffering similar symptoms that relate to the same RF source? Would ARPANSA be compelled to investigate? How many people need to be suffering RF induced health issues before an investigation is warranted?

As you may or may not be aware I have been chasing the DPI, the Victorian Energy minister, Powercor, Victorian Chief Health Officer and the ACMA regarding my sensitivity to smart meter RF. Despite the fact that there has been rampant buck passing occurring between all the aforementioned departments the clear common element is that ARPANSA has jurisdiction over public health and safety with regards to RF emissions because your organisation's RF standards are being used to claim safety for wireless devices such as smart meters. I am wondering when I can expect responsible handling of this issue by ARPANSA?

Your Sincerely,
s 47F [redacted]

From: Ken Karipidis [mailto:Ken.Karipidis@arpansa.gov.au]
Sent: Tuesday, 21 May 2013 1:03 PM
To: [redacted]
Subject: RE: Please pass attached report to "Expert Panel" [SEC=UNCLASSIFIED]

Dear s 47F [redacted]

Thank you for forwarding the commentary by Devra Davis. We will pass this to the RF Expert

Panel and review it ourselves as part of our on-going review.

Kind regards

Dr Ken Karipidis
Scientist
Non-Ionising Radiation Section
Radiation Health Services Branch

Australian Radiation Protection and Nuclear Safety Agency
619 Lower Plenty Road, Yallambie VIC 3085 AUSTRALIA

Phone +61 3 9433 2282
FAX +61 3 9432 1835
email ken.karipidis@arpansa.gov.au
http://www.arpansa.gov.au

From: s 47F [redacted]
Sent: Friday, 17 May 2013 11:41 AM
To: $ARPANSA Info
Cc: Samantha Gunther
Subject: Please pass attached report to "Expert Panel"

To whom it may concern,

It would be very much appreciated it if you could pass on the attached commentary document on the "Swedish Review Strengthens Grounds for Concluding that Radiation from Cellular and Cordless Phones is a Probable Human Carcinogen" to ARPANSA's Expert Panel. ARPANSA may want to consider updating its Mobile Fact sheets particularly Fact sheet 14 where it incorrectly says "evidence suggests that the radiofrequency (RF) electromagnetic energy (EME) emissions of mobile phone handsets are not harmful to the user". This is clearly not true.

Best regards,
s 47F [redacted]

****

Australian Government

Australian Radiation Protection and Nuclear Safety Agency

Z13001258

26 June 2013

s 47F
[redacted]

I refer to your email of 5 June 2013 regarding your health concerns with the electromagnetic emissions from smart meters, and the subsequent further documents and information you provided.

Thank you for your interest and concern in this matter and for forwarding information in the past. However continuing to forward us this information is not necessary as ARPANSA has for many years reviewed on a monthly basis, (and will continue to do so), most of the significant research and developments in electromagnetic radiation (EMR) and its health effects. This information is placed on the ARPANSA website and where appropriate, passed onto others, including other government agencies and relevant expert groups.

We appreciate that you have particular concerns around smart meters, and while current scientific evidence does not provide support that these devices can cause the symptoms that you describe, we will continue to monitor all of the evidence in this field and if necessary, will modify our advice to reflect any changes to the scientific understanding.

ARPANSA has established a means for people concerned about the health effects of EMR to report their issues through the home page of the ARPANSA website. As you know, it is not practicable to investigate individual cases, and so far there have not been many reports around concerns on smart meters lodged to this website. To date there have been less than 25 reports in the history of the register. If you are aware of others who attribute their symptoms to smart meters then these people should be encouraged to provide their information to this register. This provides the opportunity that in the future there may be a sufficient cohort for a university or other reputable body to investigate further. Research on this would need to be balanced against research into other issues and health concerns.

As indicated on the ARPANSA website, the location of smart meters on the outside of buildings, together with their low power and brief transmissions, make it likely that any physical symptoms are attributable to other causes. We encourage people to investigate that possibility, and to seek the appropriate medical assistance.

I trust this information is of assistance.

Yours sincerely

Stephen Sol

Dr Stephen Solomon
Acting Chief Radiation Health Scientist
Radiation Health Services
ARPANSA

E-mail: info@arpansa.gov.au
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04 OCT 2013

Our Ref: e3207477 / e3213379

Your Ref:

Dr Carl-Magnus Larsson
CEO
ARPANSA
619 Lower Plenty Road
YALLAMBIE VIC 3085

Dear Dr Larsson

I write to advise you of correspondence received by the Department of Health from s 47F s 47F regarding his concerns about the potential impact of radiofrequency radiation from Smart Meters and other sources.

Radiofrequency matters are considered to be outside the scope of the Victorian *Public Health and Wellbeing Act 2008*, as the Commonwealth via the Australian Communication and Media Authority has specific legislation (the *Radiocommunications Act 1992*) with the ability to both make standards for health protection and ensure compliance with them. The Department of Health does not investigate alleged cases of hypersensitivity.

s 47F correspondence deals with questions as to the appropriateness of the ARPANSA radiofrequency standard with regard to possible non-thermal effects at exposure levels well below that permitted by the current standard. I ask that you consider the enclosed material from s 47F and the associated literature referred to when considering the question of the appropriateness of the standard.

Yours sincerely

Graeme Gillespie
Director Health Protection

cc s 47F [redacted]

Victoria

Australian Government
Australian Radiation Protection and Nuclear Safety Agency

Reference: D1317187

15 October 2013

Mr Graeme Gillespie
Director Health Protection
Department of Health Victoria
GPO Box 4541
MELBOURNE VIC 3001

Dear Mr Gillespie

Re: s 47F – concerns regarding Smart Meters

Thank you for your letter of 4 October in which you advise you had received correspondence from s 47F in regard to his concerns about the potential impact of radiofrequency radiation from Smart Meters and other sources.

ARPANSA is in receipt of this documentation and has responded on various occasions directly to s 47F Attached, for your information, are the relevant ARPANSA correspondence.

- Letter to s 47F dated 15 January 2013;
- Letter to s 47F dated 12 April 2013; and
- Letter to s 47F dated 26 June 2013

ARPANSA will take the information from s 47F into account in its further work on the relevant Radiofrequency Standard.

Yours sincerely

Carl-Magnus Larsson
CEO of ARPANSA

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Australian Government

Australian Radiation Protection and Nuclear Safety Agency

Z15000424

20 March 2014

s 47F [redacted]

I refer to our letter to you dated 2 February 2015 and your further email to ARPANSA dated 12 March 2015 seeking ARPANSA's views on three separate topics which we address below together with an attached list of references.

Is 3G/UMTS microwave exposure a co-carcinogen

Although the *in vivo* studies by Tillman et al (2010) and more recently by Lerchl et al (2015) report a possible role of radiofrequency (RF) fields as a co-carcinogen these two studies alone do not provide established evidence of a causal effect. Other *in vivo* studies investigating the same combined effect of N-ethylnitrosourea (as a cancer initiator) and RF (as a cancer promoter) have not shown a higher incidence of cancer in rats (e.g. Shirai et al, 2005; Zook and Simmens, 2006; Shirai et al, 2007). There have also been other studies showing no co-carcinogenic effect of RF combined with other established carcinogens (e.g. Huang et al, 2005; Heikkinen et al, 2006; Yu et al, 2006; Hruby et al, 2008). Taken together, these studies have produced no established evidence that exposure to RF fields acts as a co-carcinogen.

Regarding the study by Dasdag et al (2015) which found that long term RF exposure altered the microRNA expression in the brain of rats; a large body of RF research has been conducted on gene and protein expression in mammalian and other cell types. These have been reviewed by health authorities including more recently by the International Agency for Research on Cancer (IARC, 2013). The studies conducted so far have not provided consistent evidence of biological effects under non-thermal RF exposure conditions. Nevertheless, based on the positive results of some studies (such as Dasdag et al, 2015) further studies should be conducted in this area.

A potential study to explain subjective symptoms associated with EHS

Most of the studies investigating the effects of RF fields on hormone levels have mainly looked at melatonin with no established effects shown. There is a lack of data on other hormones and although the study by Eris et al (2015) found that exposure to RF increased serotonin levels in rats, another study by Hata et al (2005) did not show a similar effect on serotonin. Both of these studies on the effect of RF fields on serotonin will be included in future evaluations of endocrine system effects however there is no current evidence showing that these effects are related to electromagnetic hypersensitivity (EHS).

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Although some cross-sectional studies such as Santini et al (2002) have reported an association between living close to mobile base stations and subjective symptoms, other studies have not a similar association (e.g. Baliatsas et al, 2011; Mohler et al, 2012; Frei et al, 2012). Interestingly a recent study by Bortkiewicz et al (2012) reported a correlation between subjective symptoms and residential distance to base stations but no correlation with measured exposure to RF. The International Commission on Non-Ionizing Radiation Protection has suggested that studies of symptoms and well-being find a higher prevalence of symptoms among people who are concerned about exposure from base-stations, whereas there is little evidence for an association between measured RF levels and the studied outcomes (ICNIRP, 2009).

Smart meters and documented subjective symptoms

The subjective symptoms reported by Dr Powell are attributed to smart meters based on self-reporting. Although case series observations can be valuable in identifying areas of research they do not provide evidence for establishing a causal relationship. ARPANSA is not aware of any subjective symptoms being associated to the low RF exposure from smart meters in well-conducted scientific investigations.

The Australian Centre for Electromagnetic Bioeffects Research is currently conducting human provocation and psychophysiological research into exposure to RF and subjective symptoms associated with EHS. More information is available from acebr.uow.edu.au/research-programs/UOW164837.html.

In relation to your continuing inquiries, we do not consider that there is any further information that we can provide to assist you. We will consider any future correspondence from you but may elect not to respond if this doesn't alter our current position on the health effects of RF fields. As previously advised, in May 2015, ARPANSA's Electromagnetic Energy Reference Group (EMERG) scheduled for May 2015 will focus upon the issue of EHS and you may wish to continue to raise your concerns in more detail at that forum.

We trust that this advice is of assistance.

Yours sincerely

Dr Stephen Solomon
Chief Radiation Health Scientist
Radiation Health Services

Encl.

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From:	s 47F [redacted]
To:	Ian.Macfarlane.MP@aph.gov.au
Cc:	Alan Mason; $ARPANSA Parliamentary Correspondence; nicholas.kotsiras@parliament.vic.gov.au; Minister.Davis@health.vic.gov.au; russell.northe@parliament.vic.gov.au; Noel.Cleaves@health.vic.gov.au; Minister.Dutton@health.gov.au; com@iarc.fr; kheifetsl@who.int; g.ziegelberger@icnirp.org
Subject:	Punitive power and the smart meter tyranny
Date:	Thursday, 27 March 2014 12:08:06 AM
Attachments:	img-321090925-0001.pdf A personal EHS Case Study - public 2014.pdf

Dear Hon. Ian Macfarlane, an association member sent me your reply to her concerns on smart meter emissions and health issues that she is reporting that only developed after a smart meter was installed. Although it is refreshing to see that your response was unlike the typical template responses from Government ministers, it is however disappointing to see the Government again showing a lack of care and understanding on the real issue relating to smart meter emissions. Before I explain why our RF Standards are not fit for purpose for providing the general public long term health assurances to chronic microwave RF exposures I would like to introduce myself and why I have an interest in this case and many other cases of people who have contacted me with EHS.

My name is s 47F [redacted] and I am self-diagnosed as being Electo Hypersensitive (EHS). I hold a s 47F [redacted], most recently as an Enterprise Architect and have been working in environments, and on technology, that incorporate wireless Radio Frequency (RF) technology.

I am also a victim of the Victorian Government's reckless and controversial objective to implement an Advanced Metering Infrastructure (AMI), which uses wireless smart meters, on every Victorian's home and small business. My sensitivity to other wireless transmitters in the wider community such as mobile phone towers and free public WiFi has also dramatically increased. I was not born with this sensitivity but it has developed as a result of prolonged exposure to various forms of electromagnetic radiation. I have also recently moved to Queensland to escape the torment that I experienced in Victoria from my neighbours smart meters, and yes, my health has improved – nocebo effect? – no chance.

I have discovered through my own personal experiences that there is a significant lack of awareness of EHS and it's causes held by the general public, government officials, medical and the scientific fraternities. It was for this very reason I decided to write my own personal case study to shed some light on this misunderstood and often misdiagnosed health impairment which is attached to this email.

It has also been shown in a Victorian medical report entitled "SELF-REPORTING OF SYMPTOM DEVELOPMENT FROM EXPOSURE TO WIRELESS SMART METERS' RADIOFREQUENCY FIELDS IN VICTORIA, AUSTRALIA - A CASE SERIES" that smart meters appear to be causing people who were not previously sensitive to RF frequencies to become EHS. Additionally, people who were previously self-diagnosed as being EHS found their condition was made dramatically worse. I would suggest you take the time to read this distressing story of a mother whose health has been stolen because of the non-consensual installation of a smart meter on her property http://stopsmartmeters.com.au/2014/03/26/sofias-story-punitive-power-and-the-smart-meter-tyranny/ along with this associated video https://www.youtube.com/watch?v=QVtEkwkk8Ec as an example.

You mentioned that the Victorian Government is proposing to commission a new technical study to confirm whether electromagnetic emissions continue to fall well with in the national health and safety standards. Unless there is an honest appraisal and investigation of the claims of ill health that only occurred after smart meters were installed, another study that validates emissions against a questionable RF Standard is meaningless and a waste of tax payers money. It will also demonstrate the Government's lack of commitment to solving this alarming problem and what appears to be its intention to sweep it under the carpet like many other government misadventures in the past.

ICNRP, who maintains guidelines for limiting exposure that Australia's RF Standard was based on, says:
"*The criteria applied in the course of the review were designed to evaluate the credibility of the various reported findings (Repacholi and Stolwijk 1991; Repacholi and Cardis 1997);* ***only established effects were used as the basis for the proposed exposure restrictions***."

Because scientists are unable to fully explain how non-thermal effects with potential health implications are occurring they have been disregarded when developing the exposure restrictions. This of course does not mean such effects do not exist.

"*Induction of cancer from long-term EMF exposure was not considered to be established, and* ***so these guidelines are based on short-term, immediate health effects*** *such as stimulation of peripheral nerves and muscles, shocks and burns caused by touching conducting objects, and elevated tissue temperatures resulting from absorption of energy during exposure to EMF*."

ICNIRP have clearly indicated that the RF guidelines have been established to protect against short term, immediate health effects caused by tissue heating. There has been no long term health studies conducted and non thermal affects are not fully considered. We are all full body exposed to many forms of man-made RF sources daily whether we like it or not and it is only going to get worse. Microwaves do not recognise property boundaries and are capable of easily penetrating most living spaces. Many scientific studies including the Danish Cohort Study and the Interphone study have not taken this ubiquitous irradiation into account. There are several instances where people who use different wireless devices (such as cordless phones and Wi-Fi) being clumped into the control pool (epidemiological studies) and so this masks or underestimates the potential risks.
Another significant limitation of the ICNIRP guidelines is that they do not acknowledge non-linear effects which have been demonstrated by scientist like Dr Leif Salford, nor issues of chronic exposure, nor complex frequency and modulation effects and so they are all ignored. All of these are features of modern digital microwave communications and have been shown by independent researchers to have biological effects with the potential to cause health problems including cancer.

The World Health Organisation (WHO) also has the following to say about current ICNIRP RF "Guidelines" on which many international countries have adopted their RF Standard not just Australia.

"What guidelines cannot account for...
…Guidelines are set for the average population and cannot directly address the requirements of a minority of potentially more sensitive people. Air pollution guidelines, for example, are not based

on the special needs of asthmatics. Similarly, electromagnetic field guidelines are not designed to protect people from interference with implanted medical electronic devices such as heart pacemakers. Instead, advice about exposure situations to be avoided should be sought from the manufacturers and from the clinician implanting the device." Source: http://www.who.int/peh-emf/about/WhatisEMF/en/index4.html

So what we have here is a justification to ignore people who are sensitive (which includes children and elderly) and gives the green light for mankind to continue along a path that causes significant health problems to a minority of people. What is uncertain is the real amount of people who may be affected because they are unable to identify the cause of their health issues. Unfortunately this is termed as "progress". **I prefer to call it discrimination and unjustified**. No options are provided by Governments for people who are suffering, even when WHO admits "EHS can be a disabling problem for the affected individual." At least with air pollution people can elect to stay indoors and wear masks. What can people with EHS do? ICNRIP, WHO and ARPANSA provide no clear recommendations for avoiding or reducing exposures to these non-consensual sources of pulsed radio frequencies.

Senior scientists in Australia, who work for the Australian Radiation Protection and Nuclear Safety Agency (APRANSA), like their international counterparts, admit that there are gaps in their knowledge. These gaps in knowledge, calculations of SAR against an averaged 6 minute exposure and exclusion of many non thermal effects from the RF Standard seriously brings into question the value the RF standard has as a long term protective measure for the general public. Why we do not enact the precautionary principle especially when one considers the IARC announcement in 2011 that RF is a possible carcinogen is baffling? There has been no research performed since that date that seriously contests this finding otherwise we would see a downgrading by the IARC of this classification. Instead, we have Dr Lennart Hardell, one of the scientists whose research was a key contributor to the classification of microwaves as a Group 2B Possible Carcinogen, releasing further studies since this announcement that re-affirms his original findings. When posing this question to ARPANSA they are silent on the issue.

When querying the RF Standard's position on non thermal effects, ARPANSA responds with a template response that usually incorporates the following text which has been recycled for many years:
"The weight of national and international scientific opinion is that there is no substantiated evidence that exposure to low level RF EME causes adverse health effects. However the possibility of harm cannot be ruled out." Of course they can continue getting away with making this indefensible statement because they are not willing to investigate those who claim to be affected. Such irresponsible behaviour is repugnant and demonstrates a complete absence of responsibility and duty of care to the public. It is obvious in my eyes that there is no desire to uncover the truth because of the potential legal implications to governments and the industry around the world. Trillions$ are at stake and sadly as has been shown countless times before in our chequered history, making money is a higher priority than the health and welfare of people. We are expendable and those who are EHS are collateral damage in the name of technological progress.

I would like to conclude that if the Government, or ARPANSA, are so confident in the high level of protection offered by our RF Standards they should not be afraid to investigate this issue transparently or honestly. Instead those who raise questions such as myself to the various

government departments and officials such yourself are fobbed off with statements that hide behind an RF Standard that is not all inclusive. I have an EHS register that has close to 200 people registered (mostly Victorians) that challenges the prevailing view that a high level of protection is offered. So I lay down a challenge to you and ARPANSA – demonstrate the necessary duty of care and investigate this issue. Hide behind political smoke screens and we will call you out.

"Science is a process of inquiry, not a static body of fact and law. If "scientists" are rejecting out of hand people's self-reported 'smart' meter induced symptoms as "anecdotal" or somehow "not objective" they are introducing a bias that is protective of the status quo, one that uses ridicule and doubt as tools to perpetuate itself. Such a rejection without inquiry of thousands of reports of health problems from 'smart' meters represents not just misguided science but a sociopathic recklessness." – Joshua Hart

Best Regards,

s 47F [redacted]

Irrelevant

[redacted]

From: s 47F [redacted]
Sent: Thursday, 12 June 2014 4:54 PM
To:
Cc: Stephen Solomon <Stephen.Solomon@arpansa.gov.au>; Rick Tinker <Rick.Tinker@arpansa.gov.au>; Carl-Magnus Larsson <Carl-Magnus.Larsson@arpansa.gov.au> malcolm.turnbull.mp@aph.gov.au; eme.consultation@acma.gov.au
Subject: RE: Agenda Item for inclusion at next EMERG meeting in May 2014 [SEC=UNCLASSIFIED]

Dear Dr Karipidis, please find my response to your statements below in the attached "Dr Karipidis response" along with 2 other documents, "My Personal EHS Case Study" which was shared previously with your CEO in hard copy format at the RMIT science forum late last year and a document called "Black on White" that documents EHS cases in Sweden. Unlike Australia, Sweden recognises EHS as a health impairment.

In Summary:

It is ARPANSA's remit to set standards that are inclusive and protective to the entire community. ARPANSA is not doing this presently.
ICNIRP and the WHO have made it clear that the ICNIRP guidelines do not address the requirements of a minority of potentially more sensitive people and that this is the responsibility of the relevant authorities in each country.

The vulnerable members of the public remain at risk.
A wait and see approach is repugnant and unethical considering the vulnerability of those most susceptible to NIR effects.
Radiowave/Microwave sickness, which includes serious documented health effects from exposure to RF fields, has been known and acknowledged for more than 50 years.
Financial reasons for inaction to protect public health are unethical and would certainly raise public concern regarding ARPANSA's motives and priorities.

I do sincerely hope that ARPANSA will answers the questions in my response document this time around.

Best Regards,
s 47F
[redacted]

From: Ken Karipidis [mailto:Ken.Karipidis@arpansa.gov.au]
Sent: Tuesday, 27 May 2014 5:47 PM
To: s 47F [redacted]
Cc: Stephen Solomon; Rick Tinker
Subject: RE: Agenda Item for inclusion at next EMERG meeting in May 2014 [SEC=UNCLASSIFIED]

Dear s 47F [redacted]

As indicated in our last response the EMERG meeting focused on precaution and future updates of the ARPANSA Radiofrequency Standard. Although your question on "how is ARPANSA protecting, or does it intend to protect, sensitive or vulnerable members of the public?" was not considered as a separate agenda item it was considered as part of the general discussion on the RF Standard and precaution.

The ARPANSA Standard is based on sound science and provides people of all ages and health status a high level of protection against all the known health effects of RF fields.

There is currently a level of concern about RF exposure, which is not fully alleviated by existing scientific data. In response to such concerns, and given some uncertainties that still exist in some areas of scientific knowledge, a precautionary approach is generally recommended by the World Health Organization and other health authorities including ARPANSA. A basic requirement is that precautionary measures should not undermine the credibility of scientific assessments of risk and science-based exposure limits. ARPANSA is currently mapping out a process for updating the RF Standard to take account of increased knowledge and to better harmonise with international guidance

The ARPANSA RF Standard contains elements of precaution to account for uncertainties in the scientific knowledge including safety factors and a requirement of minimising exposure for the general public. ARPANSA is planning a clear whole-of-Government policy on the precautionary approach for application by the community on exposure to RF fields.

ARPANSA appreciates that the uncertainty over the possibility of health effects from RF exposure is a source of considerable concern to some members of the Australian public and continues to monitor the research and make appropriate recommendations to ensure an appropriate level of protection.

Kind regards

Dr Ken Karipidis
Scientist
Assessment and Advice Section
Radiation Health Services Branch

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From: [redacted]
Sent: Thursday, 22 May 2014 11:38 AM
To: Ken Karipidis
Cc: Stephen Solomon; Rick Tinker
Subject: RE: Agenda Item for inclusion at next EMERG meeting in May 2014 [SEC=UNCLASSIFIED]

Dear Dr Karipidis, Can you confirm whether I can expect a formal response from ARPANSA to my original request below? I understand that the issue was not covered at the EMERG group as promised which I must say is very disappointing.

Also, I do plan to reply to the email you sent me a month or so ago covering epidemiology – It is clear by your response that you feel I do not understand what the science of epidemiology is about hence providing a link to its definition. I would like to inform you I am very much aware of what it is – I suspect my writing on this topic could have been written better or perhaps you have misunderstood what I am trying to say.

Best Regards,
s 47F [redacted]

From: s 47F [redacted]
Sent: Friday, 9 May 2014 11:12 AM
To: 'Ken Karipidis'

Cc: 'Stephen Solomon'; 'Rick Tinker'; EMR Australia PL (contact@emraustralia.com.au)
Subject: RE: Agenda Item for inclusion at next EMERG meeting in May 2014 [SEC=UNCLASSIFIED]

Dear Dr Karipidis, the best precautionary measure obviously is avoidance so I would appreciate that when ARPANSA covers the topic of precaution in the next meeting that it also takes the opportunity to offer advice on how to minimise exposure to non-consensual sources of Radiofrequencies such as smart meters, both free and subscription based Wi-Fi in public places and transportation, as well as mobile phone towers that are located in very close proximate to residential areas.

Best Regards,
s 47F

From: Ken Karipidis [mailto:Ken.Karipidis@arpansa.gov.au]
Sent: Thursday, 8 May 2014 4:53 PM
To: s 47F
Cc: Stephen Solomon; Rick Tinker
Subject: RE: Agenda Item for inclusion at next EMERG meeting in May 2014 [SEC=UNCLASSIFIED]

Dear s 47F

Thank you for your interest in the forthcoming EMERG meeting.

The meeting will have a strong focus on precaution and future updates of the ARPANSA Radiofrequency Standard. We will consider your issues not as a separate agenda item but as part of the general discussion on precaution.

Kind regards

Dr Ken Karipidis
Scientist
Non-Ionising Radiation Section
Radiation Health Services Branch

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From: s 47F
Sent: Tuesday, 29 April 2014 4:28 PM
To: Ken Karipidis
Cc: 'EMR Australia PL'; $ARPANSA Parliamentary Correspondence
Subject: Agenda Item for inclusion at next EMERG meeting in May 2014

To: Dr Karipidis, the Secretary of The Electromagnetic Energy Reference Group

(EMERG)
cc s 47F [redacted]

Dear Dr Karipidis, I would like to respectfully request that you please include the following item to the meeting agenda for discussion with attendees at the forthcoming EMERG group meeting in May.

I have, as part of my ongoing research, uncovered some interesting statements made by International bodies, ICNIRP and WHO, with respect to RF Guidelines (upon which the ARPANSA RF Standard is based) and what they do and do not cover. The 2002 ICNIRP statement (attached) was published in April 2002 and documents the following key points:

"Nature of health effects" (p 541)
"Exposure to NIR may cause different biological effects, with a variety of consequences for a human being. Biological effects may be without any known adverse or beneficial consequences, other effects may result in pathological conditions (diseases), while still other biological effects have beneficial consequences for a person. Annoyance or discomfort may not be pathological per se but, if substantiated, can affect the physical and mental wellbeing of a person and the resultant effect should be considered as a potential health hazard."

"People being protected" (p 545)
"Different groups in a population may have differences in their ability to tolerate a particular NIR exposure. For example, children, the elderly, and some chronically ill people might have a lower tolerance for one or more forms of NIR exposure than the rest of the population. Under such circumstances, it may be useful or necessary to develop separate guideline levels for different groups within the general population…"
"Some guidelines may still not provide adequate protection for certain sensitive individuals nor for normal individuals exposed concomitantly to other agents, which may exacerbate the effect of the NIR exposure, an example being individuals with photosensitivity. Where such situations have been identified, appropriate specific advice should be developed…."
"ICNIRP distinguishes occupational and public exposures in general terms. When applying the guidelines to specific situations, it is ICNIRP's opinion that the relevant authorities in each country should decide on whether occupational or general public guideline levels are to be applied…."
"Environmental conditions may also influence the effect of whole-body exposure to optical or RF radiation. Seriously ill patients might be considered as more vulnerable when exposed to NIR, but ICNIRP guidelines do not consider these potential vulnerabilities…."

WHO also has the following statement on RF Guidelines.
"What guidelines cannot account for..."
"…Guidelines are set for the average population and cannot directly address the requirements of a minority of potentially more sensitive people…" Source:

http://www.who.int/peh-emf/about/WhatisEMF/en/index4.html

Question: How is ARPANSA protecting, or does it intend to protect, sensitive or vulnerable members of the public?

Yours gratefully,

s 47F [redacted]

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<A personal EHS Case Study - public 2014.pdf>

<blackonwhite-complete-book.pdf>

Australian Government

Australian Radiation Protection and Nuclear Safety Agency

Z14002048

2 July 2014

s 47F [redacted]

I refer to your email of 12 June 2014 enclosing your comments on electromagnetic hypersensitivity (EHS) and your questions on how ARPANSA is protecting vulnerable members of the community.

As previously advised, the EMERG meeting discussion of 14 May 2014 focused on the precautionary approach and future updates of the ARPANSA Radiofrequency Standard. There was a round table discussion on both of these issues and every member was given the opportunity to express their view. It was indicated at the meeting that ARPANSA will develop, over the next 12 months, a clear whole-of-Government policy on the precautionary approach for application by the community on exposure to RF fields. It was indicated that ARPANSA will engage government and other stakeholders including EMERG to develop this policy and guidance. A summary of the meeting will be published on the ARPANSA website.

In relation to comments on EHS. I have sought advice from Sweden on whether Sweden recognises EHS as a health impairment. On the basis of information provided, electromagnetic hypersensitivity is not a recognised medical diagnosis in Sweden. Sweden has in place some compensation for "perceived functional impairment" in recognition of related symptoms and their effect on well-being and function. However Swedish health authorities in line with the World Health Organization (WHO) do not attribute such symptoms to electromagnetic fields per se.

In response to your first two questions in your email:

1. Exposure to radiofrequency (RF) fields is usually dominated by the personal use of RF emitting devices such as mobile and cordless phones. Although there is no established evidence of health effects from using such devices the possibility of harm cannot be completely excluded and for this reason ARPANSA provides advice on ways of reducing exposure from personal devices (see http://www.arpansa.gov.au/RadiationProtection/Factsheets/is_Wireless.cfm). Background exposure to RF fields in the everyday environment is many orders of magnitude lower than the localised exposure from personal devices and is usually dominated by commercial radio and TV broadcasting. Although it is clearly difficult to minimise the already small background RF exposure, the addition of new sources such as smart meters and public access wi-fi, has not generally added much to what was already present from radio and TV broadcasting. ARPANSA recently performed measurements in the environment which showed this and these will be published soon.

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2. As previously advised the ARPANSA RF Standard is based on sound science and provides people of all ages and health status a high level of protection against all the known health effects of RF fields. ARPANSA is currently mapping out a process for updating the RF Standard to take account of increased knowledge and to better harmonise with international guidance. It was also previously indicated that given some uncertainties that still exist in some areas of scientific knowledge, a precautionary approach is generally recommended by ARPANSA and the WHO.

In response to your further eight questions:

1. ARPANSA recognises that for some agents such as certain chemicals and ionising radiation, there are groups within the general public which are more susceptible to health effects than others. The scientific evidence has not established that any groups of people are more susceptible to RF effects than others however that possibility cannot be excluded. In order to compensate for uncertainties in the scientific knowledge, large safety factors are incorporated into the exposure limits of the ARPANSA RF Standard i.e. the limits are set well below the level at which all known adverse health effects occur.

2. The quoted ICNIRP advice applies to certain forms of non-ionising radiation but not others as pointed out by the example on photosensitivity which applies to ultraviolet radiation. As previously advised the ARPANSA RF Standard is based on sound science and provides all individuals a high level of protection against all the known health effects of RF fields.

3. See response to the 2nd question from earlier.

4. The established auditory responses referred to in the ARPANSA Standard such as the 'microwave hearing effect' occur at levels much higher than the limits of the Standard which are not encountered in the everyday environment by the public. Tinnitus is not an established effect of exposure to RF fields.

5. ARPANSA recognises that there are anecdotal reports into potential health effects of exposure to RF fields claiming of a variety of subjective ill-effects that have been generally termed "electromagnetic hypersensitivity" or EHS. ARPANSA and the WHO are not aware of any EHS symptoms being confirmed as due to RF exposure in well-conducted scientific investigations. ARPANSA recognises that whatever its cause, EHS can be a disabling problem for the affected individual and agrees with the advice provided by WHO that treatment of affected individuals should focus on the health symptoms and the clinical picture, and not on the person's perceived need for reducing or eliminating exposure to RF. The advice by the WHO on EHS is available from http://www.who.int/peh-emf/publications/facts/fs296/en/.

6. ARPANSA is continuing to monitor the research on RF fields including studies performed on EHS individuals. In Australia, the Australian Centre for Electromagnetic Bio-effects Research is currently conducting a study into EHS where it will investigate affected individuals.

7. It is the task of Australian regulators and industry to implement, via codes of practice and guidance, how the precautionary statement in the ARPANSA RF Standard is applied. For example, in the case of mobile phone networks, a precautionary approach is implemented through the Communications Alliance industry code "C564:2011 Mobile phone base station deployment" (http://www.commsalliance.com.au/__data/assets/pdf_file/0018/32634/C564_2011.pdf). The code requires network operators to consult with the local community and to adopt a precautionary approach in planning, installing and operating mobile phone infrastructure.

8. As mentioned earlier, background exposure to RF fields is very low and mainly dominated by radio and TV broadcasting. Nevertheless the application of the precautionary minimisation requirement in the ARPANSA standard could see good engineering principles applied to RF installations that reduce the exposure further.

ARPANSA shares your concern for the health and wellbeing of Australians, even if we may not always agree on causes and effects. ARPANSA has considered your arguments, and while there is enough information and public concern to remind us to be alert to the possibility of health effects, our advice must be based on our objective assessment of all the scientific evidence. Accordingly, ARPANSA staff will continue to read any submissions you make, and may respond if appropriate, however if questions or issues are raised that have already been addressed, a formal response may not be sent.

Yours sincerely

Professor Peter Johnston
Acting CEO of ARPANSA

Irrelevant

[redacted]

From: [redacted]
Sent: Thursday, 12 March 2015 2:17 PM
To: Stephen Solomon; nhc@nhmrc.gov.au
Cc: Carl-Magnus Larsson; Rick Tinker; Ken Karipidis; rcroft@uow.edu.au; awood@swin.edu.au; senator.ludlam@aph.gov.au; andrew.wilkie.mp@aph.gov.au; chris.baggoley@health.gov.au; luke.howarth.mp@aph.gov.au; chanm@who.int; emfproject@who.int
Subject: Radiofrequencies, Health and Research

Dear Dr Solomon,

I recently received a response from ARPANSA's Acting CEO, Professor Peter Johnston (2nd February 2015, reference Z14003471) to an open letter I wrote to the WHO, ICNIRP and ARPANSA last December. Professor Johnston did not attempt to address my concerns directly, instead indicated that I should raise my questions in an appropriate technical forum such as the EMERG group. It is my opinion, given the number and breadth of issues that I raised in my letter, that it is not a practical solution unless the whole day is reserved for me to table and discuss them all; this could be seen as unfair for the other EMERG members who may have their own questions and contributions. Another possible solution is to convene a separate meeting with some of the experts on a day adjoining the next planned EMERG meeting in May. I am not sure whether this is an option that ARPANSA is amenable to?

There is another reason for writing to you and relates to some very recent research that has been made publically available. I seek ARPANSA's views in relation to research findings that I cover in three separate topics below. I would like to understand whether ARPANSA will reconsider its view that Australia's RF standard provides a "high level of protection to all people of all health statuses" and whether ARPANSA is prepared to acknowledge that radiofrequencies do have potential health consequences that are not limited to thermal action only? I expect you will respond that more research is required and I certainly won't disagree but unfortunately very little research with a health focus is being performed by researchers in Australia that covers these important topics.

A) 3G/UMTS microwave exposure is a co-carcinogen

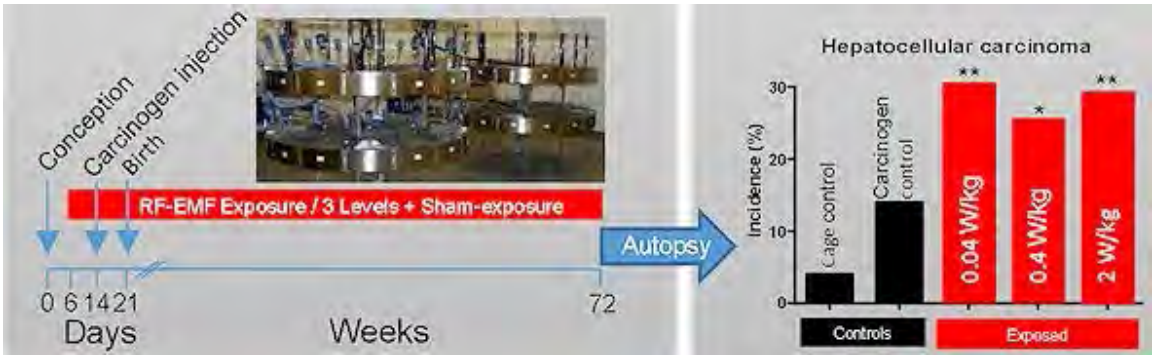
The study that I have linked below clearly shows that long-term 3G/UMTS microwave exposure can act as a co-carcinogen and statistically significantly increase cancer growth at very low exposure levels, at least 50-fold below currently permitted levels. The study author, Dr Lerchl has in the past been outspoken in his belief that current science had shown that low levels of microwave RF exposure could not be carcinogenic, so this publication which shows the opposite is to his credit.

> Dr Lerchl has indicated in the study that "*Previously published results from a pilot study with carcinogen-treated mice, however, suggested tumor-promoting effects of RF-EMF (Tillmannet al, 2010). We have performed a replication study using higher numbers of animals per group and including two additional exposure levels (0 (sham), 0.04, 0.4 and 2 W/kg SAR)... Numbers of tumors of the lungs and livers in exposed animals were significantly higher than in sham-exposed controls. In addition, lymphomas were also found to be significantly elevated by exposure. A clear dose-response effect is absent. We hypothesize that these tumor promoting effects may be caused by metabolic changes due to exposure*."
> "*Our study confirms and extends the previously published observations of tumor-promoting effects of life-long RF-EMF exposure... Since many of the tumor-promoting effects in our study were seen at low to moderate exposure levels (0.04 and 0.4 W/kg SAR), thus well below exposure limits for the users of mobile phones*."
> "*The fact that both studies found basically the same tumor-promoting effects at levels below the accepted (and in most countries legally defined) exposure limits for humans is worrying. Although animal experiments are generally not easily transferable to the situation in humans, the findings are a very clear indication that - in principal - tumor-promoting effects of life-long RF-EMF exposure may occur at levels supposedly too low to cause thermal effects*."

The publication discussed above can be found here http://www.sciencedirect.com/*science*/article/pii/S0006291X15003988. The study it replicated can be found here http://www.ncbi.nlm.nih.gov/pubmed/20545575.

It is my belief that these 2 studies should satisfy ARPANSA's requirement for substantiated and established evidence as:

1) Both studies were peer reviewed
2) The second study is a replication of previously published results, with regards to the test protocol and the test outcomes, and provides a very clear indication that mobile phone emissions can act as a co-carcinogen.



Lerchl's team have replicated this study with higher numbers of mice per group in order to clarify whether the previously reported results could be confirmed. In addition, two additional SAR levels of exposure (low and high) were included to investigate a possible dose-response relationships. I do appreciate that rats are not humans but there is nothing to suggest that humans cannot also experience similar effects especially when we know fundamental biological/cellular processes in each are similar.

What the researchers have found are co-carcinogenic promotional effects at all levels of UMTS RF/microwave exposure. In fact, the lowest level of exposure shows the highest, statistically significant, promotional effect. **Keep in mind that everyone using a 3G mobile phone or iPad or other tablet will be exposed to higher levels than this (0.04 W/kg).** The graphs also show that a clear linear dose response effect is absent which correlates with research findings – "*Experiments have shown that, the absorption of a larger amount of energy by the same mass of a given tissue and within the same time-interval, does not necessarily induce a larger biological effect. In other words, a more intense field or larger* SAR *does not necessarily relate to a larger biological response or consequent health effect*." (Panagopoulos D. et. al. 2013)

We also have at least 3 peer reviewed epidemiological studies (ARPANSA is aware of them – Interphone, Hardell and CERENAT) demonstrating heavy usage of mobile phones that leads to an increased risk of brain tumour such as Glioma.

Taking into account the conclusions of the aforementioned studies in conjunction with the findings of the recent study below and the picture becomes much clearer:

> **Long term and excessive use of 900 MHz radiofrequency radiation alter microRNA expression in brain.**
> Int J Radiat Biol. 2015 Jan 27:1-6.
> **Abstract**
>
> *Purpose: We still do not have any information on the interaction between radiofrequency radiation (RF) and miRNA, which play paramount role in growth, differentiation, proliferation and cell death by suppressing one or more target genes. The purpose of this study was to bridge this gap by investigating effects of long-term 900 MHz mobile phone exposure on some of the miRNA in brain tissue. Materials and methods: The study was carried out on 14 Wistar Albino adult male rats by dividing them into two groups: Sham (n = 7) and exposure (n = 7). Rats in the exposure group were exposed to 900 MHz RF radiation for 3 h per day (7 days a week) for 12 months (one year). The same procedure was applied to the rats in the sham group except the generator was turned off. Immediately after the last exposure, rats were sacrificed and their brains were removed. rno-miR-9-5p, rno-miR-29a-3p, rno-miR-106b-5p, rno-miR-107 and rno-miR-125a-3p in brain were investigated in detail. Results: Results revealed that long-term exposure of 900 MHz RF radiation only decreased rno-miR107 (adjP* = 0.045) value where the whole body (rms) SAR value was 0.0369 W/kg. However, our results indicated that other microRNA evaluated in this study was not altered by 900 MHz RF radiation. Conclusion: 900 MHz RF radiation can alter some of the miRNA, which, in turn, may lead to adverse effects.*
> http://www.ncbi.nlm.nih.gov/pubmed/25529971?dopt=Abstract

When one looks at what the implications are for down regulation of miR107 here http://atlasgeneticsoncology.org/Genes/GC_MIR107.html we find it gives cancers more opportunities to develop. Also Alzheimer's features too i.e. miR107 regulates tumour invasion and metastasis. Expression of miR-107 decreases early in Alzheimer's disease and may accelerate

disease progression through regulation of beta-site amyloid precursor protein-cleaving enzyme 1 (Wang et al., 2008).

B) A potential study that could possibly explain subjective symptoms associated with Electromagnetic Hypersensitivity (EHS)

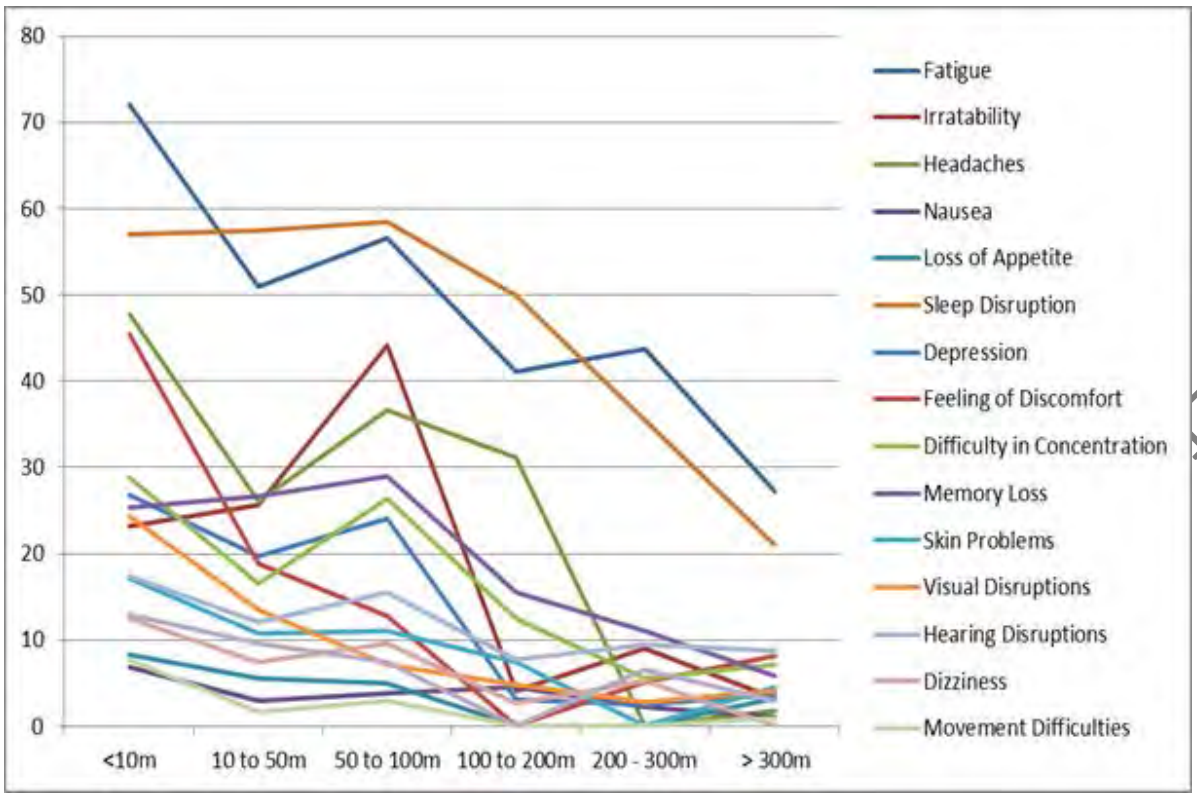
Effect of Short-term 900 MHz low level electromagnetic radiation exposure on blood serotonin and glutamate levels.

Ten male Wistar Albino rats were anesthetized 30 min before the Long term exposure to low level electromagnetic radiation (LLER) exposure, 0.5 ml blood was taken from the tail vein of rats in order to determine control values. It was found that a single 45 min of LLER exposure increased the blood 5-HT level significantly, but did not change the glutamate level of rats. Increased 5-HT level may lead to a retarded learning and a deficit in spatial memory.

Source: http://www.ncbi.nlm.nih.gov/pubmed/25665475 along with this earlier study http://www.ncbi.nlm.nih.gov/pubmed/15143927 (2004) demonstrates that radiofrequencies can raise blood serotonin levels. One study relates to rats and the other relates to a human so we are seeing similar biological effects occurring across greatly differing biological species. It is important to understand that if "non-thermal effects" are *not properly equilibrated by the organism's immune and other compensatory systems, they may very well result in health effects … Even though some scientists still express scepticism regarding the existence of non-thermal effects there is already a large and constantly increasing number of studies indicating that environmental man-made EMFs can produce severe biological alterations such as DNA damage without heating the biological tissue. This can take place through non-thermal mechanisms that involve direct changes in intracellular ionic concentrations or changes in enzymatic activity*" (Panagopoulos D. et. al. 2013)

What effect does elevated serotonin have on the body? What I found is illuminating and may explain possible causative features experienced by many EHS sufferers…. Of course I do acknowledge that other factors can cause similar effects. I will present further details of my findings from a medical and biological perspective in the next EMERG meeting where you indicated previously that I will be given an opportunity to speak on EHS.

Serotonin is an amine neurotransmitter which is found in the intestinal wall, the blood vessels, platelets, and the central nervous system. It appears to control appetite, sleep, memory, learning, temperature regulation, mood, behaviour, cardiovascular function, muscle contraction, endocrine regulation, depression, platelet homeostasis, motility of the GI tract, and carcinoid tumour secretion in conjunction with other neurotransmitters. Excessive serotonin can accumulate resulting in serotonin syndrome which has been linked to sleep problems (insomnia), nausea, dizziness, agitation, headaches, memory issues and mood changes. Most EHS people experience many of these issues. This possibility/link certainly challenges the prevailing attitude of some scientists that EHS is not related to EMR exposure or is likely to be psychological in origin.



Y Axis - % occurrence of symptom, X Axis – Distance from Transmitter

We are told subjective symptoms have not been associated with EMR exposure yet the graph above which was created from data taken from the study entitled "**Investigation on the health of people living near mobile telephone relay stations: Incidence according to distance and sex**" (Santini R. et al. 2002) show the symptoms occurrence correlate with distance from tower (closer to the tower the symptom occurrences are more pronounced) which would not be expected if EMR was not the cause.

If EHS was purely psychological as some of the ICNIRP workshop presenters were suggesting, it would mean that approximately 37,000,000 Europeans, 16,000,000 Americans and more than 900,000 Australians are suffering from "some kind of mutual mental disorder or illusion".

It is also my intention to provide scientific evidence at the next EMERG meeting that will demonstrate your organisation's claim "*that a large number of scientific studies provide evidence that EMF exposure is not correlated with the symptoms reported by EHS sufferers*" is misleading and that a significant number of studies actually do show a correlation – It is unclear why these studies that show a positive association between exposure and symptom development appear to be overlooked by ARPANSA and I daresay the WHO.

If we were really serious about investigating this issue we would conduct studies using scientists with medical and biological backgrounds rather than just psychologists and/or electrical engineers.

C) Smart Meters and documented subjective symptoms that may lead to serious health effects if sustained

I have attached a short paper written by Dr Ronald M. Powell, Ph.D that discusses two bar graphs of subjective symptoms associated with smart meters, one for a survey performed in the USA and one for a peer reviewed case series study performed in Victoria, Australia. Each bar graph shows the

percentage of the respondents who reported experiencing the symptoms shown, after exposure to wireless utility meters (principally Wireless Smart Meters) or to Wireless Smart Meters exclusively, as described in the introduction. Immediately after each bar graph is a single page of additional information written by the person conducting the analysis of the data.

These 2 studies were conducted independently and yet the outcomes are strikingly similar.

I hope that ARPANSA will take note of the three areas of research findings which I have provided, and look forward to ARPANSA's comment on them. I also look forward to your thoughts on how I might best table the issues which I raised in my open letter to WHO, ICNIRP and ARPANSA (10th December 2014).

In light of the many unanswered questions I have raised, it is important that ARPANSA's fact sheet reflects the lack of scientific certainty around the safety of wireless radiation and actively encourages precautions not only to the public but also to government and industry.

Yours sincerely,

s 47F

AUSTRALIAN RADIATION PROTECTION
AND NUCLEAR SAFETY AGENCY

17 MAR 2016

YALLAMBIE OFFICE

s 47F
[redacted]

15 March 2016

Dr Ken Karipidis
Australian Radiation Protection and Nuclear Safety Agency
619 Lower Plenty Road
Yallambie,
Vic. 3085

Dear Dr Karipidis,

Re: Low-level RF exposure limits as covered by the ARPANSA Standard

As a member of the public I am somewhat confused about the differing views expressed by various scientific individuals and bodies as to the effects of mobile phones and similar devices as far as any health effects might be concerned.

Given that there are differences in scientific opinion the issue has created a good deal of controversy. From a layman's perspective it is therefore difficult to make a proper evaluation on the merits and logic of the opposing opinions and arguments regarding which view is right and which may be wrong.

However in attempting to evaluate the opposing scientific views I feel that any conclusions I might arrive at should not depend solely on what might be the weight (consensus) of scientific opinion one way or the other at this relatively early stage in this type of technology. Reflecting on past history might validate my approach in that respect by remembering that at one time the consensus (amongst those considered as scientists-of-the-day) was that the earth was flat and if you went too far you would fall off the edge. Other more recent situations also come to mind where the initial consensus of opinion on certain issues, was later altered quite radically.

In seeking to gain a better understanding of the technical aspects associated with the type of radiofrequency electromagnetic fields involved with mobile phones and similar devices, including the effect of the strength of those fields, I have undertaken a certain amount of personal research utilising various means and reference sources.

However in doing so I have encountered an aspect that requires clarification. In that regard as the particular aspect involves ARPANSA I trust that ARPANSA will be able to assist in clarifying the issue in question.

The aspect requiring clarification involves the ARPANSA Standard (*Maximum Exposure Levels to Radiofrequency Fields – 3 kHz to 300 GHz*) together with a certain statement in ARPANSA's Fact Sheet 13 (*Mobile Telephones and Health*) as opposed to a view espoused by some in the RF industry.

In that regard where devices such as mobile phones, cordless phones, smart meters and baby monitors are concerned various bodies and individuals indicate that the power output of those devices is only low-level RF. Furthermore, in being only low-level RF, that the level of those emissions are therefore well below the maximum exposure limits of the ARPANSA Standard (the Standard). There can be no dispute regarding that position.

However some in the industry appear to maintain that the protection provided by the limits in the Standard in respect of low-level RF apply such as to cover (i.e. protect against) all aspects pertaining to non-thermal effects of a biological nature that might otherwise arise where exposure

was above the particular low-level RF safety limits. Yet ARPANSA's Fact Sheet 13, *Mobile Telephones and Health,* (copy attached) contains certain information that appears to contradict that position.

In that regard page 1 of Fact Sheet 13 contains three paragraphs, which provide details under the heading, - ***Known Effects of RF Exposure.*** Those paragraphs can be summarised as identifying three types and/or levels of RF emissions together with their respective treatment where the ARPANSA Standard is concerned.
Those three particular RF types and/or levels might be suitably described in the following terms:

1. **Thermal effects**:
   This is where the level of RF is capable of causing thermal effects through the heating of biological tissue, which may cause subsequent tissue damage. The level of this RF can be considered in terms of being high-level RF. In considering that situation various RF devices that the public are exposed to must therefore
   be designed to operate in a manner that does not exceed certain levels specified in the APANSA Standard. In determining those particular levels the Fact Sheet indicates that:
   - ***"The exposure limits are set well below levels where any significant heating occurs."***

2. **Non-thermal effects - pulsed RF**
   In referring to ARPANSA's RF levels for pulsed radiation the Fact Sheet states that: ***"The Standard also sets limits for pulsed radiation that are intended to eliminate possible effects where heating is not evident (non-thermal effects)."***

   Given that the Fact Sheet is referring to pulsed radiation of a strength that does not cause heating (i.e. non-thermal) it might reasonably be concluded (for the purpose of this summary) that the pulsed RF being referred to could be considered in terms of being a form of low-level RF.

3. **Non-thermal effects - low-level RF**
   In referring to this RF the Fact Sheet states that: ***"Some research has indicated that non-thermal effects resulting from low-level RF exposure may also occur. However, the existence of these effects and their implications has not been sufficiently established to allow for them in the Standard."***

   Therefore quite clearly – and unambiguously - this statement indicates that the current limits in the ARPANSA Standard **do not** consider certain non-thermal biological effects that might possibly arise from exposure to low-level RF.
   This is the contradiction that I refer to, as far as some in the RF industry appearing to maintain otherwise.

   While the terminology in the above two sentences in Fact Sheet 13 does not specifically mention **biological effects**, the type of *"non-thermal effects"* being referred to are of course **biological effects**.
   This understanding is verified when reference is made to **Annex 4** to the ARPANSA Standard (***"Research into RF Bio-Effects at Low Levels of Exposure"***).

In Annex 4 to the ARPANSA Standard a degree of uncertainty is expressed about the possibility of biological effects due to low-level RF exposure with respect to specific diseases, physiological or psychological responses.
Where health issues are concerned Annex 4's references to: - *"These reported effects ..", - "whether these reported bio-effects are real or artefactual..", - "those effects suggesting statistically significant biological interactions.."* – are indicative of people having experienced various symptoms and/or laboratory experiments where low-level RF exposure has resulted in some sort of change (non-thermal effect) in the subject of the experiment.

It is significant to note that despite uncertainty being expressed Annex 4 states that: - **"While *these low-level effects have not been established they cannot be ruled out ..".***

In further verifying my understanding of ARPANSA's Fact Sheet 13 on the matter, it is relevant to note that Annex 4 likewise confirms that a limit for low-level RF exposure relevant to protection against certain non-thermal biological effects, - **does not presently exist in the ARPANSA Standard**.

Ref. page 95 of the ARPANSA Standard (Annex 4)

"Whether the mechanism is actually thermal or not, or whether these ***reported bio-effects*** *are real or artefactual, those effects suggesting statistically significant* ***biological interactions*** *at SAR levels well below 1 W / kg need to be replicated satisfactorily, particularly if they are suggestive of harm,* ***before they can form the basis of standard setting.***"
(My emphasis in bold.)

Those last few words, ("*...before they can form the basis of standard setting.*") quite clearly indicate that the current limits in the ARPANSA Standard are not specifically relevant for certain non-thermal biological effects that may arise due to exposure to low-level radiofrequency electromagnetic fields.

It is important to appreciate that this aspect should not be confused with any exposure limits that are or might be contained within the Standard regarding protection against non-thermal health effects in connection with low-level **pulsed RF**. That particular aspect being identified in Fact Sheet 13 as a separate form of low-level RF involving possible non-thermal effects.

Your response to the following queries would greatly assist in clarifying the situation. In order to eliminate any possibility of misunderstanding I have separately set out the issues as itemised below.

---

1. ARPANSA Fact Sheet 13 (copy enclosed) on page 1, under the heading *Known Effects of RF Exposure*, refers to pulsed radiation where heating is not evident, and then separately, to non-thermal effects resulting from low-level RF exposure.
   With respect to the latter the Fact Sheet states, - ***"Some research has indicated that non-thermal effects resulting from low-level RF exposure may also occur. However, the existence of these effects and their implications has not been sufficiently established to allow for them in the Standard. "***

   The non-thermal effects that the sentences quoted immediately above refer to are biological effects, which reference to Annex 4 to the ARPANSA Standard confirms is the case.

   Question
   - **Is it therefore correct, as Fact Sheet 13 suggests, that the current exposure limits in the ARPANSA Standard does not cover (*"allow for"*) non-thermal effects of a biological nature that might arise from exposure to low-level RF ?**
     (Please Note: This question does not refer to, and should not be confused with, any exposure limits that are, or may be, in the ARPANSA Standard that relate to pulsed radiation non-thermal effects.)

---

2. If the ARPANSA Standard does in fact cover (*"allow for"*) non-thermal effects of a biological nature which might arise from exposure to low-level RF as distinct from other limits in the Standard protecting against possible non-thermal effects from low-level pulsed radiation :
   Question
   - **(a) Does that mean that the ARPANSA Fact Sheet 13 is incorrect by indicating otherwise?**

   - **(b) Does that mean that the statement at the end of the second paragraph on page 95 of the ARPANSA Standard in the Appendix 4 section, as quoted below, is incorrect?**

Ref. *"Whether the mechanism is actually thermal or not, or whether these reported **bio-effects** are real or artefactual, those effects suggesting statistically significant **biological interactions** at SAR levels well below 1 W / kg need to be replicated satisfactorily particularly if they are suggestive of harm, **before they can form the basis of standard setting.**"*
(My emphasis in bold.)

---

3. If, as distinct from exposure limits for pulsed radiation non-thermal effects, the RF exposure limits in the ARPANSA Standard does in fact cover (*"allow for"*) non-thermal effects of a biological nature which might arise from exposure to low-level RF: -
Question
- (a) What are those exposure limits?

- (b) Where exactly in the ARPANSA Standard are those limits specified?

- (c) How do those particular exposure limits differ from the limits applying for pulsed RF that are intended to eliminate possible non-thermal effects?

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4. When referring to the effects of **pulsed** radiation page 1 of ARPANSA's Fact Sheet 13 indicates that the Standard's limits have been set to eliminate possible non-thermal effects.
Question
- (a) With respect to pulsed radiation, - what are the particular type of possible non-thermal effects that the Standard's exposure limits protect against?

- (b) Exactly where in the ARPANSA Standard (*Maximum Exposure Levels to Radiofrequency Fields – 3 kHz to 300 GHz*) are the maximum exposure limits for pulsed radiation, which protect against non-thermal effects?

As the statutory body that exists to protect the Australian public in matters concerning radiofrequency emissions I trust that you are able to assist in clarifying the above queries and look forward to receiving your response in due course.

Regards

s 47F [redacted]

Australian Government
Australian Radiation Protection and Nuclear Safety Agency

Fact Sheet 13

Mobile Telephones and Health Effects

There is no clear evidence in the existing scientific literature that the use of mobile telephones poses a long-term public health hazard (although the possibility of a small risk cannot be ruled out).

Introduction

Hand held mobile telephones have transformed the telecommunications industry. These devices can be used to make telephone calls from almost anywhere. Communication between a mobile phone and the nearest base station is achieved by radiofrequency (RF) electromagnetic fields.

Basis of Health Concerns

Concerns have been raised about the level of RF emissions to which the brain is being exposed when using a mobile phone having potential health consequences, particularly brain cancer. In response, a major project, INTERPHONE, has been organised. The INTERPHONE project is a multi-national series of epidemiological studies testing whether using mobile phones increases the risk of various cancers in the head and neck. The project comprises national studies from 13 different countries, which are coordinated by the International Agency for Research on Cancer (IARC), an agency of the World Health Organization (WHO). A pooled analysis of all the brain tumour results has suggested no overall risk for moderate mobile phone use by adults for up to 10 years. Pooled analyses of all the brain tumour and acoustic neuroma results have suggested no overall risk for moderate mobile phone use by adults for up to 10 years. The pooled analyses suggested the possibility of an increased risk of glioma and acoustic neuroma in the group representing individuals with the highest cumulative call time. However, limitations of the methodology prevent conclusions of causality being drawn from these observations. The pooled analyses also pointed out that the possible effects of long-term heavy use of mobile phones require further investigation. Further information on the project is available from the IARC website at **www.iarc.fr/en/research-groups/RAD/RCAd.html**.

In 2011 IARC reviewed all the available evidence in relation to RF fields and cancer (see **www.iarc.fr/en/media-centre/pr/2011/pdfs/pr208_E.pdf**). Based on the limited association between wireless phones (mobile and cordless phones) for glioma and acoustic neuroma and inadequate evidence for other types of cancers, IARC classified RF fields as a "possible human carcinogen".

Known Effects of RF Exposure

When biological tissue is exposed to sufficiently high levels of RF exposure, the tissue is heated and damage may occur. The ARPANSA *Radiation Protection Standard Maximum Exposure Levels to Radiofrequency Fields - 3kHz to 300 GHz* is based on the well-established thermal effects of exposure to RF fields. The exposure limits are set well below levels where any significant heating occurs. The Standard also sets limits for pulsed radiation that are intended to eliminate possible effects where heating is not evident (non-thermal effects).

All mobile telephones marketed in Australia must satisfy the regulatory requirements of the Australian Communications and Media Authority (ACMA), as well as that part of the Australian Standard that sets limits on the power output of a mobile telephone. Therefore, use of a mobile telephone is not expected to cause significant heating in any part of the body, including the brain.

Some research has indicated that non-thermal effects resulting from low-level RF exposure may also occur. However, the existence of these effects and their implications has not been sufficiently established to allow for them in the Standard.

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Telephone: +61 3 9433 2211
Fax: +61 3 9432 1835

No Clear Evidence of Cancer

A few animal studies suggest that exposure to weak RF fields can accelerate the development of cancer. Further studies are required to establish their reproducibility and the existence or otherwise of a dose-response relationship. Whether these results are relevant to users of mobile telephones is not clear. In any event, these results cannot be dismissed at this stage.

The results from epidemiological studies are often difficult to interpret because exposure levels were either not measured or impossible to determine from the data provided. In general, however, this type of study will be useful in identifying possible links between mobile telephone use and cancer risk. Complementary cellular and animal research is required to establish any cause-and-effect relationship and the biological mechanisms involved.

ARPANSA continues to closely monitor the research being conducted in this area.

On the specific issue of brain cancer occurring in users of these telephones, it is important to note that such cancers existed before the introduction of mobile telephones. It is simply not possible to identify the cause of any single case of cancer. Long-term studies to investigate whether mobile telephone users have a greater incidence of, say, brain cancer than the general population have not been completed.

A WHO fact sheet on mobile telephones (see **www.who.int/mediacentre/factsheets/fs193/en/index.html**) states "While an increased risk of brain tumors is not established, the increasing use of mobile phones and the lack of data for mobile phone use over time periods longer than 15 years warrant further research of mobile phone use and brain cancer risk".

Government Research Funding

Commencing in 1996, the Government provides $1 million dollars per annum for the Electromagnetic Energy (EME) Program. This program supports research into and provides information to the public about health issues associated with mobile phones, mobile phone base stations and other communications devices and equipment. The program recognises public concern, and the need to ensure standards and public health policies continue to be based on the best available scientific information.

The EME program is coordinated by the Committee on Electromagnetic Energy Public Health Issues (CEMEPHI), which includes representatives from the Department of Broadband, Communications and the Digital Economy (DBCDE), the Department of Health and Ageing, ARPANSA, the ACMA, and the National Health and Medical Research Council (NHMRC). The program has three elements:

- an Australian research program (managed by the NHMRC) to conduct research into EME issues of relevance to Australia and to complement overseas research activities
- continuing Australian participation in the WHO's International Electromagnetic Field (EMF) Project which assesses the health and environmental effects of EME exposure
- a public information program (managed by ARPANSA) to provide information to the public and the media.

Conclusion

There is no clear evidence in the existing scientific literature that the use of mobile telephones poses a long-term public health hazard (although the possibility of a small risk cannot be ruled out).

Users concerned about the possibility of health effects can minimise their exposure to the RF emissions by: limiting the duration of mobile telephone calls, making calls where reception is good, using a 'hands-free' attachment or speaker options, or by texting. Given the lack of any data relating to children and long term use of mobile phones, and their potentially long life-time use of them, ARPANSA recommends that parents encourage their children to limit their exposure by reducing call time, by making calls where reception is good, by using hands-free devices or speaker options, or by texting.

More information is available from the ARPANSA website www.arpansa.gov.au.

Australian Government
Australian Radiation Protection and Nuclear Safety Agency

25 May 2016

s 47F [redacted]

Dear s 47F [redacted]

I refer to your letter of 15 March 2016 regarding "low-level RF exposure limits as covered by the ARPANSA Standard". We apologise for the late reply to your letter.

Before responding to your individual questions it should be noted that Factsheet 13 on "Mobile Telephones and Health Effects" has been revised. It now has no number and is titled "Mobile phones and Health". The revised fact sheet is available from http://www.arpansa.gov.au/mobilephones/index.cfm and is also attached.

Question 1

The exposure limits in the ARPANSA RF Standard apply to all established effects which at different frequencies include electrostimulation, whole-body and localised heating and the microwave hearing effect. Although effects have been reported at levels below the limits of the Standard (i.e. low level effects) these have not been substantiated. The Standard does not stipulate exposure limits for effects that have not been established.

Question 2

(a) Factsheet 13 has been revised as mentioned earlier. In order to make the fact sheet more accessible to the general population it has been rewritten in a way that avoids information that is too technical for some. For people that want more information we refer them to the actual Standard.

(b) The statement that you refer to is not incorrect.

Question 3

Apart from electrostimulation at low frequencies there are no established non-thermal effects so there are no exposure limits for such effects in the Standard.

Question 4

(a) The microwave hearing effect is related to pulsed fields. Microwave hearing occurs due to thermoelastic expansions caused by pulsed fields so in some ways this is also a thermal effect. Perhaps effects due to pulsed fields should not have been termed non-thermal in Factsheet 13 but at the time the fact sheet was trying to distinguish between direct heating and effects from pulsed fields. As mentioned earlier ARPANSA has revised the fact sheet on mobile phones and health.

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(b) The Basic Restrictions for pulsed fields are provided in Table 3 (page 8) of the Standard.

We hope that your questions have been adequately addressed. If you have any further questions can you please send an enquiry via our online contact form http://www.arpansa.gov.au/AboutUs/feedback.cfm

Yours sincerely

Dr Ken Karipidis
Assistant Director
Assessment and Advice Section
Radiation Health Services Branch

s 47F
[redacted]

3 October 2016

Dr Ken Karipidis
Australian Radiation Protection and Nuclear Safety Agency
619 Lower Plenty Road
Yallambie,
Vic. 3085

Dear Dr Karipidis,

Re: (A) Low-level RF exposure limits as covered by the ARPANSA Standard
(B) Tinnitus / Microwave Hearing Effect

I refer to your letter dated 25 May 2016, which replied to my correspondence of 15 March 2016 (and follow-up copy dated 8 April 2016). Thank you for the details provided in your letter, which indirectly verified the correctness of Fact Sheet 13, (Mobile Telephones and Health Effects) where it stated that; *"Some research has indicated that non-thermal effects resulting from low-level RF exposure may also occur. However, the existence of these effects and their implications has not been sufficiently established to allow for them in the Standard."*

Regarding your suggestion that I utilise ARPANSA's online contact form in forwarding any further enquiries to you I am unfortunately unable to do so at the present time as I do not have personal email or Internet facilities available. In any event the ARPANSA Service Charter (last updated 29 Sept. 2013) indicates that its staff can also be contacted by mail.

Aside from its requests as per part B (Tinnitus / Microwave Hearing Effect) this follow-up correspondence with respect to part A (Low-level RF exposure limits) may be considered as feedback and in some ways also a complaint, as invited by the ARPANSA Service Charter.
My preference would have been to send this correspondence soon after receiving your letter of 25 May 2016 however unforeseen events have unfortunately caused me to delay forwarding it until now.
As an Australia Post registered mail item with delivery confirmation I trust that your nominated mail collection agent Modesta Armenio, ARPANSA Administration Department (or an alternative agent) will fully observe all collection procedures regarding all actions required for delivery confirmation items.

* * * * * * * * * * *

Regarding your comments concerning the revision of Fact Sheet 13 I am amazed that the section headed "Known Effects of RF Exposure"[1], – which included the above referenced information, - has now been entirely deleted from the superseding fact sheet of March 2015. The latter, being re-titled as "Mobile Phones and Health".

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[1] **From Fact Sheet 13** (Mobile Telephones and Health Effects):

"Known Effects of RF Exposure"

"When biological tissue is exposed to sufficiently high levels of RF exposure, the tissue is heated and damage may occur. The ARPANSA *Radiation Protection Standard Maximum Exposure Levels to Radiofrequency Fields – 3kHz to 300 GHz* is based on the well-established thermal effects of exposure to RF fields. The exposure limits are set well below levels where any significant heating occurs. The Standard also sets limits for pulsed radiation that are intended to eliminate possible effects where heating is not evident (non-thermal effects).

All mobile telephones marketed in Australia must satisfy the regulatory requirements of the Australian Communications and Media Authority (ACMA), as well as that part of the Australian Standard that sets limits on the power output of a mobile telephone. Therefore, use of a mobile telephone is not expected to cause significant heating in any part of the body, including the brain.

Some research has indicated that non-thermal effects resulting from low-level RF exposure may also occur. However, the existence of these effects and their implications has not been sufficiently established to allow for them in the Standard."

I am even more astounded at the explanation given for deleting that information, which you indicated was; - *"In order to make the fact sheet more accessible to the general population it has been rewritten in a way that avoids information that is too technical for some. For people that want more information we refer them to the actual Standard."*

In view of the straightforward nature of the deleted section this explanation makes no sense to me whatsoever. The details within the three paragraphs of the now deleted "Known Effects of RF Exposure" section, (as per the footnote on page 1) are basically nothing more than general information. In that regard I would have thought that anyone in the general population who had enough interest in the first place to seek out ARPANSA's website and peruse various fact sheets would not have found that general information to have been too technical.
Conversely, anyone in the general population who might otherwise struggle with comprehending details of a basic nature (on any subject) would probably not be the type to even bother, in the first place, with spending time to access ARPANSA's website to seek out various fact sheets.

If ARPANSA's philosophy in providing the general population with better 'accessibility' to its fact sheets is to reissue them with a 'dumbed-down' superseding version having information relevant to the public deleted from the new version, – are all other ARPANSA RF/EMF fact sheets to be given similar treatment? In that respect there are many fact sheets in the RF/EMF series that some might also subjectively interpret as containing information *"that is too technical for some"*.

Where 'accessibility' to the general population is concerned the action of deleting the section "Known Effects of RF Exposure", - <u>especially its third paragraph</u>, - hardly makes the new 'reworded' superseding fact sheet any more accessible than was originally the case with Fact Sheet 13. Both fact sheets could be easily accessed via the ARPANSA website (or in any case Fact Sheet 13 used to be readily accessible.)

In being more user-friendly 2 or 3-page documents ARPANSA fact sheets could, apart from being readily accessible in the first place, be reasonably seen as being a more convenient 'first-stop' means of enabling the general public to obtain basic information on RF/EME subjects of interest to them. That is as compared to otherwise having to trawl through the far more technical and voluminous 128-page ARPANSA Standard, - which a significant proportion of the general population would normally not be expected to do given the complex nature of that document.

In providing information to the public the ARPANSA Service Charter indicates that ARPANSA's objective is to *"make our documents and procedures straightforward"* and to *"ensure our public information is easily accessible"*.

However I believe that deleting certain relevant information from a more user-friendly ARPANSA public information document (as distinct from the Standard itself) may result in an entirely different outcome than that being suggested (regarding better accessibility).

By referring people who want *"more information"* * to the Standard itself this initially places a hurdle in the public's information search process by firstly requiring them to separately make contact with ARPANSA. Then secondly they would need to scour a lengthy and technical document to essentially find the same information that was deleted from the revised version of Fact Sheet 13. As such this does not make the information search procedure for the (deleted) information in question more *"straightforward"* or make the subject information *"easily accessible"* but instead has the opposite effect. Which would appear to be counter to the stated aim of the Service Charter.
(* *For people that want more information we refer them to the actual Standard.")*

The end result in this case is that it would now more likely reduce the number of people within the general population who may have otherwise eventually become aware that the RF exposure limits in the ARPANSA Standard <u>do not apply</u> to some non-thermal effects that may occur as a result of exposure to low-level RF.

I would have thought that many people in the general population who are experiencing various symptoms when in the vicinity of certain radiofrequency devices would be very interested to know of that position.

With the wide range of such devices presently used by the general population I believe that we all have the right to be clearly aware of what the exposure limits in the Standard do not apply to. And that such information should be available in a convenient manner that does not see it only provided within a very lengthy and complex technical document such as the ARPANSA Standard itself.

Amongst the various RF devices concerned are of course the remotely read electricity meters, – i.e. smart meters.

During the rollout of those devices they were promoted as having only very low radiofrequency emissions (i. e. **low-level RF**) that were well within the RF exposure limits of the ARPANSA Standard. That assurance obviously suggests that no adverse health effects would therefore result from exposure to the RF emissions from smart meters.

Yet since the installation of those devices many people have reported experiencing a range of health effects, some quite debilitating. While those affected may be in the minority their symptoms have in many cases caused them substantial distress and have significantly affected their lifestyle. You are aware of those health reports yourself as during a telephone conversation I had with you some years ago (regarding the RF power output strength of a smart meter) you mentioned that ARPANSA gets people calling all the time reporting health symptoms. At that time I had not actually seen you before or had any prior dealings with you.

During that same phone conversation you also conceded that, - maybe there is something in the smart meter technology that we don't yet know that is actually making people feel ill. Given what now appears to be ARPANSA's official public position on the issue of smart meters I imagine that that concession was only your own personal thoughts on the matter. Or at least those were your thoughts at that particular time.

Those health reports cannot be ignored, as some authorities do, by conveniently passing them all off as being due to some psychological or psychiatric cause. Or by being due to a 'nocebo' effect, or a Pavlovian effect (i.e. conditioned response) or as symptoms that are genuine but which have purely been brought about by anxiety in having to accept a smart meter. Also adding to those explanations (denials) is the claim that there are no accepted medical standards for the diagnosis of a condition that is referred to as electromagnetic hypersensitivity syndrome (EHS).

For various Victorian authorities (in particular) to effectively continue ignoring those health reports, – which are also being reported world-wide, - on the basis that the health effects involved are not accepted as presently known and/or 'established' health effects of RF exposure, is completely unacceptable. In fact on that point, - in what effectively established a legal precedent, - such an argument has been dismissed as irrelevant during a case that the Administrative Appeals Tribunal of Australia[2] (AATA) dealt with in 2013.

That case involved a compensation claim by Dr Alexander McDonald against CSIRO's insurer, Comcare, for health effects brought about by, or exacerbated by, his exposure to electromagnetic fields and frequencies during his employment duties with the CSIRO. The range of symptoms reported by Dr McDonald are amongst those typically also being reported by some people sensitive to RF electromagnetic fields following the installation of a smart meter on their homes.

In seeking to defend the compensation claim Comcare also raised the argument that electromagnetic hypersensitivity syndrome (EHS) was not an ailment as there was no diagnostic criteria for such a condition.

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[2] **McDonald & Comcare (2013) AATA 105 (28 February 2013)** ... (decision report paragraphs 79, 80 & 81.)

However in effectively dismissing that argument as irrelevant AATA Deputy President J W Constance held that: *"I do not accept this argument. The definition of ailment does not require that it be a condition which fits within a particular diagnostic criteria."* (Ref. AATA decision para 79)
*"I am satisfied that from about 1993 Dr McDonald has suffered from an ailment, **albeit one which may not be the subject of a recognized diagnostic label**. The condition he has described is that of suffering **nausea, disorientation and headaches**. It is a condition which he believes was caused by exposure to electromagnetic fields."* (Ref. AATA decision para 81)
(My emphasis in bold)

The fact that the majority of the general population does not appear to experience any adverse effects from smart meter RF emissions is thankful and fortunate. But because that is the case that position should not act as providing a basis for casting doubt on the validity of the symptoms being reported by those who do claim to be affected.
In that regard there are some in the general population who, because of their particular physiology or immune condition, cannot tolerate some environmental conditions or particular products that most people do not have a problem with. That situation is accepted so why should a similar position not be accepted with respect to the effects, on some people, of low-level RF exposure?

In being aware of reports of people experiencing various effects after having a smart meter installed ARPANSA's position is that more research is required before the implications of low-level RF exposure can be sufficiently established and then, if warranted, specifically reflected in the ARPANSA Standard's exposure limits.

However where RF research is concerned a significant portion of funding for many of those research projects is provided (either directly or indirectly) by the RF industry itself. In that respect is it realistic to expect that any research that the RF industry has some involvement in would be exhaustive and that funding would continue to flow if some outcomes began to point towards results that might ultimately be to the detriment of the RF industry? Should that be the case then for how many more years will calls for more research continue to be made while in the meantime affected people will continue to suffer.

As already mentioned smart meters were promoted by various authorities in Victoria (including the Department of Primary Industry) as having very low (i.e. low-level) RF emissions, which were indicated as being well within the exposure limits of the ARPANSA Standard.
Yet, as revealed by Fact Sheet 13 and the ARPANSA Standard (within its Foreword and Annex 4) <u>there are in fact no RF exposure limits in the Standard</u> that apply to some (biological) non-thermal effects that may occur from exposure to low-level RF.

Understandably the "general population" might then rightly question, - if they all knew, - whether the non-thermal effects that some research has indicated may occur from exposure to low-level RF has any connection with the health effects being reported by some people following the installation of a smart meter on their home.

But now more people within the general population (than might previously have been the case) may never even be in a position to contemplate such a question. That is because the brief and simply written reference to the findings of that particular research - and what the exposure limits in the ARPANSA Standard in fact <u>do not apply to</u>, - has been deleted from a revised easily accessible public information document.
The same information is certainly contained within the ARPANSA Standard itself. However in my opinion, in being a far more technical document of 128 pages, it would be most unlikely that a large number of people within the general population would seek out and access that particular document.

Further to its action of deleting information relevant to the public from a conveniently accessible fact sheet, ARPANSA's approach in public forums would in my opinion also appear to indicate a

degree of sensitivity and reluctance to openly discuss what the Standard's limits do not apply to (as was indicated in Fact Sheet 13).

My correspondence of 25 May 2016 to you actually arose because of events that occurred during one of those public presentations, which I elaborate upon as follows.

❑

Population Health Research on Electromagnetic Energy (PRESEE) event
Tuesday July 21, 2015 - AMREP Lecture Theatre, Alfred Hospital, 75 Commercial Rd, Prahran, Melbourne.

Over the past few years I have attended a number of scientific events relating to radiofrequency and its effects, which were also open to the public. One of those was the above PRESEE event on July 21, 2015. Two colleagues accompanied me on this particular occasion.

The presentation, entitled Translation Event, was organised by Monash University in conjunction with other universities. In essentially conducting the event as the chair Professor Rodney Croft from the University of Wollongong welcomed the audience and introduced a panel of speakers. Each panel member then made a presentation on a topic relevant to various aspects of electromagnetic radiation and any associated health effects. (Copy of program attached.)

At the conclusion of the presentations a question and answer session followed where Professor Croft invited the audience to raise any questions as directed to those on the stage.

Together with my colleagues I was seated in about the third or forth row from the front and slightly to the right of centre. This location was slightly more toward the theatre's main entry doorway to my right and to an adjacent stairway, which ascended along the wall of the theatre to provide access to the seating rows.

In asking the first two questions of the session I rose from my seat, identified myself and directed my questions to Professor Croft.

- **My first question queried the credibility of the ARPANSA Standard.**
  While not including a reason for this question it was based on my awareness that several other countries had set their maximum RF exposure limits at levels far lower than was the case in the ARPANSA Standard.

  Professor Croft replied in a manner that defended the credibility of the ARPANSA Standard.

- I prefaced my second question by firstly mentioning that the public had been told that devices such as mobile phones, smart meters and baby monitors transmitted only very low-level radiofrequency signals that were well within the exposure limits of the ARPANSA Standard.

  I then asked Professor Croft: - **how could it be broadly claimed that the RF emissions from those devices were within the ARPANSA Standard's exposure limits when ARPANSA Fact Sheet 13 indicated that the ARPANSA Standard did not allow for some non-thermal effects resulting from low-level RF exposure?**

  Professor Croft's reply, - without any form of qualification or elaboration whatsoever, - was to simply state that the ARPANSA Standard did provide limits for low-level RF effects.

  Due to the dimmed lighting in the audience area I was unable to clearly read word for word the relevant two sentences from Fact Sheet 13. Had the lighting been better I would have read them aloud for the whole audience and panel to hear. Instead, while verbally indicating the meaning of those sentences I passed a copy of ARPANSA Fact Sheet 13 down to where one of the panel members took possession of it. In the process of doing so I invited Professor Croft to read the two sentences, which I had highlighted for ease of identification. In the brightly illuminated stage area where he stood it would have taken him no more than 15

seconds to read those two short sentences.
Alternatively, while panel members were responding to other questions from the audience he could have been reading the two sentences and then returned to properly complete dealing with my question.

However, while standing no more than 2 or 3 paces from the panel member who had received the copy of Fact Sheet 13, Professor Croft made absolutely no attempt to take possession of it and to my mind he seemed quite determined not to do so. It appeared to me that he didn't want to deal with the specific aspect that I had raised. This was extremely disappointing, as it was him who had invited the audience to ask questions.

Scientific forums involving audience participation are completely pointless if those officially involved with the presentations are not prepared to properly deal with specific aspects, when raised, that are relevant to the subject matter of the forum.

Strangely however, throughout the entire question and answer session, a man wearing a dark suit stood on the first few steps of the stairway nearest the entry door with his back against the theatre's side-wall. By way of assisting Professor Croft during his response to my second question that man interjected from the sidelines to quite firmly also state that the ARPANSA Standard did contain limits covering non-thermal effects from low-level RF exposure.

However once again, as with Professor Croft's response, the nature of that interjection also did not include any qualification or elaboration with respect to any particular non-thermal effects arising from low-level RF exposure that the Standard's exposure limits did not apply to.

Clearly my question had been aimed at a specific aspect within ARPANSA Fact Sheet 13 as verbally outlined to Professor Croft. And that specific aspect had also been emphasised by my action of passing a copy of that fact sheet - with the relevant area highlighted - down to one of the panel members so it could be handed on to Professor Croft standing very nearby.

To that extent the precise nature of my question, as to what the Standard's limits did not cover, could hardly have been misunderstood.

In that regard the nature of the response from the man on the sidelines (as well as from Professor Croft) applied in a way that ignored the existence of the aspect that I was highlighting. But in doing so, - within the context that applied to my question, - his response (and Professor Croft's response) could have also been taken as having an effect that denied the validity of the area within ARPANSA Fact Sheet 13 that my question was based upon.

Given the impressions conveyed by the responses from the man on the sidelines and Professor Croft (as above) it appeared to me that the man on the sidelines also did not wish to acknowledge and specifically deal with the relevant aspect within Fact Sheet 13.

Where the two responses might have been aimed only at the Standard's existing exposure limits that are intended to protect against non-thermal effects resulting from low-level RF such as electrostimulation or microwave hearing, * then the responses might be seen as being correct without any potential to be misleading. (* Although as your letter of May 25, 2016 to me mentioned, microwave hearing, by occurring *"due to thermoelastic expansions"*, could *"in some ways"* be actually considered as a *"thermal effect."*)

However within the context that applied to my question, - which was clearly referring to a particular aspect within Fact Sheet 13, - then without any limiting qualification being included in the responses they could have been seen to apply in two ways.
They could firstly be seen as potentially misleading by giving an impression that the

Standard's exposure limits applied to all non-thermal effects likely to arise from exposure to low-level RF. Secondly, by not encompassing the relevant aspect within Fact Sheet 13 that I had clearly raised, those responses had the effect of suggesting that the subject aspect within that fact sheet was not correct.

In that regard when answers to questions about specific aspects are incomplete and/or unqualified in that they do not address the specific aspect contained within the question that was asked, the answers given can have a misleading effect or have the potential to be misleading.

This particular situation was what prompted my letter of 15 March 2016 to you, which contained several questions relating to the specific aspect in Fact Sheet 13 that I had raised at the PRESEE event. However even then your reply of 25 May 2016 to my question 2(a) did not address that particular question. To my mind this appeared to further indicate that when dealing directly with the public ARPANSA's preferred approach is not to mention the subject statement[3] in Fact Sheet 13 or to officially confirm that that statement was in fact completely correct.

In that respect question 2 in my letter of 15 March 2016 to you, which consisted of parts 2(a) and 2(b), was prefaced with a statement. That statement, in respect of the Standard's exposure limits, was based on what I felt was being implied given the nature of the responses provided by Professor Croft and the man interjecting from the sidelines at the PRESEE event.

That prefacing statement was: -

2. - "If the ARPANSA Standard does in fact cover (*"allow for"*) non-thermal effects of a biological nature which might arise from exposure to low-level RF as distinct from other limits in the Standard protecting against possible non-thermal effects from low-level pulsed radiation:"
"Question
- (a) Does that mean that the ARPANSA Fact Sheet 13 is incorrect by indicating otherwise?"

The response that your letter of 25 May 2016 provided for question 2(a) was: -
"Question 2
(a) Factsheet 13 has been revised as mentioned earlier. In order to make the fact sheet more accessible to the general population it has been rewritten in a way that avoids information that is too technical for some. For people that want more information we refer them to the actual Standard."

This answer however more particularly applies for a question that asked, - why was Fact Sheet 13 revised? However that was not what my question 2(a) or any other question asked. In fact I could not have even asked a question that your answer 2(a) was relevant to because at the time of sending my letter of 15 March 2016 to you I was not aware that Fact Sheet 13 had been revised.

My question 2(a) needed only a 'yes' or 'no' answer. Or more comprehensively, either; 'Fact Sheet 13 is incorrect' – or – 'Fact Sheet 13 is not incorrect'. With the latter being the actual position.
That was the approach taken for question 2(b), which asked whether a statement on page 95 of the Standard was incorrect, and where your response for that question indicated that that particular statement was not incorrect. I am at a loss as to why question 2(a) involving Fact Sheet 13 was not treated in a similar manner.

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[3] **From Fact Sheet 13 (Mobile Telephones and Health Effects):**
"Some research has indicated that non-thermal effects resulting from low-level RF exposure may also occur. However, the existence of these effects and their implications has not been sufficiently established to allow for them in the Standard."

At the PRESEE event on 21 July 2015 the man wearing a suit who interjected from the sidelines to support Professor Croft was not listed in the event's program as an official participant. Nevertheless he appeared to have some official connection with the event. The manner of his interjection into the discussion in support of Professor Croft was quite firm. It was almost as if he had also taken offence at my questioning the credibility of the ARPANSA Standard's exposure limits. Notably, while continuing to stand at the sidelines throughout the entire question and answer session, this man took no further part in proceedings, with my questions being the only ones where he interjected to become involved.

At the time I suspected that this man may have had some connection with ARPANSA and had been present to intervene if questions such as mine were raised. My suspicions were later proved to be correct.

On 16 February 2016, while viewing a Catalyst program on the ABC in Melbourne that dealt with various mobile phone radiofrequency aspects, I recognised an ARPANSA representative on that program as the man who had stood on the sidelines and interjected at the PRESEE event on 21 July 2015. It was you Dr Karipidis. Reference to your diary schedule would no doubt confirm your attendance at that particular PRESEE event. You may even recall the events described above when you interjected, as certainly do my colleagues and no doubt, as many other members of the audience would also.

- **Science and Wireless event November 27, 2013**
  Kaleide Theatre, RMIT University, 360 Swanston Street Melbourne

Prior to the PRESEE event on July 21, 2015 I also attended an RMIT Science and Wireless event on 27 November 2013, which was conducted under the auspices of the Australian Centre for Electromagnetic Bioeffects Research (ACEBR).

Those participating in the presentation included Professor Rodney Croft (ACEBR / Wollongong University), Dr Carl-Magnus Larsson (ARPANSA CEO), Dr Steven Solomon (ARPANSA Chief Radiation Health Scientist), Mr Michael Bangay (Michael Bangay Consulting), Mr Richard Hoy (Energy Networks Australia) and several others. (Copy of program attached.)

Mr Michael Bangay, as you would probably know, was formerly employed for some 25 years with ARPANSA as a Technical Specialist, EMR Section, NIR Branch. Together with you he is listed on page 123 of the ARPANSA Standard as being one of the contributors in the working group that helped in drafting and reviewing the ARPANSA Standard.

At the conclusion of the presentations by each panel member a question and answer session followed. During that session a young man in the audience of the completely packed theatre directed a question to panel member, Dr Stephen Solomon.

The young man asked whether the ARPANSA Standard included limits for low-level RF that protected against biological effects where heating was not involved.

Dr Solomon answered by briefly indicating that consideration of non-thermal effects was encapsulated within the Standard's exposure limits (or words to that effect).

Immediately following Dr Solomon's response to the young man's question another audience member sitting several people further along the row to my left rose from his seat and, if I heard correctly, I believe identified himself as Bruce Hocking. He appeared to be quite incensed at the answer Dr Solomon gave and in that respect he strenuously disputed what was being implied as far as the Standard containing exposure limits for low-level RF regarding non-thermal biological effects.

Unless I am mistaken that gentleman was Dr Bruce Hocking an occupational medicine specialist and consultant, who is the author of several papers on the effects of radiofrequency as well as Electromagnetic Hypersensitivity Syndrome (EHS).
Dr Bruce Hocking, as you may know, is also listed on page 123 in the ARPANSA Standard as one of the contributors in the working group that drafted and reviewed the ARPANSA Standard. In that respect one might expect that he would be intimately familiar with what effects the Standard's exposure limits apply to and what effects the limits do not apply to.

By way of assisting Dr Solomon another panel member, Mr Michael Bangay, then joined in to provide comments in a way that essentially supported Dr Solomon's answer. In doing so (if I remember correctly) he referred to the Standard's limits as providing protection in relation to 50Hz low frequency power and electrostimulation in terms of skin contact and involuntary muscle effects.

Once again if the answers given were only directed at non-thermal effects from low-level RF exposure such as electrostimulation (as Mr Bangay mentioned) or the microwave hearing effect (despite neither response specifically mentioning that effect) then those responses could not be considered as being incorrect or misleading.

However again, without any limiting qualification being included in the answers, they could be seen as indicating that the Standard's low-level RF exposure limits had a broad effect. That being to also apply to non-thermal effects of a biological nature, - which was precisely the aspect that was specifically contained within the young man's question. When seen from that perspective the answers given may have had a misleading effect. If taken in that way this possibly may have been what caused Dr Bruce Hocking (or whoever it was if not actually Dr Bruce Hocking) to rise from his seat and strenuously dispute the nature of Dr Solomon's answer.

Aside from that particular interchange the issue of electromagnetic hypersensitivity syndrome (EHS) and reports of health symptoms in relation to smart meter RF exposure was also raised during the presentation. In responding to that aspect Dr Solomon, as ARPANSA's Chief Radiation Health Scientist, commented that; -*"sufferers are strongly encouraged to seek medical advice to* ***investigate other causes.***" (My emphasis in bold.)

Another audience member at this event also highlighted the situation where the International Agency for Research on Cancer (IARC) had, in May 2011, classified radiofrequency in general (not just RF associated with mobile phones) as a Group 2B agent. Group 2B being the category for agents that were possibly carcinogenic to humans.

In addressing that aspect Dr Solomon did so by indicating that, coffee, pickled vegetables and car exhausts were also listed as Group 2B agents.

By mentioning the first two items, which most people would consider as being fairly innocuous everyday items, and car exhausts, in being something that most people are unavoidably exposed to some of the time anyway, the impression being given by Dr Solomon was that a Group 2B classification was fairly insignificant. In other words by mentioning only those type of items (agents) the effect was to downplay and/or diminish the significance of an IARC Group 2B classification.

Others also use this type of approach from time to time, particularly the RF industry and its supporters (as expected). The IARC Monographs of course, when referred to, clearly outline the actual reasons why various seemingly innocuous everyday items (agents) can cause undesirable health effects, and accordingly why they have been given a Group 2B listing.

However when those prone to citing certain items (agents) in a way that portrays a Group 2B classification in a certain inconsequential light, - they 'strangely' always steer clear of mentioning things such as lead and DDT. Those are also Group 2B classified agents, which most people who are old enough would immediately recognise as agents that are particularly harmful.

One can understand the RF industry and its supporters highlighting seemingly innocuous agents in a way that gives the public the impression that an IARC Group 2B classification was nothing of any particular significance that they should be concerned about.

However as the ARPANSA Service Charter indicates its aim (according to the stated Values of ARPANSA) is to be objective and to communicate clearly when dealing with the public. So when an ARPANSA representative responds in the same way as RF industry advocates by only citing what appear to be innocuous Group 2B agents such as coffee, etc, with the effect applying in a way that diminishes the standing of a Group 2B listing, an entirely different perspective applies. That is because it might then give the appearance of ARPANSA acting in a biased manner rather than in a balanced and objective manner.

By all means when ARPANSA representatives are communicating with the public about what a Group 2B classification means, and gives examples of various agents, things such as coffee, pickled vegetables and car exhausts etc might certainly be mentioned. But to give the public a truly balanced view of the actual significance of a Group 2B listing, agents such as **lead** and **DDT should also be mentioned**. Then the public can get an accurate idea of the situation and decide for themselves what significance should be attached to an IARC Group 2B classification.

❑ **Related Aspects**

As already indicated in this letter I had previously phoned ARPANSA in Melbourne (prior to July 2015) and spoken with you. In that call I had mentioned that a number of people had been experiencing health symptoms after a smart meter had been installed on their home. You verified that to have been the case by indicating that ARPANSA gets people calling all the time with those reports. You then conceded (presumably unofficially) that, - maybe there is something in the smart meter technology that we don't yet know that is actually making people feel ill.

However ARPANSA's official public position has been to effectively deny the probability of any connection between the operation of smart meters and the health symptoms being reported by various people. As already mentioned this was demonstrated by ARPANSA's Chief Radiation Health Scientist, Dr Stephen Solomon, at the RMIT seminar in Melbourne on November 27, 2013 when, in dealing with the subject, he stated, - *"sufferers are strongly encouraged to seek medical advice to investigate other causes."*

That official blunt public refusal to even entertain the possibility of any connection between smart meters and the health effects being reported comes even where ARPANSA's own publications[4] have mentioned the fact that some research has indicated that non-thermal effects resulting from low-level RF exposure may also occur.

Coincident with that official public approach I also find it odd that when suggesting practices for minimising RF exposure from various low-level RF devices ARPANSA noticeably avoids any mention of smart meters.

This is distinctly apparent in ARPANSA Fact Sheet 14, - ***"How to reduce exposure from mobile phones and other wireless devices"*** (last updated February 2013).

In firstly dealing with mobile phones that fact sheet emphasises that **distance away from the source of RF** is the most effective way to reduce exposure to RF. In addition **limiting the time of exposure to RF** is also recommended.

When also mentioning cordless phones in that fact sheet ARPANSA suggests using a similar approach to mitigating RF exposure by highlighting the desirability of *"keeping your distance from*

[4] ARPANSA Fact Sheet 13, & ARPANSA Standard RPS3 page 95 (Annex 4)

the cordless phone base unit" - because – *"the bases of many cordless phones are **continually transmitting low-level signals**."* (My emphasis in bold.)

In then moving on to mention ***"Other wireless devices"*** Fact Sheet 14 refers to wireless computer networks, audio-visual transmitters, wireless security cameras and baby monitors. In doing so this fact sheet then indicates that, - *"You can reduce your exposure from these devices by: **keeping them at a distance**, for example placing the wireless router **away from where people spend time**"*, - and – *"**reducing the amount of time** you use them."* (My emphasis in bold.)

Where baby monitors are concerned ARPANSA in other warnings has recommended that they be placed **at least one metre away from the cot** to obtain a useful reduction in RF exposure.

Apart from the various practices that ARPANSA is suggesting in order to limit exposure to the low-level RF emissions from the devices mentioned one glaring exposure mitigation aspect should be fairly obvious. And that aspect is that all of those particular devices are **voluntary use devices**. It is not mandatory for people to have to use them.

But another even more glaring aspect within Fact Sheet 14 exists as far as suggestions about reducing RF exposure from ***"Other wireless devices"***. And that is, - that **smart meters are not mentioned at all**. Is that an accidental oversight, or are smart meters not considered as being wireless devices?
Moreover smart meters - are **mandatory use devices** - at least in Victoria in any case – which operate 24/7.

Why then in Fact Sheet 14 does ARPANSA consider it appropriate to provide the public with RF exposure mitigation advice with respect to certain low-level RF devices, which are voluntary use devices in the first place? But not appropriate to also include amongst the list of *"Other wireless devices"* similar advice for mandatory use low-level RF devices, - such as smart meters?

In tens of thousands of homes the older type of analogue electricity meter was often placed at the front of the house on a wall that was invariably a bedroom. And in many cases the bed-head inside that room was positioned directly adjacent to where that electricity meter, – which is now a smart meter, – was located. In that regard the distance between the smart meter and a person's head, often separated only by weather-board and plaster sheeting, would be **significantly less than one metre**.

By excluding smart meters from the list of *"Other wireless devices"* mentioned in Fact Sheet 14, one could easily form an opinion that ARPANSA is treating smart meters as the 'sacred cows' of the RF world. That is by virtue of not treating them in the same way as the other wireless devices mentioned. Yet one only has to use an RF measuring meter to monitor the RF spikes being emitted from a smart meter to appreciate that they do not transmit only a few times per day as some authorities would have people believe.

The rollout of smart meters in Australia arose as a result of the federal government's Advanced Metering Infrastructure (AMI) program with the state government in Victoria even making their installation in all homes and small businesses a mandatory requirement. In that regard a political imperative can be seen to be involved. The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA), - is also a federal government agency.

Where the provision of any RF exposure minimising advice relating to smart meters is concerned, rather than coming from ARPANSA such advice (albeit very limited and low key) has actually come from an electricity distributor.

In that regard I became aware of a situation where an electricity distributor had advised a customer (by phone) to shift the position of their bed so that the bed-head was further away from the wall where a smart meter was located on the outside wall. The customer had previously complained to the electricity distributor about experiencing health symptoms after having a smart

meter installed on the outside of the bedroom wall. The advice given obviously relates to the RF exposure reducing effect of substantially increasing distance away from the source of the RF.

In another case that I am aware of an electricity distributor (no doubt unofficially) provided an elderly man who had a pacemaker and was severely affected by the smart meter RF, with a section of radiofrequency shielding mesh-like material. This was placed on the inside wall of his lounge room directly over the position where his smart meter was located on the outside. However in being only approximately 1,000mm x 1,400mm the area covered by the shielding material was inadequate to provide any worthwhile beneficial effect and consequently there was no noticeable improvement in the man's symptoms when in that room.

However the fact that the power distributor provided some radiofrequency shielding material indicated that the power distributor was fully aware that RF emissions from a smart meter could certainly have some effect within a room opposite its location on the outside wall. The man concerned was only able to gain some relief from his symptoms when he slept in a particular area of his garage, which was a considerable distance away from his smart meter.

RF readings subsequently taken from that area in his garage indicated readings that were far lower than in his lounge room and other areas inside his house. The cause of the far lower readings in his garage may have purely been due to a RF 'dead-spot' in the vicinity or otherwise some feature of his garage and surrounds that provided a shielding effect. However it was hardly practical or healthy for the man to sleep in his garage, especially during the winter months.

That this man's symptoms were alleviated when he spent time in a particular area of his garage coincides with far lower RF readings in that location than RF readings taken in his lounge room, - suggests an obvious conclusion. That is, - that the level of RF being emitted from his smart meter into his lounge room is responsible for the effects he is feeling when he is in his lounge room. That is despite the RF readings in his lounge room and in other areas of his house being within the ARPANSA Standard's present exposure limits. That is to say, - the exposure limits that ARPANSA has determined for established (i.e. presently known) health effects.

In other cases that I am aware of where complaints about health symptoms have been made to electricity distributors, they have offered to turn down the signal strength of the complainant's smart meter to only 10 percent of the usual signal power. This power reduction has been confirmed by readings subsequently taken shortly afterwards with RF measuring meters. However as the signal strength adjustment is made remotely the power distributor could just as easily readjust the signal strength back to full strength at some later date.

That certain electricity distributors have been providing some affected customers with RF exposure reduction advice and action as above instead of ARPANSA is disappointing and in my opinion does not reflect well on ARPANSA. To my mind this further acts to indicate to me that for some reason ARPANSA appears to be extremely sensitive about issues involving smart meters.

❑

Tinnitus / Microwave Hearing Effect

Nuisance auditory effects are one of the effects that the RF exposure limits in the ARPANSA Standard RPS3 have been formulated to protect against.

Yet amongst the various effects being reported by some people soon after having a smart meter installed on their home is that of perceiving a type of ringing or buzzing sound that appears to be coming from within their ears, head or behind their head. This condition, which can occur from a variety of causes, is known as tinnitus and is a well-known and medically recognised condition.

In this instance however the effect possibly has some type of connection with, or similarity to, the microwave hearing effect. In that regard your letter of May 25, 2016 indicated that the microwave hearing effect can result due to the effect of pulsed fields. Your letter also mentioned that

exposure limits for pulsed fields are covered by the Basic Restrictions as contained within Table 3 (on page 8) of the ARPANSA Standard.

In establishing the different exposure limits for various health effects arising from exposure to RF ARPANSA has indicated that the particular limits arrived at have been determined by also considering a safety margin to ensure protection against the particular effect that the exposure limit applies to.
In view of the above can you please clarify the following: -

1. Excluding the safety margin contained within the Basic Restriction of 2 mJ/kg* for the general public: - **what level (mJ/kg) did ARPANSA use as the base line (i.e. starting point) for establishing a particular level at which the general public would first begin to experience auditory effects from pulsed fields?**
   (*spacial peak specific absorption in the head within any 50 micro second interval)

2. Whatever that threshold level (starting point) was: – **does ARPANSA accept that within any general public group it is possible that different people can have different thresholds and/or tolerances to the effects of pulsed fields?**

3. As distinct from the **initial threshold** level used to establish when the general public would first begin to experience auditory effects (as in question 1): - **how was the magnitude of the additional safety margin between the initial threshold and the Basic Restriction of 2 mJ/kg arrived at?**

4. With a pulsed field, what is the practical relationship between: - **the energy delivered into a person's head in terms of heating a given mass of tissue and, - the pulsed field's strength, - its time of application and – its speed in reaching its peak strength?**

5. **Does ARPANSA recognise and accept tinnitus as being an established, medically accepted and diagnosable condition?**

6. **Is tinnitus one of the auditory effects that the Basic Restrictions for the general public in Table 3 of the ARPANSA Standard should prevent from occurring?**

7. (a) Does ARPANSA maintain that even for people who have previously never experienced its symptoms tinnitus can be brought about by conditions such as: - **anxiety, a 'nocebo' effect, a conditioned response** (Pavlovian effect) or an **imaginary effect**, - simply because of having a smart meter installed?

   (b) If ARPANSA maintains that the above, as in question 7(a), can in fact be the case:
   - **can you please explain the medical and/or psychological / psychiatric mechanism by which tinnitus can essentially be spontaneously brought about by any of the following conditions and also identify any of those that would definitely not cause tinnitus;**
     - anxiety
     - a nocebo effect
     - a conditioned response (Pavlovian effect)
     - an imagined effect
     - a psychological / psychiatric effect

I look forward to your response to the above questions as well as any further comments you might wish to make with respect to other matters raised in this letter.

Yours sincerely

s 47F [redacted]

PRESEE POPULATION HEALTH RESEARCH ON ELECTROMAGNETIC ENERGY

Translation Event

Tuesday 21st July, 2015

Monash University

Invitation

Does the use of mobile phone technology and exposure to radiofrequency devices concern you? Researchers from the NHMRC CRE on Population Health Research on Electromagnetic Energy (PRESEE) will be presenting a brief overview of their current and past research in this short program. Following the presentations, a short question and answer session will follow. Practitioners in Health and Safety, Industry, students and interested members of the general public are invited to attend.

Cost: FREE

Location

AMREP Lecture Theatre,
75 Commercial Road
Melbourne VIC 3004

RSVP Essential by 5pm Wednesday 15th July: geza.benke@monash.edu

MONASH University | The University Of Queensland | University of Wollongong

NHMRC | KIT

Program

5.00-5:05pm	**Welcome** Professor Rodney Croft, University of Wollongong
5.05-5:20pm	**Intro to PRESEE and previous Monash Research** Professor Michael Abramson, *PRESEE, Monash University*
5.20-5:30pm	**The Mobi-Kids Study** Dr Geza Benke, *PRESEE, Monash University*
5.30-5:40pm	**Current Studies of Sleep Research in Children** Dr Sarah Loughran, *PRESEE, IHMRI, University of Wollongong*
5.40-5:50pm	**PEMS and Kindergarten Studies** Mr Chhavi Bhatt, *PRESEE, Monash University*
5.50-6:00pm	**Risk Perception** Dr Mary Redmayne, *PRESEE, Monash University*
6.00-6:05pm	**MRI Research** Mr Miguel Fuentes, *PRESEE, University of Queensland*
6.05-6:15pm	**Future RF Exposure Studies** Dr Geza Benke
6.15-6:30pm	**Questions and Answers**
6.30-7:30pm	**Foyer for nibbles and refreshments**

Science & Wireless 2013 Program

AUSTRALIAN CENTRE FOR ELECTROMAGNETIC BIOEFFECTS RESEARCH (ACEBR)

Wednesday 27th November 2013, 2:15 – 5.00 p.m.
"Kaleide Theatre", RMIT Building 8, Level 2
360 Swanston Street, Melbourne, VIC 3000

"Health & Future RF Technologies"

RMIT Welcome	(1) *Professor David J. Adams (Acting Deputy Vice-Chancellor Research & Innovation and Vice-President)*	2.15 – 2.20pm
ACEBR Welcome	(2) *Professor Rodney Croft (ACEBR / University of Wollongong)*	2.20 – 2.25pm
Opening Address	(3) *Dr Carl-Magnus Larsson (CEO ARPANSA)*	2.25 – 2.35pm
Overview of new technologies	(4) *Professor Andrew Wood (ACEBR / Swinburne University)*	2.35 – 2.50pm
4G telecommunications technologies	(5) *Mr Mike Wood (Aust. Mobile Telecomm. Assoc.)*	2.50 – 3.00pm
Survey & Audit of 4G facilities	(6) *Mr Michael Bangay (Michael Bangay Consulting)*	3.00 – 3.10pm
Smart-meter technologies	(7) *Mr Richard Hoy (Energy Networks Australia)* ENA	3.10 – 3.20pm
Public health aspects of new technologies	(8) *Dr Stephen Solomon (Chief Radiation Health Scientist, ARPANSA)*	3.20 – 3.35pm
Panel Discussion	(9) *Facilitated by Professor Ray Kemp (ACEBR / Swinburne University)*	3.35 – 4.15pm
Refreshments & Light Snacks		4.15 – 5.00pm

SW2013
Science & Wireless

Australian Government
Australian Radiation Protection and Nuclear Safety Agency

Report by the ARPANSA Radiofrequency Expert Panel

Review of Radiofrequency Health Effects Research – Scientific Literature 2000 – 2012

Technical Report Series No. 164

Australian Government
Australian Radiation Protection and Nuclear Safety Agency

Report by the

ARPANSA Radiofrequency Expert Panel

on

Review of Radiofrequency Health Effects Research – Scientific Literature 2000 – 2012

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Notice

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ARPANSA Perspective

The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) published the Radiation Protection Standard '*Maximum Exposure Levels to Radiofrequency Fields - 3 kHz to 300 GHz*' in May 2002 (ARPANSA, 2002 – referred to in this document as the 'Standard' or 'RPS3'). The Standard sets limits for human exposure to radiofrequency (RF) fields in the frequency range 3 kHz to 300 GHz which may be produced from various sources including mobile telephone handsets and base stations as well as radio and television transmitters, other wireless devices and industrial sources. The Standard provides the basis for the regulation by the Australian Communications and Media Authority of RF exposure to members of the public from licensed radio transmitters.

The 2002 Standard was prepared by a working group established under the auspices of the ARPANSA Radiation Health Committee (RHC). While the International Commission on Non-Ionizing Radiation Protection (ICNIRP) 1998 exposure guidelines provided the initial basis for the 2002 Standard, further material was considered, including all relevant literature up to a cut-off date (about 2000) prior to the publication of the Standard. Overall harmonisation with ICNIRP was considered important and the exposure limits in RPS3 differ only in small detail from those in the ICNIRP guidelines.

Notwithstanding the large body of research underpinning the existing exposure limits, the issue of whether or not they are adequate to provide complete protection from harmful effects of exposure to RF fields remains a subject of research and of active debate within the scientific and wider community. At the time the Standard was prepared, it was recognised that new scientific research may indicate that changes may need to be made to the limits or the implementation of the Standard.

Since the year 2000, research in the area of RF and health has grown rapidly and several major research programs and reviews have been undertaken internationally. Since the cut-off date of the examination of scientific literature for RPS3, ARPANSA has identified more than 1300 publications relevant to the understanding of possible health effects of RF electromagnetic fields. These include the review by the International Agency for Research on Cancer (IARC) in 2011 (Baan et al., 2011) that resulted in the classification of RF fields as possibly carcinogenic but which did not assess the magnitude of any risk to health, and the 13-country INTERPHONE epidemiological study in 2010 (INTERPHONE Study Group, 2010). In addition, several countries, or groups of countries, have undertaken one or more comprehensive reviews of the subject, such as the recent review conducted by the Health Protection Agency in the UK in 2012 (HPA, 2012).

In July 2012 ARPANSA established a Radiofrequency Expert Panel with the task of making an assessment of the scientific literature to determine whether there are any significant changes to the science underpinning the 2002 Standard and to advise whether it continues to provide adequate protection. The Expert Panel conducting the review comprised three Australian academics who are experts in the areas of biophysics, experimental research and epidemiology as well as ARPANSA scientific staff. Members of the Expert Panel independently examined the major reviews and key individual papers in their area of expertise and identified issues that have arisen in the research since the publication of RPS3.

In their findings in this Report, the Expert Panel notes that since the preparation of RPS3 there have been significant advances in the science. Based on the assessment of the scientific evidence from January 2000 till August 2012, the Expert Panel find that the underlying basis of the ARPANSA RF exposure Standard remains sound and that the exposure limits in the Standard continue to provide a high degree of protection against the known health effects of RF electromagnetic fields.

However, the Expert Panel find that while the exposure limits of RPS3 are still valid for protection against known adverse effects, under some circumstances the margin of safety between these limits and the threshold for harmful effects may be less than originally intended.

While the findings of the Expert Panel in this Report provide confidence that the 2002 Standard provides adequate protection, they identify areas where RPS3 and its annexes could be updated to take account of increased knowledge and to better harmonise with international standards.

In recognition of the limitations on scientific knowledge of potentially harmful effects, the 2002 Standard includes a precautionary minimisation requirement for exposure to members of the public. Based on the findings of the Expert Panel, ARPANSA will give consideration to whether the precautionary elements of the standard should be clarified and extended to occupational exposure.

ARPANSA will continue to monitor the scientific research on RF fields and health and to monitor, in particular, the national cancer incidence trends and emerging trends in the use of RF.

ARPANSA would like to acknowledge the work of the external experts, Prof. Andrew Wood, Prof. Rodney Croft and Dr Geza Benke, and the ARPANSA staff, Dr Lindsay Martin, Dr Ken Karipidis and Don Wijayasinghe in the preparation of this report.

Dr Stephen Solomon
Chief Radiation Health Scientist
Radiation Health Services Branch
ARPANSA

March 2014

Contents

PART 1

1. Introduction

The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) published the Radiation Protection Standard '*Maximum Exposure Levels to Radiofrequency Fields - 3 kHz to 300 GHz*' in 2002 (referred to in this document as the 'Standard' or 'RPS3'). At the time the Standard was prepared, it was recognised that new scientific research may indicate that changes may need to be made to the limits or the implementation of the Standard. With this in mind, ARPANSA has continued to monitor the research and expert reviews.

Since the cut-off date of the examination of scientific literature for RPS 3 (about 2000), ARPANSA has identified more than 1300 publications in the relevant areas of study, including the report of the 13-nation Interphone study (2010), and important reviews by the International Commission on Non-Ionizing Radiation Protection, (ICNIRP) (2009), the International Agency for Research on Cancer, (IARC) (Baan et al., 2011), the Health Protection Agency, (HPE), in the UK (AGNIR, 2012) and others. A list of major reviews and research programs on RF and health since the publication of RPS3 is given in Appendix 1. Based on 'limited evidence'[1] in humans and experimental animals, in 2010, IARC classified RF as 'possibly carcinogenic to humans'.

In July 2012 ARPANSA established an RF Expert Panel to assess the scientific literature to formally determine whether there are any significant changes to the science underpinning the Standard and whether it continues to provide adequate protection. The terms of reference for this 'Expert Panel' are presented in Appendix 2. The Panel comprised three Australian academics who are experts in the areas of biophysics, human provocation research and epidemiology as well as three ARPANSA scientific staff. A list of the members of the Expert Panel is provided in Appendix 3. The experts were invited to join the panel by ARPANSA based on their academic involvement and experience in the area of RF and health. Summaries of the relevant qualifications and credentials of the academic experts are presented in Appendix 4.

The ARPANSA RF Expert Group considered four main areas of scientific research relevant to the understanding of possible health effects of RF electromagnetic fields: in vitro/in vivo research, epidemiological research, human provocation research and RF dosimetry research.

[1] IARC defines 'limited evidence of carcinogenicity' as a positive association that has been observed between exposure to the agent and cancer for which a causal interpretation is considered to be credible, but chance, bias or confounding could not be ruled out with reasonable confidence.

2. Expert Panel Methodology

The RF Expert Panel review was based on an assessment of the published literature, including scientific papers, specialist reviews and literature summaries.

IN VITRO/IN VIVO RESEARCH

One way of looking for possible harmful effects is through the exposure of living cells (or other components of an organism) outside the human or animal (in vitro) or through the exposure of living animals (in vivo). In either case, one can look for increases in disease, for changes in physiology, or for subtle biochemical or other changes than might help predict possible harmful effects on humans or the environment.

HUMAN PROVOCATION RESEARCH

Perhaps the most direct way to study possible harmful effects is to deliberately expose human volunteers under controlled circumstances in what are termed human provocation studies. Ethical and practical considerations generally limit these studies to short-term exposures and to the examination of acute effects such as changes to physiology or perceptions by the subject.

DOSIMETRY

The science of radiofrequency dosimetry provides the link between the external and internal electric and magnetic fields and radiation, and the deposition of energy within the living cells and other structures of the human body. It allows the interpretation of experiments performed on humans or animals, and allows the extension of these results to other exposure situations.

EPIDEMIOLOGY

While the results of in vivo and in vitro research can be difficult to apply directly to human health, the field of epidemiology provides a means of examining the incidence of human disease in real-life situations. This area of research hopes to link increases in disease to a particular chemical, life-style or agent such as RF electromagnetic fields. However, because the exposures are not controlled as in a laboratory study, the results can be difficult to interpret.

Specific methodologies were employed by the experts in reviewing their area of expertise, including their method of evaluation of studies. These are described in more detail in the later sections.

2.1 Expert Panel Processes

The Expert Panel met on two occasions:

a. On 8 August 2012 to plan the RF review. The Expert Panel agreed that:

- The academic experts would look at the published literature and investigate special focus areas.

- The academic experts would identify any issues that may have arisen in the research since the publication of RPS3.
- ARPANSA would identify special areas of investigation for the academic experts.
- The relevant expert would also look at dosimetric issues that have arisen since the publication of RPS3.

b. On 27 September 2012 to discuss special focus areas and to plan the final report. The Expert Panel agreed on:

- A set of findings based on the assessment of the scientific evidence.
- The structure of the final report.

2.2 RF Literature Database

Prior to the formation of the Expert Panel, ARPANSA collected studies on RF and health-related outcomes published since the year 2000. The methods employed by ARPANSA in identifying the studies are described in detail in Appendix 5. The RF literature database assembled by ARPANSA includes 1354 studies with health/biological outcomes from January 2000 till August 2012 (298 epidemiological, 238 human/provocation, 453 in vivo and 365 in vitro). The database also includes 72 major reviews or specialist reviews on in vivo/in vitro research published during that period. The academic experts in the panel were not restricted to considering the studies collected by ARPANSA and were able to take into account any other studies.

2.3 RF Literature Summaries

Summaries on the epidemiological and human/provocation research were prepared by ARPANSA staff in order to assist the experts in the panel representing these particular areas of research. Due to the wide range of specialised research topics found within the published in vivo and in vitro research, similar summaries were not prepared by ARPANSA staff. Instead, ARPANSA collected in vivo/in vitro summaries prepared for health authorities or for peer-reviewed journals by expert individuals or group of scientists and made these available to the academic experts in the panel.

3. Expert Panel Assessment

This review has been prepared to advise ARPANSA on the current scientific knowledge and its relevance as interpreted by the members of the Expert Panel.

The detailed individual Expert assessments are provided in the later sections, but in summary, in the specific areas studied, the Experts found:

IN VITRO/IN VIVO RESEARCH

While in vitro/in vivo studies give indications of some effects, these often appear to occur at levels higher than typical exposures or relate to subtle biological effects not necessarily related to disease, and with effects to date that are not apparently replicable. Accordingly, based on the in vitro/in vivo research, there is no evidence of a need for the reconsideration of the exposure limits in RPS3.

Since 2000, there have been a number of nationally and internationally-funded research programs in relation to the safety of mobile telecommunications, many having an in vitro/in vivo component. Many of the research topics continue the issues discussed in Annex 4 of RPS3 and have been informed to a certain extent by the World Health Organization (WHO) RF Research Agendas (the most recent being WHO, 2010). In addition, there have been some significant advances in the study of possible mechanisms for non-thermal effects as well as bioeffects and applications of millimetre waves and terahertz radiation. There are clearly new topics of research which need consideration and views formed on whether the newer evidence strengthens the summaries presented in RPS3 or otherwise. Although the papers published since 2000 would appear roughly balanced (47% 'effect'; 53% 'no effect'), this does not take into account such considerations as: publication bias; internal consistency; methodological weakness or dosimetric rigour.

Most discipline-based reviews conclude thermal effects to be adequate to explain the observed data. Overall, it seems unlikely that there is any need to revise the conclusion that the Basic Restrictions should be based on thermal effects and electrostimulation. However, the rationale for a precautionary approach may need to be clarified in light of the growth in the body of knowledge over the last 10 years.

HUMAN PROVOCATION RESEARCH

Numerous studies since 2000, employing both self-reported hypersensitive individuals and healthy human volunteers, have investigated a range of effects (such as cognitive effects, cardiovascular effects, subjective symptoms etc) from RF exposure and predominantly mobile phone use and these are summarised by various major reviews (e.g. ICNIRP, 2009; SCENIHR, 2009; AGNIR 2012). There is no human provocation evidence from any of the major reviews that raises any doubt about the adequacy of the limits described in RPS3. Further, there is no additional human provocation research that demonstrates that the RPS3 limits are inadequate for protecting humans. It is noted that this research is mostly limited to healthy young adults, which raises the possibility that other groups (e.g. children, the elderly and the ill) may not be represented by this research. However no evidence or argument is given suggesting that such populations may be differentially affected by RF fields.

Therefore, based on the human provocation research, there is no evidence of a need for the reconsideration of the exposure limits in RPS3.

DOSIMETRY

Examination of the dosimetry research confirms that the RPS3 Basic Restrictions and Reference Levels continue to provide high levels of protection against the known thermal effects.

The development of realistic digital models of the human anatomy (phantoms) for a variety of body sizes (including newborn infants) represents a major advance in RF dosimetry in the last decade. Research utilising this improved dosimetry has not identified any health effects associated with exposures within RPS3. However, there is growing evidence that the limits for exposure from a distant source on electric and magnetic fields in RPS3 are not as conservatively formulated in some frequency range as was earlier thought and that while there are no likely health impacts, the safety margins built into the RPS3 exposure limits, in some frequency ranges for certain body sizes, may not be as conservative as originally thought.

In addition, there is the question of whether the localised deposition of RF energy in living tissue, the basis for the exposure limits of RPS3, continues to be an accurate predictor of local temperature rise in living tissue and hence of the degree of protection against biochemical changes, such as denaturation or proteins, changes in cell processes and other adverse thermal effects.

EPIDEMIOLOGY

Since the publication of RPS3 in 2002, there have been many epidemiological publications examining cancer/non-cancer outcomes and RF exposure, especially those associated with mobile phone use. Although the epidemiology in the past decade has improved our understanding of the limitations of exposure assessment and the likely extent of RF exposure to humans, the epidemiology of exposures to RF electromagnetic fields has not progressed with any dose-response relationships regarding carcinogenic and non-carcinogenic effects which would warrant significant changes to RPS3.

4. Findings

The following are the findings agreed by the Expert Panel. The more detailed rationales for how the Expert Panel decided on these findings are presented in the following Section 5 – 9.

Overall findings

1. Since the preparation of RPS3 there have been significant advances in the science.
2. The examination of the science in this area from January 2000 till August 2012 by the Expert Panel indicates that the Basic Restrictions of RPS3 are still valid for protection against known adverse effects.
3. Advances in numerical dosimetry suggest that under certain circumstances, RPS3 Reference Levels are not as conservative, relative to the Basic Restrictions, as originally thought. However, there is no evidence that this marginal difference in conservatism impacts on health in relation to RPS3.
4. The rationale and current text in RPS3 no longer accurately represents, in all respects, the current state of scientific understanding and needs to be brought up to date.
5. The RPS3 annexes, describing the significance of various research studies, no longer accurately represent, in all respects, the current state of scientific understanding and needs to be brought up to date at some stage.
6. The uncertainty about the absolute safety of exposures below the current RPS3 limits remains and consideration should be given whether the existing precautionary minimisation requirements of RPS3 address those uncertainties.

PART 2

5. Expert Assessment of In vitro/in vivo research

Prof. Andrew Wood

This section examines in vitro/in vivo research and notes that while in vitro/in vivo studies give indications of some effects, these often appear to occur at levels higher than typical exposures or relate to subtle biological effects not necessarily related to disease, and with effects to date that are not apparently replicable. Accordingly, based on the in vitro/in vivo research, there is no evidence of a need for the reconsideration of the exposure limits in RPS3.

Since 2000, there have been a number of nationally and internationally-funded research programs in relation to the safety of mobile telecommunications, many having an in vitro/in vivo component. Many of the themes continue the issues discussed in Annex 4 of RPS3 and have been informed to a certain extent by the WHO RF Research Agendas (the most recent being WHO, 2010). In addition, there have been some significant advances in the study of possible mechanisms for non-thermal effects, bioeffects and applications of millimetre waves and Terahertz (THz) radiation. The most useful recent review is that of the HPA (AGNIR, 2012), which tabulates studies since 2003 under several headings as shown below (Y = effect; N = no effect):

5.1 In vitro

Topic	Y	N
Genotoxic effects	16	32
Proliferation/apoptosis	25	30
Gene expression	4	10
Stress response/ Heat Shock Protein	4	17
Intracellular signalling	1	3
Membrane effects	17	4
Direct effect on proteins	15	1

It is interesting to note that the first five of these topics represent issues which have had a history of concern, stretching back to the period covered by RPS3 Annex 4. The last two represent the application of more recently developed techniques and may represent a publication bias. The Australian study on sperm motility (De Iuliis et al., 2009) is one that has captured some media attention and in common with many recent in vitro experiments reporting RF effects have pointed to the production of Reactive Oxygen Species (ROS) as a possible link between RF exposure and adverse bio-effects. However, the putative link between RF energy and altered ROS production remains tenuous. The work of several research groups, including that at Oxford University, on the possible role of retinal cryptochromes and associated free radical lifetimes in avian magneto-reception continues to provoke debate (Solov'yov and Schulten, 2009),

the link with RF being via experimental data showing altered flight patterns in birds exposed to low MHz RF, supported by theoretical analysis (Henbest et al., 2004), (Timmel and Henbest, 2004). However, the relevance of this work to mobile telecommunications frequencies is unclear.

In view of the wide-spread use of MRI systems, it is important to pay attention to any reports of adverse effects associated with the RF exposure in these systems, including, for example, suggestions of genotoxicity (Lee et al., 2011).

In addition to the frequencies covered by the AGNIR report, there has also been considerable interest in the frequencies above 30 GHz and extending to the THz range. These frequencies are used in some types of airport scanner and are being investigated for medical imaging applications. A recent review by Ziskin (Ziskin, 2012) covers some of the work at millimetre waves, whereas there is a growing database of studies at THz.

5.2 In vivo

The AGNIR review (AGNIR, 2012) has also tabulated outcomes from over 100 studies involving exposure to live animals and the subsequent analysis of tissue, physiological function or behaviour for indications of biological effects at levels mainly relevant to human exposures. These are summarised below:

	Topic	Y	N
1.	Brain and Nervous Tissue effects		
1.1	Cell physiology, injury, apoptosis	21	17
1.2	Neurotransmitters	1	1
1.3	Brain electrical activity	3	2
1.4	Blood-brain barrier and microcirculation	4	8
1.5	Autonomic function	0	2
2.	Behaviour		
2.1	Spatial memory tasks	7	4
2.2	General Learning tasks	4	5
3	Endocrine system	3	5
4	Auditory function	4	7
5	Genotoxicity and mutagenesis	8	10
6	Tumour incidence: normal strains	1	4
7	Tumour incidence: tumour-prone strains	2?	3
8	Co-carcinogenesis	0	7
9	Implanted tumours	3?	0
10	Immune system and haematological system	5	3
11	Testicular function	8	5
12	Pregnancy and foetal development	9	10

Clearly, the outcomes of these types of experiments continue to be mixed, with no obvious explanation of why under almost identical exposure circumstances different results are obtained in different laboratories. There is a tendency for replication studies to fail to reproduce the RF-related effects in the original study.

Conclusion from in vitro/in vivo research

The AGNIR review covers the period from 2003 to approximately late 2011. The cut-off for the RPS3 Annex 4 review was 2000, so in any revisions of in vitro/in vivo reviews, there will be a need to add to the numbers shown above. There are clearly new topics of research which need consideration and views formed on whether the newer evidence strengthens the summaries presented in RPS3 or otherwise. Although the reports would appear roughly balanced (47% 'effect'; 53% 'no effect'), this does not take into account such considerations as: publication bias; internal consistency; methodological weakness or dosimetric rigour. Most discipline-based reviews conclude thermal effects to be adequate to explain the observed data. Overall, it would seem unlikely that there would be any need to revise the conclusion that the Basic Restrictions should be based on thermal effects. However, despite the growth in the body of knowledge over the last 10 years, the variability in the science supports the rationale for a precautionary approach.

6. Expert Assessment of Human/provocation research

Prof. Rodney Croft

6.1 Structure of Report

This report provides the details of the Author's judgement as to whether the current RF Human Provocation Science indicates that a reconsideration of RPS3 is warranted. It should be noted that the Author's judgement was not based on an analysis of every relevant paper in the literature, as that method was not viable given time constraints. Rather, the report provides the following:

- A consideration of RPS3's conclusions as to the state of RF Human Provocation science at the time of publication of RPS3 (6.4)
- A consideration of the conclusions of major reviews as to the state of RF Human Provocation science (6.5)
- A consideration of whether there are discrepancies between RPS3 and these current major reviews (6.6)
- Where any such discrepancies are identified, a consideration of whether these indicate that a reconsideration of RPS3 is warranted (6.7)
- A consideration of whether there is any further evidence (not considered by RPS3 or the current major reviews), that is relevant to the issue of reconsidering RPS3 (6.8).

6.2 Choice of expert bodies' reviews

As we do not have a classification system that permits one to include/exclude a document as an expert body review, a subjective decision was made that allowed the inclusion of what the Author believed to be the principle recent expert reviews with strong scientific grounding. These are:

- International Commission on Non-Ionizing Radiation Protection, ICNIRP (2009). Exposure to high frequency electromagnetic fields, biological effects and health consequences (100 kHz-300 GHz)
- Scientific Committee on Emerging and Newly Identified Health Risks, SCENIHR (2009). Health Effects of Exposure to EMF.
- Advisory Group on Non-Ionising Radiation, HPA (2012). Health Effects from Radiofrequency Electromagnetic Fields

6.3 Consideration of research not contained in RPS3 or expert bodies' reviews

ARPANSA provided a literature survey covering RF Human Provocation research (see Appendix 5). This list was consulted by the author to determine whether there were any research papers that were not considered in the above Expert Reviews (6.2), and if so, whether they provided sufficient grounds for a reconsideration of RPS3. Further, the author utilised his knowledge of the area more

generally to determine whether there were other research papers (not contained in either the Expert Reviews above or the ARPANSA literature survey), that impact on whether a reconsideration of RPS3 was warranted. Any such research papers were thus included in the author's evaluation of whether a reconsideration of RPS3 was warranted.

Further to this it is noted that there is a Report that has been widely cited in the RF Health debate, the BioInitiative Report (BIR, 2007). The BIR is not included as one of the Reports to be considered in the present Report, primarily because it does not count as an expert body review (rather, it is the opinion of one author only). However, all Human Provocation studies cited in the BIR, as well as the conclusions reached from these, are considered in this Report to determine whether they provide evidence that RPS3 requires reconsideration.

6.4 Consideration of RPS3 conclusions regarding human provocation studies

Unlike the present day, there was only a small body of research pertaining to the effect of RF exposure on humans using provocation designs at the time of RPS3 publication. This was summarised on page 90 of RPS3, where it was concluded that:

- No consistent effects of RF on sleep patterns has been demonstrated
- No effect of RF on pituitary hormone or melatonin production has been demonstrated
- No clinically relevant effects on cardiovascular function have been demonstrated (however, it was not stated whether effects not clinically relevant had been demonstrated).

It may be noted that mention was made of a report of an effect on cardiovascular function, but that as this was methodologically too limited to conclude that an effect of RF had occurred, this was (appropriately) not taken to represent an effect.

Thus no Human Provocation RF effects were reported in RPS3 below the occupational exposure limits, and corresponding to this there was no evidence reported that these limits were inadequate for ensuring safe human exposure.

A limitation of this conclusion may be that the small number of relevant Human Provocation studies raises the possibility that that there are RF health effects within the exposure limits that exist but that were merely not tested. Thus it is important to consider whether subsequent reviews have identified such evidence of harm.

6.5 Consideration of expert bodies' conclusions regarding human provocation studies

International Commission on Non-Ionizing Radiation Protection, ICNIRP (2009)

Due to the bulk of Human Provocation research conducted since RPS3, this review provided an extensive analysis of Human Provocation research (p222-272). The review groups research into the following somewhat arbitrary categories: Nervous System (electrical activity of the brain, auditory

and vestibular system, regional cerebral blood blow, cognitive performance, and subjective symptoms); Endocrine System (melatonin, and pituitary and other hormones); Cardiovascular Function & Thermoregulation (heart rate and blood pressure changes, and cardiovascular responses during thermoregulation). It provides a good coverage of the literature pertaining to these categories, and concludes the following.

Nervous System: It was concluded that there is some evidence for low-level RF (GSM) effects on the electroencephalograph (EEG), in terms of both resting alpha and sleep spindle activity. The qualification ('some evidence') refers to the evidence being strong, but not conclusive at this point, and is differentiated from the remainder of the Human Provocation research domains in that although they also report effects, when considered within the context of the literature as a whole, the remainder do not provide evidence for an effect (due to conflicting findings and methodological issues).

However, the review notes two important caveats. First is that the resting alpha findings have not been corroborated by the results from event related potential (ERP) studies. It is not clear to the Author why this would affect the resting alpha conclusions, as the relation between resting alpha and ERPs is far from clear, and research dedicated to addressing the interaction of RF, resting alpha and ERPs would be required to understand how any such relations might operate (and such research has not been conducted to date). Thus the Author does not believe that the resting alpha/ERP issue affects the tentative conclusion that RF affects resting alpha. The second caveat is that there is no indication that either the resting alpha or sleep spindle changes relate to health. This is important as it means that regardless of the certainty of the resting alpha and sleep spindle findings, there is no indication that this is relevant to RF standards. Thus for these findings to be relevant to RF standards, they would need to be shown to be relevant to health (or at least argued to represent a reasonable possibility for impaired health that has not yet been addressed). The Author is not aware of any such research showing that the alpha or sleep spindle changes relate to health, nor that there is a reasonable possibility that they would. Thus the Author agrees with the ICNIRP 2009 conclusion that these findings do not suggest limitations with ICNIRP Standards, nor correspondingly RPS3.

In terms of the other nervous system endpoints considered in the ICNIRP 2009 review, it is concluded that there is no evidence for any effects of RF. This includes a consideration of subjective symptoms from individuals who believe that they are adversely affected by RF, where although acknowledged that such individuals do indeed suffer ill health, it is concluded that there is strong evidence that this is not related to the RF per se.

Endocrine System: The only endocrine measure that was viewed as 'possibly' affected by RF, was melatonin, whereby one study reported a decrease in saliva melatonin following RF exposure. However, that was treated as very tentative given that a number of other studies have failed to identify such an effect, and thus merely a finding recommended as worthy of confirmation. Thus it was concluded that there is no evidence of effects of RF on the endocrine system, and the Author agrees with this conclusion.

Cardiovascular Function & Thermoregulation: The Review notes that although there have been some reports of RF effects on cardiovascular function, the majority of studies do not report an effect, and given the methodological problems associated with many of the studies, it concludes that there is no evidence that RF affects cardiovascular function.

The Review also considers the effect that RF-related temperature elevation may have on health. It fails to identify any evidence that low-level RF-related temperature changes affect health, only that levels far exceeding RPS3 can have such an effect. It does raise the untested possibility that RF-related temperature changes may affect cognition and thus accident rates, but does not identify any research demonstrating this. The Author views this as very unlikely as experimental research has failed to identify consistent impairment in cognition for core body temperature increases of less than 1 degree C, and there is evidence that RF exposure within RPS3 levels cannot increase core body temperature to this extent (if at all). Thus the Author views RF-related changes to thermoregulation as very unlikely to impact on health.

Conclusion from the ICNIRP Review, 2009

Overall, the Review does not find any Human Provocation evidence that RF levels within RPS3 impact negatively on humans. The Author believes that this is an appropriate conclusion given the available evidence. It further notes that this research is mostly limited to healthy young adults, which raises the possibility that other groups (e.g. children, the elderly and the ill) may not be represented by this research. However no evidence or argument is given suggesting that such populations may be differentially affected by RF. The Author believes that this evidence is sufficient to arrive at an informed conclusion, and that it does not suggest that there is evidence of RF-related harm below RPS3 levels.

Scientific Committee on Emerging and Newly Identified Health Risks, SCENIHR (2009)

SCENIHR 2009 is to be read as an update on the SCENIHR 2007 review, where it takes the 2007 conclusions as a starting point, and then considers whether any research subsequent to that review is relevant to human health. SCENIHR 2009 considers a wide range of Human Provocation research, but as it covers a broader range of frequencies and as it is only considering research subsequent to SCENIHR 2007, there is less detailed discussion of this RF literature than is provided in the ICNIRP 2009 review. The review groups Human Provocation research into the following somewhat arbitrary categories: Symptoms; Nervous System (behaviour and cognition, electrophysiological measurements, sensory related functions); & Miscellaneous Human. Although it is less clear than in the ICNIRP 2009 review which studies have been included in its deliberation, it is implied in the SCENIHR 2009 review that all relevant research since SCENIHR 2007 has been considered, and as the two contemporaneous Reviews' conclusions are similar, this provides some support for the view that it did in fact consider the appropriate literature. The Author believes that the SCENIHR 2009 review does arrive at appropriate conclusions given the literature at the time, where it concludes the following.

Symptoms: SCENIHR 2007 concluded that there was no evidence that individuals experienced symptoms as a result of RF, nor that they were able to detect the presence of RF. Extending from this, SCENIHR 2009 notes that there is a substantial difference in the results from double-blind versus open exposures in terms of symptoms, with only open exposure methods finding symptoms to be

related to exposure status. They conclude that this provides evidence for the nocebo effect, rather than RF playing a causal role in symptom provocation. Thus they conclude that there is currently no evidence that RF (within RPS3 levels) affects symptoms or the perception of exposure, within either healthy individuals or those reporting sensitivity to RF. This is consistent with the ICNIRP 2009 review conclusions, and the Author believes that this does represent strong evidence against the thesis that low level RF can cause the symptoms that have been reported by those who believe themselves to be sensitive to RF emissions.

Nervous System: SCENIHR 2007 concluded that there was no consistent evidence that low level RF affects behaviour and cognition (where cognition is measured behaviourally) or sensory processes, but that there was some evidence of RF-related changes to electrophysiological endpoints. SCENIHR 2009 concludes that subsequent research does not alter its conclusions in relation to cognition or sensory processes, however it strengthens its conclusions in relation to electrophysiological endpoints, noting that recent research indicates that RF does affect resting and sleep EEG (albeit noting the lack of demonstrable relevance of this to health). All of these conclusions are consistent with those of ICRNIRP 2009.

Miscellaneous Human: SCENIHR 2007 concluded that there was no evidence of other 'miscellaneous' health effects due to RF, and SCENIHR 2009 concluded that as no further research has been conducted, the 2007 conclusion is still valid.

Conclusion from SCENIHR 2009

Overall the SCENIHR 2009 conclusions are very similar to those of ICNIRP 2009. The Review does not find any Human Provocation evidence that RF levels within RPS3 impact negatively on humans. In particular, it finds that there is currently no evidence that RF (within RPS3 levels) affects symptoms or the perception of exposure, within either healthy individuals or those reporting sensitivity to RF, or behaviour, behavioural measures of cognition, nor sensory processes, but that there was some evidence of RF-related changes to electrophysiological endpoints that did not relate to health. The Author believes that this is an appropriate conclusion given the available evidence.

Advisory Group on Non-Ionising Radiation, AGNIR (2012)

AGNIR considers a wide range of Human Provocation research in their review that was published since their previous review (AGNIR, 2003), and groups Human Provocation research into the following somewhat arbitrary categories: Neurocognitive Effects (cognitive and performance studies, EEG and ERP, other neurophysiological studies, and auditory and vestibular studies); Symptoms; and Other (Non-Cancer) Studies (cardiovascular function). It provides a good coverage of the literature pertaining to these categories (reported in pages 205-264), and concludes the following.

Neurocognitive Effects: There are a large number of cognitive and performance studies that argue against the possibility that this domain is affected by RF exposure. Similarly, it is concluded that there is no evidence of an effect of RF on auditory and vestibular function. AGNIR 2012 also notes that there is a large number of resting and sleep EEG studies that report effects of RF, however, they argue that this body of research is not yet convincing, and that even if it was shown to occur, that there is no evidence that this relates to health. Thus its conclusion regarding this is similar to ICNIRP 2009 and SCENIHR 2009 in terms of its relevance to current RF standards (and thus RPS3), but less committal than both of these in terms of whether the reports of EEG effects are accurate. Although the Author's view regarding EEG are more closely aligned with that of ICNIRP 2009 and SCENHIR 2009, he agrees with the most relevant point of AGNIR 2012 (which concurs with that of ICNIRP and SCENHIR 2009), which is that there is no evidence that these results are relevant to current RF standards (and thus RPS3), and thus that they do not provide any justification for a reconsideration of RPS3.

Further, due to the greater body of recent research pertaining to the above effects on children and adolescents, unlike ICNIRP 2009 and SCENIHR 2009, AGNIR was able to consider whether there was any evidence that the 'developing brain' was more sensitive than the healthy adult brain to RF. AGNIR concluded that there was no evidence that it was, but noted that there is still a 'relative' paucity of research to base this conclusion on. The Author agrees with both of these points, and as such concludes that there is no data that shows that RPS3 may not be cautious enough when considering children and adolescents.

Symptoms: AGNIR concludes that there is now a substantial body of Human Provocation research pertaining to symptoms and exposure status, and that it does not provide evidence that either healthy controls or those reporting sensitivity to RF, are capable of detecting the presence of RF, or that they experience symptoms due to RF. Given the difference between results from double blind and open trials, they also conclude that the evidence suggests the possibility of a nocebo effect, rather than RF playing a causal role in symptoms. Thus they conclude that there is currently no evidence that RF (within RPS3 levels) affects symptoms or the perception of exposure, within either healthy individuals or those reporting sensitivity to RF. This is consistent with both the ICNIRP 2009 and SCENIHR 2009 conclusions, and the Author believes that this does represent strong evidence against the view that low level RF can cause the symptoms that have been reported by those who believe themselves to be sensitive to RF emissions.

Other (Non-Cancer) Studies: AGNIR concludes that there are number of well conducted studies addressing the issue of whether RF affects heart function, and that these provide strong evidence that there are no such effects. They note that one study has shown a likely increase in microperfusion of the ear due to RF, and that this is likely due to low level heating, but also note that there is no evidence that this relates to health. Thus they conclude that there is no evidence from cardiovascular research that RF affects health. This is consistent with ICNIRP 2009 and SCENIHR 2009, and the Author agrees with this conclusion and thus that this research domain does not provide evidence of inadequacies in RPS3.

Conclusion from AGNIR 2012

Overall the AGNIR conclusions are very similar to those of ICNIRP 2009 and SCENIHR 2009. The Review does not find any Human Provocation evidence that RF levels within RPS3 impact negatively on humans. In particular, it concludes that that there is no evidence that cognitive and performance measures of human function are affected by low level RF exposure (with a caveat being that there is uncertainty concerning EEG results, which are not relevant to health), that there is no evidence that either healthy controls or those reporting sensitivity to RF are capable of detecting the presence of RF or that they experience symptoms due to RF, and that there is no evidence that heart function is affected by low level RF exposure. The Author believes that this is an appropriate conclusion given the available evidence.

6.6 Discrepancies between RPS3 and recent expert bodies' conclusions

Only minor discrepancies were identified between the ICNIRP 2009, SCENIHR 2009 and AGNIR 2012 reviews. As described above, the most important of these is that ICNIRP 2009 and SCENIHR 2009 view the resting and sleep EEG findings as more conclusively demonstrated than does AGNIR 2012.

6.7 Do any discrepancies indicate a need for RPS3 reconsideration?

The only discrepancies between the three reviews considered were minor, and none suggest that there is any evidence of health-related effects within RPS3 levels. For example, although the reviews differ slightly in terms of how conclusive the demonstration of RF-related EEG effects is, they each conclude that there is no evidence that such an effect would be relevant to health. Thus the three reviews are in accord in concluding that there is no evidence that RPS3 levels can result in health effects.

6.8 Is there any missing evidence that impacts on conclusions reached in 6.7?

ARPANSA's Literature Review

The Author has considered the ARPANSA literature review, which is more inclusive than those of the three Reviews described above, and does not believe that it contains any research that invalidates the conclusions of those Reviews.

The Author's knowledge of the literature

The Author, being heavily involved in RF/Health research, has also considered whether there is any research beyond that described in the three Reviews and the ARPANSA Literature Review that may alter the conclusion that there is no evidence that RF exposure within RPS3 levels results in health effects. The Author is not aware of any such omitted research.

The BioIniative Report 2007 (BIR)

There is a clear discrepancy between the conclusions of the BIR and those of ICNIRP 2009, SCENIHR 2009 and AGNIR 2012, particularly in terms of conclusions reached from research concerning RF and brain tumours. However, in terms of human provocation research, essentially the same conclusions are reached as those from the Reviews considered above.

The BIR contains only one section on human provocation research (Section 9), which is authored by only one person (Henry Lai). Consistent with ICNIRP 2009 and SCENIHR 2009, Lai concludes that there is evidence that low level RF affects the human EEG, but consistent with these and AGNIR 2012 he also concludes that there is no human provocation research supporting the view that this represents harm. Beyond these points, he does not argue for evidence of any negative effect from low level RF on humans. Consistent with this, Section 1 of the BIR (authored by Cindy Sage), which states that it provides a summary of the various sections of the BIR, does not conclude that there is human provocation research that has demonstrated any negative health consequences from low level RF.

Thus although there are claims in the BIR that do relate to health, there is nothing concerning human provocation research that importantly contradicts the conclusions reached by ICNIRP 2009, SCENIHR 2009 or AGNIR 2012. The BIR thus does not provide any evidence that the current RPS3 limits may result in negative health consequences.

Conclusion from human provocation research

It is concluded that there is no human provocation evidence from ICNIRP 2009, SCENIHR 2009 or AGNIR 2012 that raises any doubt about the adequacy of the limits described in RPS3. Further, neither the BioInitiative Report (2007) nor the ARPANSA literature review provide any further evidence that mitigates against that conclusion, and to the Author's knowledge there is no additional human provocation research that demonstrates that the RPS3 limits are inadequate for protecting humans.

Thus the Author concludes that based on the human provocation research, there is no evidence of a need for the reconsideration of the exposure limits in RPS3.

7. Expert Assessment of Dosimetry

Prof. Andrew Wood

This dosimetry section examines the advances in computation of the deposition of radiofrequency energy within human tissue. This confirms that the RPS3 Basic Restrictions and Reference Levels continue to provide high levels of protection against the known thermal effects. It is noted that for some frequency ranges and body sizes, that while there are no likely health impacts, more sophisticated dosimetric calculations indicate that the Reference Levels may not provide as large a margin of protection as was originally thought.

The fundamental restrictions over most of the frequency range of current exposure standards apply to the rate of deposition of radiofrequency energy within human tissue (specific absorption rate, SAR). Since this quantity is relatively inaccessible, both in experimental situations and in practical compliance checking, measurements of the electric and magnetic fields (or equivalent flux of electromagnetic energy) external to the body are generally used to estimate, or infer, the SAR level.

For environmental exposures, where the incident radiation is relatively uniform, the exposure standards place limits on whole-body-average SAR (SARWB) which adds to the total amount of thermal energy the body must dissipate. While the human body has well developed thermal regulatory systems and can cope with large additional thermal inputs without undue temperature increases, these mechanisms have limitations and place a load on body systems that can lead to impacts including deterioration of work performance and other undesirable effects.

For exposures from transmitting equipment used very close to the body, or specialised occupational situations, the deposition of energy within the body can be very non-uniform and localised SAR and local temperature rises need to be controlled. Current standards permit localised SAR, as commonly defined as the average of 10 g of tissue (SAR10g) to exceed whole-body-average SAR by factors of 20 – 25, based on estimates that this will restrict localised temperature rises to less than 1° C.

The development over the last decade of more realistic numerical models of the human body (phantoms), derived modern imaging technologies, has greatly improved the reliability of the estimates of SARWB and SAR10g for given exposure situations and confirmed the conservatism of current Reference Levels in most circumstances. Phantoms have now been developed for a variety of body sizes (including newborn infants) and these use better estimates of the electrical properties of human tissue. These improved models allow better understanding of both the experimental studies that led to the formulation of current Basic Restrictions (SARWB and SAR10g) and of the derivation of limits on external fields (Reference Levels) that may be used to ensure compliance with the Basic Restrictions. Of special interest has been the examination of the assumptions made in deriving the values in the current standards for a wider range of body size, including, particularly, children.

Using these improved models, evidence is accumulating that the current Reference Levels are not as conservatively formulated for short-statured adults, or young children, including babies, as was earlier thought. In addition, the margin of conservatism between the Basic Restrictions (BRs) and situations in which an increase of regional body temperature rises above 1° C due to RF exposure

may also be less than previously estimated. The principal studies indicating possible shortcomings in the ICNIRP-derived Reference Levels relative to the Basic Restrictions are summarised below.

In a study in which thermal and electromagnetic models were combined, Bernardi et al., (2003) concluded that, in comparing BRs with thresholds for 'thermal damage', the safety factor for determining the Whole Body Specific Absorption Rate (SARWB) limit 'is reduced from 50 to 10 when local temperature increases are considered'. For example, at 40 MHz, the models predict increases of temperature in the ankle of 0.72° C for a 10g SAR of 3 W/kg with a plane wave power flux density (PFD) of 2 W/m^2. This would imply that, at the 4W/kg limb limit for the public, the temperature rise would be around 1°C. Since a 6° - 8° rise is the threshold for damage, the safety margin for this limb limit is small. At the occupational limit of 20 W/kg the safety margin is virtually non-existent. It should be noted that 40 MHz represents a resonant condition and similar temperature rises are not expected over the wider frequency range. In the region 1 – 10 GHz, Laakso (2009) has also noted that a SAR10g of 10 W/kg occurring in the brain (the occupational limit) can produce temperature rises of over 1°C, but the paper notes that this could be an over-estimation.

Conil et al. (2008) report a large variability in SARWB when considering six different anthropomorphic models (representing differing gender and ethnicity), with up to a 40% deviation from the mean. The study also reported that for the 5-year and 9-year old child models the SARWB was exceeded in the range 1.5 – 3 GHz for incident power flux densities at the ICNIRP limits of 10 W/m^2 above 2 GHz.

The possibility of exceeding the current Basic Restriction limits for exposures that meet current Restriction Levels has also been reported by the Health Protection Agency/University of Florida group (Dimbylow & Bolch, 2007; Dimbylow et al., 2010). They reported situations above 1.5 GHz with PFD levels below the Reference Levels producing SARWB up to 50% in excess of Basic Restriction limits and also marginally in excess at the respective resonant frequencies for children below 4 years of age. A PFD of around 6.63 W/m^2 (50 W/m) is suggested as being more appropriate above 1 GHz.

Dimbylow et al., (2010) reported that the current Reference Levels failed to provide adequate protection for newborns at resonance for certain polarisations (orientations of the electric field) in the region of 200 MHz, suggestive of a need to lower the PFD limits in this range. Further, the study of Uusitupa et al. (2010) has shown that even for small adults, certain polarisations in incident plane waves can lead to exceeding the SARWB limit, again suggestive of the need to lower RLs in the range 2 – 5 GHz. Recent work by Lee and Choi (2012) confirms the need to lower RLs in this range and also in the range 20 – 200 MHz.

Overall, the research cited above indicates that meeting current Reference Levels may not guarantee meeting of Basic Restrictions over all body sizes in some frequency ranges and that the safety margins provided by current Reference Levels may be lower than intended. The localised SAR in limbs may also lead to temperature rises larger than previously thought and the acceptability of this needs to be reviewed.

In addition to the work cited so far, there is a growing literature of SAR values associated with the RF component of MRI, including the effects of body morphology. This literature tends not to be reflected in RF dosimetry reviews and needs to be considered.

Conclusion from Dosimetry

While recent advances in numerical dosimetry have confirmed the conservatism of current exposure limits in most circumstances, the inclusion of a wider range of body sizes has produced strengthening evidence that the Reference Levels may not be providing the intended safety margins at some frequency ranges for certain body sizes. Further, there is also the question of whether the Basic Restrictions continue to be an accurate indicator of local rise in temperature, particularly in the limbs under resonant conditions and hence the degree of protection against protein denaturation and other adverse thermal effects. The Rationale and other sections of RPS3 could be revised to reflect the current state of knowledge in this area.

8. Expert Assessment of Epidemiology

Dr Geza Benke

When dealing with incidence and distribution of disease in human populations, if the dose-response relationship is weak then epidemiology is limited in its usefulness. The epidemiology regarding RF exposure can be dichotomized into carcinogenic effects and non-carcinogenic effects. The recent IARC review (Baan et al., 2011) perhaps best illustrates the current position on the carcinogenic effects of RF with the conclusion that there is limited evidence in humans, and RF was classified as 'possibly carcinogenic to humans'(Group 2B). There have been over a hundred epidemiological publications since the standard was published regarding cancer, other outcomes and RF exposure.

Despite many international collaborative efforts (Interphone, 2010), a clear dose-response relationship for the most important of the carcinogenic effects, brain cancer, has not been described. The lack of any consistent dose-response relationship is primarily due to the inconsistent results of the many case-control studies reported in recent years. Case-control studies suffer from many biases and confounders, so results from cohorts studies are considered more reliable. However, since the review of the epidemiological literature and publication of the current standard there have not been many cohort studies published. The heavily criticised Danish cohort study has been the largest and most extensive of these, but has not shown an association between mobile phone exposure and a range of cancers (Frei, 2011).

In addition to the inconsistent descriptive study results, there have not been any significant increases in the population rates for brain cancer in recent years (Larjavarra et al., 2011). It is reasonable to contend that it may yet be too early, given the long latency period for brain cancer, for an increase to be observed. However, the world population exposure has increased exponentially since the late 1990s and if RF exposure from mobile phones is carcinogenic then increased population rates should be observed in the very near future.

The findings for non-carcinogenic effects have mirrored those for the carcinogenic effects. For non-thermal exposure levels, there has been inconsistent evidence for cognitive function effects. Studies investigating possible cognitive function effects have not been able to describe a dose-response relationship and so have not been able to contribute to meaningful consideration of adverse effects.

The results of the environmental studies since the publication of the standard for broadcast transmitters and mobile phone base stations have also be inconsistent. Many of these studies were ecological or cross-sectional in design and were at best hypothesis generating. Limitations regarding the methods and interpretation of results have been well described elsewhere (ICNIRP, 2009).

Conclusion from Epidemiology

Although the epidemiology in the past decade has improved our understanding of the limitations of exposure assessment and likely extent of RF exposure to humans, it has not progressed with any dose-response relationships regarding carcinogenic and non-carcinogenic effects which would warrant significant changes to the current Standard.

9. Epidemiology – Literature Review

Dr Ken Karipidis

9.1 Introduction

Since 2000 epidemiological research has grown rapidly and in particular studies on mobile phones and cancer. We conducted a review of epidemiological studies published from January 2000 till August 2012 on RF and health.

All studies found during the literature search outlined in 2.1 were included, whether they have been peer-reviewed or not. Non-English-language papers were included in the review by extracting information from English abstracts. When abstracts of non-English publications were not available, the papers were still cited. Papers included, were all types of epidemiological studies (cohort, case-control, cross-sectional, ecological) as well as meta- and pooled analyses. Reviews, editorials, methodological papers (exploring exposure assessment, bias, confounding etc), case reports, letters or comments were not generally included although some of these were used in preparing this summary.

The papers found were classified into three main categories according to the source of the exposure, namely: (a) occupational exposure, (b) environmental exposure from transmitters, and (c) personal exposure from wireless devices.

9.2 Occupational exposure

The epidemiological studies on occupational exposure that have been published since 2000 have looked at a variety of health outcomes. However, nearly half of the studies are devoted to cancer outcomes.

9.2.1 Cancer

9.2.1.1 Cohort studies investigating a range of cancers

There were three large cohort studies, investigating a wide range of cancer outcomes in groups with potential RF exposure. The study by Morgan et al. (2000), conducted on Motorola employees in the US, was reviewed in the epidemiological annex of the 2002 ARPANSA Standard (ARPANSA, 2002). The study examined all major causes of mortality, with brain cancers, lymphomas, and leukaemias as a priori outcomes of interest. The study results did not suggest any general increased mortality risk, and showed no evidence of an increase in any specific cancers. Groves et al. (2002) updated an earlier study on mortality related to RF exposure (from radar) in a cohort of Korean War US navy technicians, as compared to other veterans deemed to be in low-exposure jobs. The results of this study also found that in general RF exposure had little effect on mortality due to cancer. However there was one possible exception with an increased risk of nonlymphocytic leukaemia in radar-exposed navy veterans restricted to only one of three highly exposed occupations (aviation electronics technicians). In the most recent cohort study, Degrave et al. (2009) investigated cause

specific mortality in Belgian military personnel who served in anti-aircraft radar units. The authors reported an increase in hemolymphatic cancers, although the results were based on small numbers.

There were a further three cohort studies investigating occupational RF exposure and cancer however these studies were of lower quality. Richter et al. (2000) reported increased cancer morbidity amongst radar technicians however the cohort included only 25 workers. In a study of the whole male population of military career personnel in the Polish army, Szmigielski et al. (2001) reported significantly higher morbidity rates in the group classified as exposed to RF fields for various cancers including brain tumours and leukaemias. However this study has been heavily criticized for its methodological inadequacies, for example, the study used more sources of exposure information for cancer cases than for non-cancer subjects and was analysed improperly (Ahlbom et al., 2004). Another cohort study by Soleneva et al. (2004) reported no overall mortality risk amongst TV workers but showed increased mortality risk for malignancies of some locations; however this study was published in Russian and methodological details could not be discerned from the English abstract.

9.2.1.2 Case-control studies investigating specific cancers

There were several case-control studies of specific cancer sites, investigating occupational RF exposure. De Roos et al. (2001) found no statistically significant association between parental occupational exposures to RF and the incidence of neuroblastoma in offspring. In the same year Stang et al. (2001) reported an increased risk of ocular melanoma in subjects with self-reported occupational exposure to RF and Fabbro-Peray et al. (2001) reported excess risk of non-Hodgkin lymphoma among radio operators. Baumgardt-Elms et al. (2002) found no association between people that worked in close proximity to RF emitters and testicular cancer. In a nested case-control study Kliukiene et al. (2003) found no statistically significant excess breast cancer risk among female radio and telegraph operators. In two fairly recent studies, Karipidis and co-workers showed no significant associations between RF exposure (assessed using a job-exposure matrix) and glioma and non-Hodgkin lymphoma (NHL) (Karipidis et al., 2007a, 2007b). Berg et al. (2006) and Samkange-Zeeb et al. (2010) used subjects that participated in the German part of the INTERPHONE project (which will be discussed later) to assess whether occupational exposure was associated with brain tumour; no significant association was found. Similarly, Baldi et al. (2011) found no association between occupational RF exposure and brain tumours.

9.2.1.3 Occupational studies based on job-title alone

There were also 3 studies analysing collected data sets on cancer incidence or mortality, in which risks of cancer were assessed in relation to job title with a presumed exposure to RF but also other physical or chemical agents. Ballard et al. (2000) investigated cancer incidence and mortality among flight personnel by conducting a meta-analysis of cohort studies. The authors reported an increased risk associated with flight personnel for several types of cancer. In investigating non-Hodgkin lymphoma and occupation, Cano and Polan (2001) reported excess risk among telecommunications workers. However, the lack of individual information on level and duration of exposure weakens any causal inferences derived from these studies.

Conclusion from occupational studies on cancer

In general, the studies investigating occupational exposure to RF and cancer since 2000 continue to show inconsistent results and have not greatly improved on the methodological problems of older studies. A major limitation in the occupational studies continues to be poor exposure assessment. None of the three large cohort studies improved on the information collected on exposure from older cohort studies. Some of the more recent case-control studies have improved on exposure assessment by using sophisticated job-exposure matrices however exposure misclassification is not eliminated. The continuing issue of adequate exposure assessment combined with other methodological limitations inhibits any firm conclusions from the occupational cancer studies to date.

9.2.2 Other (non-cancer) health outcomes

Occupational studies have also investigated a variety of outcomes other than cancer. In a retrospective cohort, Degrave et al. (2005) found no increase in all-cause mortality in military personnel who were in close contact with radar equipment. In an extended follow up of the same cohort, Degrave et al. (2009) found no increase in mortality from other specific diseases[2].

9.2.2.1 Reproductive effects

Several studies since 2000 have investigated a wide range of potential reproductive consequences of occupational RF exposure, although results have been largely inconsistent. In a cross-sectional study, Grajewski et al. (2000) reported minor semen quality and hormonal differences between RF dielectric heater operators and an unexposed control group. In a case-control study of female physiotherapists, Lerman et al. (2001) reported an association between exposure to RF short-waves and harmful effects on pregnancy outcomes, specifically low birth weight. In contrast, in a cross-sectional study, Cromie et al. (2002) found reduced incidence of congenital malformations and miscarriage in physiotherapists.

Several studies have investigated reproductive outcomes in people working with radio communications equipment, primarily in the military. In a case-control study investigating male infertility factors in the French military, Velez de la Calle (2001) found no significant association with RF exposure. A series of Chinese cross-sectional studies reported effects on male fertility and sexual function in radar operators (Liu et al., 2003; Ding et al., 2004; Yan, 2007; Ye, 2007). There have been four Norwegian studies conducted on naval personnel; three cross-sectional studies included Mageroy et al. (2006) who reported a higher risk of congenital anomalies in the offspring of personnel who served aboard a missile torpedo boat and Baste et al. (2008) and Mollerlokken and Moen (2008) who showed an association between working with RF equipment and radar and reduced fertility. The fourth study was a cohort of Navy servicemen that showed an association with serving aboard fast patrol boats with an increased RF exposure and adverse pregnancy outcomes (Baste et al., 2012).

[2] There was an increase in hemolymphatic cancers as mentioned earlier.

Finally, two studies have examined reproductive outcomes in the general working population; in a retrospective cohort study, Mjoen et al. (2006) found no link between paternal occupational exposure to RF and risk of adverse pregnancy outcomes, and in a case-control study investigating various physical or chemical occupational exposures and semen quality, De Fleurian et al. (2009) did not find an association with RF fields. Generally, possible adverse effects of occupational RF exposure and reproductive outcomes have remained unsubstantiated suffering from similar methodological problems as in the cancer studies where exposure assessment limitations prevent any firm conclusions. These results do not change the conclusions of the pre 2000 studies which were mainly based on investigations with physiotherapists and military personnel and also showed little consistency (ARPANSA, 2002; Ahlbom, 2004).

9.2.2.2 Cardiovascular effects

A number of mainly cross-sectional studies have investigated cardiovascular effects related to occupational RF exposure. Tikhonova in two separate studies reported a higher risk of cardiovascular disease in personnel working at a civilian aircraft radar-tracking system (Tikhonova, 2003; Tikhonova and Rubtsova, 2004). Wilen et al. (2004) reported lower heart rate and more episodes of bradycardia in RF welding operators compared to controls. The same authors reported changes in heart rate variability associated with RF exposure in a study using the same subjects (Wilen et al., 2007). Bortkiewicz et al. (2003) reported changes in the circulatory system of radio and TV broadcast workers and also found a significant relationship between blood pressure and neurovegetative regulation disorders and exposure parameters. Investigating a similar occupational group Vangelova et al. (2006) found that blood pressure and cholesterol were higher in radio and TV station operators compared to controls. Higher cholesterol levels were also reported for physiotherapy staff compared to controls by Israel and Ivanova (2007).

Although the above studies investigating cardiovascular effects have shown positive associations with occupational RF exposure, these studies were cross-sectional which by themselves cannot infer causation. The three large cohort studies by Morgan et al. (2000), Groves et al. (2002) and Degrave et al. (2009) mentioned earlier reported no association between occupational RF exposure and cardiovascular mortality. In addition a smaller cohort study by Solenova et al. (2004) also exhibited lower mortality rates associated with cardiovascular disease among TV workers.

9.2.2.3 Genetic effects

Since 2000 a small number of cross-sectional studies of cytogenetic biomonitoring in workers exposed to RF have been published (Lalic, 2001, radio-relay station workers; Magdy, 2002, engineers and air traffic controllers; Maes, 2006, radio engineers; Garaj-Vrhovac, 2009, 2010, radar workers). The studies on genetic effects have been reviewed by Verschaeve (2009). All of these studies show a relationship between occupational exposure to RF and genetic damage (e.g. chromosomal aberrations). However all of these studies have numerous methodological limitations including poor study design, lack of exposure assessment and limitations due to confounding and bias.

9.2.2.4 Other (non-cancer) effects

Pak et al. (2001) reported haematological and cytochemical effects in workers servicing radio communications equipment. Wilen et al. (2004) did not find a significant difference between RF operators and controls in the prevalence of subjective symptoms such as fatigue, headaches, and warmth sensations in the hands. In two separate studies, Vangelova et al. did not find any variation in the melatonin levels of TV station operators, although there was a change in the excretion rates of stress hormones when compared to controls (Vangelova et al., 2002; Vangelova et al., 2005). In another study conducted on people working in broadcasting stations, Oktay et al. (2004) reported higher hearing thresholds for these workers. A study investigating various health parameters by Yuan et al. (2004) found that low intensity VHF fields can decrease the nervous system function in occupationally exposed personnel and induce increase in specific enzymes and immunoglobulins. Tuschl et al. (2000) reported no substantial overall suppressive effect in immune parameters in workers using induction heaters (most of which included frequencies in the very low-frequency, VLF, range of 3–30 kHz), compared with controls.

Although there were some pre 2000 studies investigating possible associations between occupational RF and cataracts there were no post 2000 studies published for this health outcome.

Conclusion from occupational studies and other (non-cancer) health effects

Overall the literature regarding occupational RF since 2000 provides little evidence of an association with other (non-cancer) health effects.

9.3 Environmental exposure from transmitters

A variety of epidemiological studies investigating environmental exposure from transmitters (including radio, television, microwave, and mobile telephone communications) and health have been published since 2000.

9.3.1 Cancer

9.3.1.1 Broadcast transmitters

Some of the studies since 2000 have investigated the incidence of cancer near radio or TV transmitters. Cooper et al. (2001) updated the earlier studies by Dolk and co-workers of cancer incidence around the Sutton Mast radio and TV transmitters in the UK (Dolk, 1997a & 1997b). They used more recent cancer data to re-analyze cancer incidence around the transmitters and found no significant associations. However, in a similar study, Michelozzi et al. (2002) reported excess childhood leukemia in a population living near the high-power radio transmitters of 'Vatican Radio'. Similarly, Ha and co-workers, in two separate studies investigating cancer incidence within 2km of AM radio transmitters showed increases in some cancers, including childhood leukaemia, but not other cancers (Ha et al., 2003; Park et al., 2004). A correlation between melanoma incidence and the number of FM transmitters was reported by Hallberg et al. in three separate (but very similar) studies

(Hallberg et al., 2002, 2004, 2005). Hocking and Gordon (2003) updated an earlier study (Hocking et al., 1996) to show an association between residential proximity to TV transmitters and decreased survival among cases of childhood leukeamia in North Sydney, Australia. An update of an earlier study on tumour data for residential areas in the vicinity of the Lookout Mountain transmitters in the US found a persistent elevation of brain tumours (CDPH, 1999, 2004). Finally Preece et al. (2007) found no excess cancer in three villages in the vicinity of military antennas. Most of the above studies were ecological in design[3] , lacking any information on individual subjects so it is difficult to draw firm conclusions from these results (e.g. individual RF exposures are not necessarily related to distance).

There have also been three case-control studies that have investigated broadcast transmitters and cancer. Ha et al. (2007) reported an increased leukaemia risk for children living within 2km of AM broadcast transmitters; there was no excess risk for brain cancer. However, two recent case-control studies (Merzenich et al., 2008; Schmiedel et al., 2009) showed no elevated risks of childhood leukaemia associated with living within 2km of radio and TV transmitters.

9.3.1.2 Mobile phone base stations

A limited number of studies have investigated exposure from mobile phone base stations (no studies were reported prior to 2000). Four ecological studies reported higher cancer incidence in the vicinity of base stations (Eger et al., 2004, 2009; Wolf and Wolf, 2004; Dode et al., 2011). However two other ecological studies found no elevated cancer incidence in municipalities with mobile phone base stations (Meyer et al., 2006; Stewart et al., 2012). In a cross-sectional study, Yildirim et al. (2010) reported no difference in measures of carcinogenesis (micronucleus frequency and chromosomal aberrations) between people living close to base stations and healthy controls. It must be noted that a study by Oberfeld (2008)[4] showing a significant cancer incidence with regard to timing and location in the area around a base station was withdrawn amidst reports that the base station cited in the paper did not in fact exist[5]. In a review of base stations and health consequences, Valberg et al. (2007) noted that given the random nature of the distribution of cancers in the population, it is not surprising, statistically, that cancer clusters should appear. Valberg et al. also pointed out that given the ubiquity of base stations in the community, one would expect that a base station being near existing cancer clusters is a likely occurrence.

The most recent work on base stations and cancer has been three case control studies. Spinelli et al. (2010) found that residing less than 500 m to base stations was associated with a statistically significant decreased risk for brain tumour. In a large case control study Elliott et al. (2010) reported no association between risk of early childhood cancers and estimates of the mother's exposure to mobile phone base stations during pregnancy. Finally in a study that investigated both base stations and broadcast transmitters Atzmon et al. (2011) found no apparent trend in overall cancer risk to be associated with proximity to any type of transmitters.

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[3] The study by Preece et al. (2007) was cross-sectional design.

[4] http://www.powerwatch.org.uk/news/20080325_oberfeld_study.pdf.

[5] http://www.fmk.at/Medien/FMK-Presseaussendungen/2009-(1)/FMK-Krammer--Mobilfunk-ist-in-Osterreich-Trumpf?lang=en-US.

Conclusion from studies investigating transmitters and cancer

Overall, the post 2000 epidemiological research on environmental RF exposure from transmitters and cancer does not provide adequate evidence for a possible association and has not improved on the inconsistencies of the pre 2000 studies. The studies are hampered by many methodological limitations such as diverse exposure sources, poorly estimated population exposures, and selective investigation in response to cluster concerns.

9.3.2 Other (non-cancer) health outcomes

9.3.2.1 Mobile phone base stations

There were no studies prior to 2000 that investigated environmental exposure from transmitters and outcomes other than cancer. However, since 2000, a number of cross-sectional studies on the occurrence of subjective symptoms and well-being in relation to RF exposure from mobile phone base-stations have been published. Several of these have reported a range of symptoms related to well-being of people living in the vicinity of base stations (Santini et al., 2002a, 2003[6] ; Navarro et al., 2003; Oberfeld et al., 2004[7] ; Hutter et al., 2006; Gadzicka et al., 2006; Abdel-Rassoul et al., 2007; Blettner et al., 2009; Eger and Jahn, 2010; Kato and Johansson, 2012). However, there have also been studies that have not found an association between living close to base stations and subjective symptoms (Eltiti et al., 2007[8] ; Thomas et al., 2008a; Berg-Beckhoff et al., 2009; Kuhnlein et al., 2009; Breckenkamp et al., 2010; Mohler et al., 2010, 2012; Roosli et al., 2010; Baliatsas et al., 2011; Frei et al., 2012). A noteworthy study by Augner et al. (2009) found that people living within 100m of a base station (self-proclaimed) were more psychologically strained than others whilst there was no difference in EMF-related health concern. A more recent study reported a correlation between subjective symptoms and residential distance to base stations but no correlation with measured electric field strength (Bortkiewicz et al., 2012). The ICNIRP (2009) review suggested that studies of symptoms and well-being find a higher prevalence of symptoms among people who are concerned about exposure from base-stations, whereas there is little evidence for an association between measured RF levels and the studied outcomes.

There were only two studies on mobile phone base stations which investigated effects other than subjective symptoms. In a cross-sectional study, Buchner and Eger (2011) reported modification of clinically important neurotransmitters in participants living close to a base station. In another cross-sectional study, Eskander et al. (2012) reported effects on the hormone levels of people living within 500 m of a base station.

[6] The 2002a and 2003 papers by Santini present the same data.
[7] The study by Oberfeld et al. (2004) is a reanalysis of the results by Navarro et al. (2003).
[8] The study by Eltiti et al. (2007) investigated both mobile phone and broadcast antennas.

9.3.2.2 Broadcast transmitters

There have been some cross-sectional studies that have investigated broadcast transmitters and outcomes other than cancer (none pre 2000). A series of three Italian studies reported immune system effects (reduced cytotoxic activity) in women that lived in the vicinity of radio and TV antennas compared to a control group (Del Signore et al., 2000; Boscolo et al., 2001, 2006). Abelin et al. (2005) showed sleep disturbances in people living in the vicinity of a short-wave broadcast transmitter. In a follow up study, Altepeter et al. (2006) showed that sleep quality improved once the short-wave transmitter was shut down, however the authors noted that since blinding of exposure was not possible this may have affected the outcome. More recently Clark et al. (2007) reported increased estrogen metabolite excretions among postmenopausal women residing near radio and television broadcasting transmitters. Preece et al. (2007) reported no association between specific illnesses and military antennas; although there was heightened risk perception and a considerable excess of migraine, headache and dizziness, which the authors attributed to the visibility of the transmitters and not the RF. Finally in a large study Mohler et al. (2010) showed impairment of subjective sleep quality due to exposure from various RF sources including broadcast antennas.

9.3.2.3 All transmitters

A recent meta-analysis of epidemiological studies investigating subjective symptoms included all types of transmitters (Baliatsas, 2012). The authors reported no association between RF transmitters and subjective symptoms.

Conclusion from studies investigating transmitters and other (non-cancer) outcomes

Overall, the cross-sectional studies on environmental RF exposure from transmitters have not produced convincing evidence for an association with subjective symptoms or other (non-cancer) health effects. There are a number of methodological limitations in cross-sectional studies including poor exposure assessment and reporting bias related to the effects studied.

9.4 Personal exposure from wireless devices

This category mainly focuses on exposure from mobile phones but also includes cordless phones and other wireless devices. Although published research on mobile phones and health was limited prior to 2000 the rate of publication has increased in the last decade. The vast majority of epidemiological studies published since 2000 have focussed on mobile phone exposure.

9.4.1 Cancer

As with occupational exposure and environmental exposure from transmitters, the majority of studies involving mobile phones have concentrated on cancer outcomes and in particular brain tumours.

9.4.1.1 Cohort studies investigating a range of cancers

There has been one large cohort study with three follow up analyses investigating mobile phone use and a variety of cancers in Denmark. In 2001, Johansen et al. reported no association between mobile phone use and increased risk of any types of cancer. In an extended follow up of the same cohort, Schuz et al. (2006a) also found no evidence for an association between cancer risk and mobile phone use among either short-term or long-term users. Using and extending the same cohort Frei et al. (2011) and Schuz et al. (2011) more recently reported that they found no evidence that mobile phone use was related to malignant and benign brain tumours, respectively. In the Danish cohort study, mobile phone subscription records were used as a surrogate for mobile phone use and this could have resulted in considerable misclassification of exposure (Baan et al., 2011).

9.4.1.2 Case-control studies investigating brain tumour

There have been several case-control studies specifically looking at the association between mobile phone use and brain tumours due to the relative rarity of the disease. These studies experience severe limitations with exposure assessment because of their reliance on personal recall of cases and controls of their mobile phone use (Bondy et al., 2008). Four hospital-based case-control studies failed to find any associations between mobile phone use and acoustic neuroma, meningioma, glioma or combined tumours (Muscat et al., 2000; Inskip et al., 2001; Muscat et al., 2002; Warren et al., 2003). However, as noted in a review by Croft et al. (2009), the use of hospital controls may overmatch for exposure, and may be unrepresentative of the general population in other ways that makes it difficult to identify a relationship.

The majority of case-control studies on mobile phone use and brain tumours have been population-based and can be divided into 2 main groups: (a) the INTERPHONE studies and (b) the studies by Hardell and co-workers (some of which have also included use of cordless phones).

9.4.1.3 The INTERPHONE studies

The INTERPHONE project which was coordinated by the International Agency for Research on Cancer was a multi-national series of population based case-control studies (from 13 different countries including Australia) investigating mobile phone use and the associated risk of various cancers in the head and neck. The INTERPHONE studies were based on a common core protocol to enable valid data pooling. The study included approximately 2765 gliomas, 2425 meningiomas, 1121 acoustic neuromas, 109 malignant parotid gland tumours and 7658 controls making it the largest epidemiological study of these tumours to date (Cardis et al., 2007).

Many of the INTERPHONE country centres published their own results, showing no overall association between mobile phone use and head and neck cancer (Christensen et al. 2004, 2005; Hepworth et al., 2006; Hours et al., 2007; Klaeboe et al., 2007; Lahkola et al., 2007, 2008; Lonn et al., 2004a, 2005, 2006; Sadetzki et al., 2007; Schlehofer et al., 2007; Schoemaker et al., 2005; Schuz et al., 2006b; Takebayashi et al., 2006, 2008). However some of the studies reported a small association with acoustic neuroma and glioma for prolonged (more than ten years) ipsilateral mobile phone use. Although these findings may be causal, it is also possible that they are artifactual due to recall bias of phone use and other methodological limitations; these are described in detail by several authors (e.g Ahlbom et al., 2009; Kundi, 2009; Croft et al., 2009; Olsen, 2009).

Pooled analyses of the INTERPHONE studies for malignant brain tumours (glioma and meningioma) and acoustic neuroma showed no overall associations (INTERPHONE Study Group, 2010; 2011). There were suggestions of associations (most pronounced for glioma and acoustic neuroma) in the group representing individuals with the highest cumulative call time. Limitations of the methodology, included selection bias and recall bias preventing firm conclusions of causality being drawn from these observations, as mentioned above. A recent case-case study[9] used INTERPHONE data from 7 participating (European) countries to investigate the location of gliomas in relation to mobile phone use (Larjavaara et al., 2011). The study did not find that gliomas in mobile phone users are preferentially located in the parts of the brain with the highest radio-frequency fields from mobile phones. Contrary to these results another study which used INTERPHONE data from 5 participating countries (mainly non-European) showed increased risks for tumours in the most exposed part of the brain in those with prolonged mobile phone use (Cardis et al., 2011).

9.4.1.4 The Hardell studies

Hardell and colleagues have published a number of papers on wireless phone use and brain tumours since 2000 based on 3 original case-control studies performed in Sweden; some of which have been pooled analyses of the results (all relevant Hardell studies are listed in the Bibliography). Khurana et al. (2009) summarised the Hardell results as statistically significant positive associations between glioma/acoustic neuroma and analogue, digital and cordless phone use. The risks increased with latency period, particularly more than 10 years, and with cumulative mobile phone use more than 2000 hours. Although the Hardell studies are similar to the INTERPHONE studies there are subtle methodological differences which could account for the deviating results. Furthermore the Hardell group shows methodological variation within their own studies. In contrast, the INTERPHONE results originated from 8 independent research groups, which followed a common protocol. The Hardell group has also been criticised for the many re-analyses of the same dataset which may give rise to apparent raised risk estimates as a consequence of multiple testing (Health Protection Agency, 2012).

9.4.1.5 Other case-control studies on brain tumour

There have been recent case-control and case-case studies on mobile phones and brain tumours which are not part of INTERPHONE or the Hardell group. Gousias et al. (2009) investigated the use of mobile phones and other potential risk factors with mainly negative results; a positive association of severe cranial trauma was observed, but this association was not statistically significant. In a case-case study, Hartikka et al. (2009) reported increased glioma risk in the part of the brain most heavily exposed from mobile phones; although this result was limited by the small sample size. Two recent French studies by Spinelli et al. (2010) and Baldi et al. (2011) investigated various occupational and environmental risk factors for brain tumour and found no association with mobile phone use. Finally, in another case-case study, Sato et al. (2010) reported an increased risk of acoustic neuroma for mobile phone users with average call duration of more than 20 min/day.

[9] Tumour locations are compared.

9.4.1.6 Meta-analyses of brain tumour studies

There have been five major meta-analyses of brain tumour studies. The first by Lahkola et al. (2006) which combined results from 11 case-control and 1 cohort study found no overall association; although there was no latency analysis. Hardell et al. (2007, 2008) in a meta-analysis of 2 cohort and 16 case-control studies reported no overall association however there was a twofold increased risk of acoustic neuroma and glioma for more than 10 year ipsilateral phone use. Kan et al. (2008) combined 9 case-control studies to show only a marginal increased risk for greater than 10 year use. In a more recent meta-analysis, Hardell et al. (2009) included 11 case-control studies to again show increased risks of glioma and acoustic neuroma and ipsilateral phone use of more than 10 years. Finally Myung et al. (2009) in a meta-analysis of 23 studies also showed no overall association but reported a small increased risk for mobile phone use of 10 years or longer. It must be noted that the issue of heterogeneity and varying methodologies between different studies makes results from meta-analyses difficult to interpret (Croft et al., 2009). Much of this is addressed by the INTERPHONE pooled-analysis since all the studies used a similar methodology.

9.4.1.7 Ecological studies investigating brain tumour

Other research on mobile phones and brain tumours since 2000 includes several ecological studies that have compared temporal trends in brain tumour rates with the prevalence of mobile phone use. Cook et al. (2003) reported that incidence rates for malignancies arising in the head and neck have not changed since the introduction of mobile phones in New Zealand. Contrary to Cook's findings, Johannesen et al. (2004) reported that incidence rates of brain and central nervous system (CNS) tumours increased in Norway during the period 1970-1999; however the authors noted that this increase may be closely related to gender and age. Similarly Baldi et al. (2011) reported an overall increase in CNS tumour incidence in France from 2000 to 2007 although Kohler et al. (2011) did not find an increase in CNS tumours in the US from 1975 to 2007.

Looking at ecological studies specifically on malignant brain tumours, Lonn et al. (2004b) reported increases in the incidence in Nordic countries during the late 1970s and early 1980s, which coincided with the introduction of improved diagnostic methods. After 1983 and during the period with increasing prevalence of mobile phone users, Lonn et al. reported that the incidence remained relatively stable. Deltour et al. (2010) in a follow up study to Lonn et al. (2004b) showed no change in incidence rates in Nordic countries from 1998 to 2003; the authors mentioned that this would be the time when possible associations between mobile phone use and cancer risk would be informative with an induction period of 5 – 10 years. Several other studies have looked at the time trends of brain tumour with two finding an increase in the cancer incidence (Klaeboe et al., 2005; Lehrer et al., 2011) whereas other studies did not show an increase in incidence (Muscat et al., 2006; Roosli et al., 2007; de Vocht, 2011). In Australia, Dobes et al. (2011a,b) reported no overall increase in the incidence of primary brain tumours between 2000-2008 in New South Wales and the Australian Capital Territory; there was a significant increase in malignant brain tumours however this was largely due to an increase in the ≥65-year age group. Finally, a second follow up by Deltour et al. (2012) again showed no change in glioma incidence rates in Nordic countries from 2004 to 2008; in addition the authors performed simulations to show the risk increases seen in some case-control studies appear to be incompatible with the observed lack of incidence rate increase. Similarly, Little et al. (2012) reported stable incidence rates for glioma, between 1992-2008 in the US, which are not

consistent with the raised risks reported by Hardell for mobile phone use; although the authors noted that the incidence rates could be consistent with the modest excess risks in the Interphone study.

Looking at ecological studies specifically on acoustic neuroma, Nelson et al. (2006) found that trends in acoustic neuroma incidence in England and Wales did not lag behind trends in cell phone use in a correlated fashion. More recently Larjavaara et al. (2011) reported that the overall incidence of acoustic neuroma increased in all the four Nordic countries combined between 1987 and 2007, with marked differences between countries. However, the incidence rates more or less stabilised in the late 1990s, showing relatively stable incidence rates and even some decline after 2000. It must be noted that overall these ecological studies are limited in many ways and provide the least evidence for a causal association.

9.4.1.8 Studies on children

An important issue about mobile phone use and risk of brain cancer is the possible hazard to children. Only one study to date has included children, who are considered heavy users of mobile phones and may potentially be more susceptible to harmful effects. In a multicentre case-control study conducted in Nordic countries, Aydin et al. (2011) reported no association between mobile phone use and brain tumour in children aged 7-19 years; there was also no increased risk observed for brain areas receiving the highest amount of exposure. Another international multicentre study (called MOBI-KIDS) involving 13 countries, including Australia, is currently investigating mobile phone use during childhood and adolescence and later onset of brain tumours in people between the ages of 10 and 24 years (http://www.mbkds.net/news/press-release-11052009). Given the current lack of published literature, conclusions cannot be made on whether children are more susceptible than adults when using mobile phones.

Conclusion from studies investigating wireless phones and brain tumour

It is clear from the published literature that no overall increase in the risk of brain tumour or acoustic neuroma due to the use of wireless phones has been observed. There are some indications of an increased risk of glioma and acoustic neuroma in the sub-group with the heaviest use however methodological shortcomings prevent a causal connection. The long-term risk affecting individuals who report heavy use will require further research.

9.4.1.9 Salivary gland tumours

Several studies have investigated mobile phones and salivary gland tumours. Six case-control studies have not found an increased risk including studies by Auvinen et al. (2002), Hardell et al. (2004), Duan et al. (2011) and Soderqvist (2012) and the INTERPHONE studies by Lonn et al. (2006) and Sadetzki et al. (2008). However in an ecological study, Czerniski et al. (2011) reported that the total number of parotid gland cancers in Israel increased 4-fold from 1970 to 2006 (from 16 to 64 cases per year) whereas other major salivary gland cancers remained stable; the authors noted that

increased mobile phone use could be a factor (although mobile phone use prevalence was not reported). Similarly, in another ecological study de Vocht (2011) reported a 2-fold increase in parotid gland tumour incidence together with a dramatic increase in mobile phone subscriptions in England from 1986 to 2008.

9.4.1.10 Other head and neck cancers

Some studies have investigated mobile phones and other head and neck cancers, especially ocular melanoma. Johansen et al. (2002) in an ecological study reported no increasing trend in the incidence rate of ocular melanoma in Denmark, in contrast to the exponentially increasing number of mobile phone subscribers starting in the early 1980s; a similar result was reported by Inskip et al. (2003) in the US. A recent case-control study also found no association between mobile phone use and ocular melanoma (Stang et al., 2009).

For other head and neck cancer sites the case control study by Warren et al. (2003) showed no association with facial nerve tumours. Finally, the INTERPHONE case control study by Takebayashi et al. (2008) and the case control study by Schoemaker and Swerdlow (2009) showed no association with pituitary gland tumours.

9.4.1.11 Haematological cancers

Some case-control studies have specifically investigated haematological malignancies. Hardell et al. (2005) reported an association between T-cell NHL and the use of cellular and cordless telephones, however the result was based on small numbers; there was no association with B-cell NHL. Linnet et al. (2006) found no association between mobile phones and any type of NHL. Kaufman et al. (2009) in a study looking at various risk factors and leukaemia found no clear association with mobile phone use, but durations of use were relatively short. A more recent study found no increased risk for leukaemia (Cooke et al., 2010); there was an increased risk in people who used a phone for more than 15 years but this result was not statistically significant.

9.4.1.12 Other cancers

For any other type of cancer, Hardell et al. (2007) in a case-control study found no association between mobile/cordless phone use and testicular cancer even considering latency; no association was also found with place of keeping the mobile phone during standby, such as trousers pocket. In another case-control study the same authors reported no overall association between mobile/cordless phone use and malignant melanoma; however, there was a doubling of the risk for the most exposed area (temporal, cheek and ear) when using phones excessively (cumulative use > 365 hours) (Hardell et al., 2011b).

Conclusion from studies investigating wireless phones and other cancers

Overall, the studies investigating mobile phones and cancers other than brain tumour have generally not shown statistically significant increased risks, although the research for each specific cancer type is limited.

9.4.1.13 Other wireless devices

Since 2000, there has been only one study that has investigated a wireless device other than a mobile or cordless phone and cancer. Schuz et al. (2006c) used subjects from the INTERPHONE project in a case-control study to investigate RF exposure from base stations of DECT cordless phones and the risk of glioma and meningioma. The authors reported no increased risk although the study was limited due to the small number of exposed subjects.

9.4.2 Other (non-cancer) outcomes

9.4.2.1 Subjective symptoms

Numerous cross-sectional studies and surveys since 2000 have investigated the relation between mobile phone use and subjective symptoms such as headaches, tinnitus, dizziness, fatigue, sensations of warmth, sleep disturbance etc:

(Chia et al., 2000, headache; Oftedal et al., 2000, various symptoms; Sandstrom, 2001, various symptoms; Santini et al., 2002b, various symptoms; Wilen et al., 2003, various symptoms; Al-Khlaiwi and Meo, 2004, various symptoms; Roosli et al., 2004, various symptoms; Balik et al., 2005, ocular symptoms; Balikci et al., 2005, various symptoms; Herr et al., 2005, sleep quality; Szyjkowska et al., 2005, various symptoms; Meo and Al-Drees, 2005a, 2005b, hearing and vision symptoms; Schreier et al., 2006, various symptoms; Al-Khamees, 2007, various symptoms; Davidson and Lutman, 2007, hearing and vestibular symptoms; Mortazavi et al., 2007, various symptoms; Khan, 2008, various symptoms; Kucer, 2008, ocular symptoms; Soderqvist et al., 2008, various symptoms; Thomas et al. 2008a, 2008b, various symptoms; Korpinen and Paakkonen, 2009, various symptoms; Kumar, 2009, headache; Milde-Busche et al., 2010, headache; Mohler et al., 2010, sleep quality; Heinrich et al., 2010, various symptoms; Heinrich et al., 2011, various symptoms; Thomee et al., 2011, various symptoms; Suresh et al., 2011, hypertension; Munezawa et al., 2011, sleep disturbances; Frei et al., 2011, various symptoms; Chu et al., 2011, headache; Mortazavi et al., 2011, various symptoms; Kato and Johasson, 2012, various symptoms; Mohler et al., 2012, sleep quality; Bhargava et al., 2012, various symptoms).

The majority of these studies reported an association between subjective symptoms and mobile phone use. However such studies are highly susceptible to recall bias as outlined in the review by Ahlbom et al. (2004). A more recent review specific to subjective symptoms and exposure to RF by Roosli (2008) also asserts that the large majority of individuals who claim to be able to detect low level RF (electromagnetic hypersensitive, EHS) cannot do so under the double blind conditions of provocation studies. Four separate cross-sectional studies have shown that people that identify themselves as EHS report more symptoms compared to healthy individuals (Schuz et al., 2006d; Rubin et al., 2008; Landgrebe et al., 2009; Roosli et al., 2010). In another cross-sectional study Meg Tseng (2011) reported that people with psychiatric morbidity are more likely to report sensitivity to electromagnetic fields including mobile phone use. Furthermore a cross-sectional study by Johansson et al. (2010) reported a difference between people with symptoms related specifically to mobile phones and people with general EHS. Overall the cross-sectional studies on mobile phones and subjective symptoms are un-informative due to their numerous methodological shortcomings which are described in detail elsewhere (Health Protection Agency, 2012).

9.4.2.2 Cognitive effects

There have been a limited number of studies investigating cognitive outcomes since 2000. Three cross-sectional studies have assessed cognitive function in mobile phone users compared to non-users. Cao et al. (2000) reported that mobile phone use could affect reaction time. Lee et al. (2001) reported that mobile phones may have a mild facilitating effect on attention although the authors raised the possibility that mobile phone users may be naturally better at multiple tasking. Finally, Arns et al. (2007) also reported better executive function in mobile phone users which the authors stated may reflect more focused attention possibly associated with a cognitive training effect of mobile phone use. In a cohort study Ng et al. (2011) reported no effect of digital mobile phones on the cognitive function of older people (more than 55 years old).

Some cross-sectional studies have investigated wireless devices and cognitive effects in children. In an Australian study examining cognitive function in secondary school students, Abramson et al. (2009) reported that mobile phone use was associated with faster and less accurate responding to higher level cognitive tasks. However the authors noted that these behaviours may have been learned through the frequent use of a mobile phone. In a follow-up study that examined the same sample of secondary students one year after the original study by Abramson et al. (2009), Thomas et al. (2010a) observed some changes in cognitive function. However the authors advised that this may have been related to the statistical methods used rather than the effects of mobile phone exposure. In a different study Thomas et al. (2010b) using personal dosimetry to assess exposure from mobile phone use (as well as exposure from other RF sources such as cordless phones, mobile phone base stations and wireless internet) reported that exposure to RF fields in the highest quartile was associated to overall behavioural problems for adolescents but not for children. Finally, Khorseva et al. (2011) reported that children that used mobile phones showed a decline in cognitive performance parameters such as increased number of phonemic perception disorders and effects on memory. Overall, there is insufficient evidence to determine whether mobile phone use causes cognitive changes in children (Health Protection Agency, 2012).

9.4.2.3 Developmental effects

Four studies have investigated prenatal mobile phone use and child developmental outcomes. In a cohort study conducted in Spain, Vrijheid et al. (2010) found little evidence for an adverse effect of maternal mobile phone use during pregnancy on the early neurodevelopment of offspring. However Divan and co-workers using the much larger Danish national birth cohort in a series of studies reported associations between prenatal and postnatal mobile phone use and behavioural problems in children (Divan et al., 2008, 2010). A more recent study of the same Danish cohort found no evidence between prenatal mobile phone use and motor or cognitive/language developmental delays among infants (Divan et al., 2011). These findings require further investigation.

9.4.2.4 Male fertility

Since 2000 there have been some cross-sectional studies that have investigated mobile phone use and male fertility. Davoudi et al. (2002), Fejes et al. (2005), Agawarl et al. (2008), Wdowiak et al. (2007) and Gutschi et al. (2011) all reported that mobile phone use can affect male fertility via effects on sperm quality. Also, Kilgallon and Simmons (2005) found that keeping mobile phones close to the

waist decreased sperm concentration compared with men not using mobile phones or storing it elsewhere. In a review of mobile phones and male fertility, Agarwal (2007b) points out that in spite of their consistent results, all these studies had some serious limitations such as the exclusion of other possible risk factors (e.g. life style issues, occupational history, etc).

9.4.2.5 Hearing function

Some, mainly cross-sectional, studies have investigated mobile phone use and hearing. Kerekhanjanarong et al. (2004) observed that people who used a mobile phone more than 60 mins per day showed a decline in hearing threshold however this result was based on a small number of subjects. Similarly Garcia Callejo et al. (2005) and Shayani-Nasab (2006) reported a similar hearing impairment in a larger sample of subjects. Oktay and Dasdag (2006) and Al-Abduljawad (2008) both found that a higher degree of hearing loss is associated with long-term mobile phone use but these results were also based on small numbers. Panda et al. (2010, 2011) also found that long-term and intensive mobile phone use may cause inner ear damage however this result again was based on small numbers. Velayutham et al. (2011) reported that long-term mobile phone use is associated with high frequency hearing loss in the dominant ear (most used to make calls) compared to the non-dominant ear. In general it remains unclear how well these studies controlled for other environmental exposures causing hearing loss.

In a case-control study, Hutter et al. (2010) reported no association between regular mobile phone use and tinnitus however the authors did find a doubling of the risk for prolonged use (≥ 4 years). Tinnitus was also investigated in a cross-sectional study that included EHS individuals and healthy controls; the study found no association between mobile phone use and tinnitus (Landgrebe et al., 2009). The recent review by the Health Protection Agency (2012) has commented that it remains unclear as to how well the epidemiological studies on mobile phones and hearing have controlled for other environmental exposures including direct exposure to sound in the auditory range.

9.4.2.6 Endocrine system effects

There has been a small number of cross-sectional studies that have investigated effects on the endocrine system since 2000. In a study of male electric utility workers Burch et al. (2002) reported that prolonged use of mobile telephones at work may lead to reduced melatonin production, and elevated 60-Hz magnetic field exposures may potentiate the effect. Bergamaschi et al. (2004) reported an association between mobile phone use and thyroid dysfunction however the authors noted that stress could have confounded this result. Similarly, Mortavazi et al. (2009) reported alterations in thyroid stimulating hormone and thyroid hormones following mobile phone use. Finally, Eskander et al. (2012) reported effects on various hormone levels of people who used mobile phones. In general these studies have many methodological limitations including poor study design, lack of exposure assessment and possible errors from confounding and bias.

9.4.2.7 Genetic effects

There have been some cross-sectional studies that have reported genetic effects among mobile phone users (Gadhia et al., 2003, chromosomal damage; Gandhi et al. 2005a, DNA and chromosomal damage; Gandhi et al. 2005b, chromosomal damage and micronuclei in buccal mucosa cells; Yadav et al., 2008, micronuclei in buccal mucosa cells). These studies have been reviewed by Verschaeve

(2009). Two more recent cross-sectional studies by Hintzsche and Stopper (2010) and Ros-Llor et al. (2012) did not find any significant increase in the frequency of micronuclei in buccal and oral mucosa cells (respectively) of mobile phone users. All of these studies suffer from the same methodological limitations as the occupational studies on genetic effects.

9.4.2.8 Other (non-cancer) effects

There have also been several studies that have investigated various other (non-cancer) outcomes. A standout is the Danish retrospective cohort study by Schuz et al. (2009) which generally found no elevated risks for central nervous system diseases among mobile phone subscribers; although there were slightly increased risks for migraine and vertigo. A re-analysis of the same Danish cohort by Harbo Poulsen et al. (2012) found no overall association between mobile phone subscribers and multiple sclerosis; there was a small increased risk among females but this was based on small numbers.

The remaining studies addressing other (non-cancer) effects have mainly been cross-sectional. A study by Zur Nieden et al. (2009) assessed the incidence of various health conditions (cardiovascular, neurodegenerative, hearing function etc) between 1993 and 2005 and found no dramatic increases. Khiat et al. (2006) did not find metabolic changes in the brain amongst mobile phone users. Atay et al. (2009) found no statistically significant difference in iliac bone (which is the most common carriage site for mobile phones) density between subjects with the iliac side exposed to the mobile phone and subjects with the unexposed side. However, Saravi (2011) reported asymmetries in hip mineralization in mobile cellular phone users. Soderqvist et al. (2009a) reported an association between long-term and/or short-term use of mobile and cordless telephones and changes to the blood-cerebrospinal fluid barrier; in a different study on the same subjects Soderqvist et al. (2009b) failed to find any effects on the blood-brain barrier. Parkar et al. (2010) reported no physiological and haematological effects amongst students who used mobile phones although mild alteration of lipid profiles were found. Bhargava et al. (2012) reported that heavy users of mobile phones had an increased salivary flow rate, blood flow rate, and volume of parotid glands. Finally, in a series of ecological studies Hallberg and Johansson have reported a correlation between increased mobile phone use and morbidity (Hallberg and Johhanson, 2004; Hallberg, 2005; Hallberg, 2007; Hallberg and Johhanson, 2009). Overall, the research on all these outcomes is too limited to draw any firm conclusions.

9.5 Conclusion

As mentioned in the epidemiological annex of the RF Standard the epidemiological studies primarily relate to the question of whether there is or is not an increased risk of disease in human populations exposed to RF radiation (ARPANSA, 2002). Epidemiological studies investigating occupational and environmental exposure from RF transmitters since 2000 have not altered the conclusion that no detrimental health effects have been observed consistently in such studies. Research that has progressed quite substantially since the publication of the RF Standard has been on mobile phone use and a possible connection with brain cancer. Although, the studies by the Hardell group and INTERPHONE generally have not shown an overall association, some of the studies have reported an increased risk with acoustic neuroma and glioma for prolonged (more than ten years) or high cumulative mobile phone use. As mentioned earlier these findings could possibly be causal, however

it is also possible that they are artifactual due to recall bias of phone use and other methodological limitations. The gaps in the current epidemiological knowledge may be resolved through well-designed long-term prospective studies such as the Cosmos study in Europe (Schuz et al., 2011).

In May 2011 the International Agency for Research on Cancer (IARC) assessed the carcinogenicity of RF electromagnetic fields and classified them as a possible human carcinogen (Baan et al., 2011). IARC concluded that there is 'limited evidence in humans' for the carcinogenicity of RF fields, based on positive associations between glioma and acoustic neuroma and exposure to RF from wireless phones (mobile phones and cordless phones). IARC also concluded that there is 'limited evidence' in experimental animals for the carcinogenicity of RF fields. Finally IARC concluded that there is only weak mechanistic evidence relevant to RF-induced cancer in humans. It must be noted that the classification by IARC does not provide estimates of what risk of cancer might be posed by any given level of exposure to RF fields.

10. The IARC Monograph and BioInitiative Update

Although the cut-off date for literature that was assessed by the Expert Panel was August 2012 there have been two documents that have been published since then that have created some interest, namely the IARC Monograph on RF fields and an update on the BioInitiative report.

Following the classification of RF electromagnetic fields as a Class 2B or 'possible carcinogen' in May 2011 (Baan et al., 2011), IARC published a monograph in April 2013 which outlined the scientific evidence that was considered by the IARC Working Group in reaching their decision (IARC, 2013). The IARC Monograph does not consider any studies after May 2011 so the research that it covers was included in the literature assessed by the Expert Panel.

The 2012 BioInitiative report updates its original examination of the health risks of RF as well as extremely low frequency fields published in 2007. Similar to the 2007 report, the 2012 update is a collection of separate chapters written by individual authors. The report discusses selected research results indicating the possibility of harmful effects beyond those considered established by the mainstream scientific community. The policy recommendations made by the editors of the report do not necessarily follow from the overall body of scientific evidence on the subject but are available for governments and communities to consider. The BioInitiative 2012 update does not contain any significant research published after the cut-off date for the assessment of literature by the Expert Panel.

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Appendix 1 Major reviews and programs on RF and health since the publication of RPS3

Reviews

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French Agency for Environmental and Occupational Health Safety (Afsset) (2009). Radiofrequencies

SSM's Independent Expert Group on Electromagnetic Fields (2009), Recent Research on EMF and Health Risks.

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Scientific Advisory Committee on Radio Frequencies and Health (CCARS) (2009), Report on radio frequencies and health (2007-2008).

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Advisory Group on Non-Ionising Radiation (2012), Health effects from radiofrequency electromagnetic fields, Documents of the Health protection Agency: Radiation, Chemical and Environmental Hazards Series No. 20.

Programs

International Agency for Research on Cancer (IARC), The ITERPHONE study, 1999-2012 http://interphone.iarc.fr/index.php

Mobile Telecommunications and Health Research Programme, 2001 – Ongoing. http://www.mthr.org.uk/index.htm

Federal Office for Radiation Protection, German Mobile Telecommunication Research Programme, 2002-2008. http://www.bfs.de/en/elektro/forsch_mobil.html

EMF-Net, Research on biological effects of electromagnetic fields, 2004 – 2008. http://ihcp.jrc.ec.europa.eu/our_activities/public-health/exposure_health_impact_met/emf-net

European Health Risk Assessment Network on Electromagnetic Fields Exposure (EFHRAN), 2009-2012. http://efhran.polimi.it/index.html

European Union's 7th Framework Programme for research and technological development, MOBI-KIDS, 2007-2013. http://www.mbkds.net/

Appendix 2 Terms of Reference for the RF Expert Panel

1. Assess whether there are any significant changes to the science underpinning ARPANSA's RF Standard and whether the Standard provides adequate protection by:

    - Examining the reviews prepared by ARPANSA on epidemiological and human experimental research since 2000.
    - Examining major reviews of in vivo and in vitro studies since 2000.
    - Examining any other key individual papers since 2000 that are not included in the above.

2. Assess the research according to whether the findings would have an influence on the guidance provided by the RF Standard.

3. Prepare a final report recommending whether a formal review of the RF Standard be undertaken.

4. Prepare an independent assessment of the RF literature since 2000 which will be published.

Appendix 3 Membership of the RF Expert Panel

Academic experts

Dr Geza Benke (Epidemiology)	Centre for Occupational and Environmental Health Monash University, Vic
Prof. Rodney Croft (Human provocation research)	School of Psychology University of Wollongong, NSW
Prof. Andrew Wood (Biophysics)	Brain and Psychological Sciences Research Centre Swinburne University of Technology, Vic

Appendix 4 Relevant qualifications and credentials of the academic experts

Prof. Andrew Wood

Andrew W Wood, BSc(Hons), MSc, PhD is a Professor in the Brain and Psychological Sciences Research Centre (BPsyC) at Swinburne University of Technology in Melbourne, and was Research Director with the Australian Centre for Radiofrequency Bioeffects Research. After studying physics at Bristol University, UK, he earned a PhD in biophysics from King's College Hospital Medical School, London, UK. At Swinburne, he has taught Medical Biophysics at both undergraduate and postgraduate level for over 30 years. He has supervised twelve successful PhD candidates. He has served on the Radiation Health Committee of the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) for over ten years. He acted as a temporary consultant to the WHO in Malaysia on radiation-related matters. In relation to possible health effects of (non-ionising) electromagnetic fields, Dr Wood conducts laboratory studies both at the cellular level and with human volunteers. He also is involved in theoretical research into mechanisms of action of these fields on biological systems, particularly in relation to dosimetric aspects of standards setting. He has published over 70 articles in peer-reviewed journals. He is an Associate Editor for Bioelectromagnetics.

Prof. Rodney Croft

Rodney Croft obtained a PhD in Psychology, and currently holds the appointment of Professor of Psychology at University of Wollongong. He has been working in the RF Health field for over twelve years, where his expertise has focused on human experimental research, but he has also contributed in the areas of RF in vitro, epidemiology and dosimetry research. Croft was Executive Director of the Australian Centre for Radiofrequency Bioeffects Research from 2004 to 2011, and is currently director of the new NHMRC Centre of Research Excellence, the Australian Centre for Electromagnetic Bioeffects Research. He has worked on a range of RF Health committees in Australia, including the ACIF Code Evaluation Committee and ARPANSA's EME Reference Group, and internationally was an invited contributor to the WHO's 2010 Radiofrequency Research Agenda and the USA National Academy of Science's 2007 Radiofrequency Research Agenda. Croft is actively involved with international EME standards, as a member of the IEEE ICES SC3 and SC4 Standards Committees, the ICNIRP Biology Standing Committee, and as an ICNIRP Main Commission member. He has also been involved in a number of EME consultancies, including for the Australian Defence Force, the Defence Science & Technology Organisation, COMCARE, Shoalhaven City Council and Optus.

Dr Geza Benke

Geza Benke is a Senior Research Fellow in the Centre for Occupational and Environmental Health, Department of Epidemiology and Preventive Medicine, Monash University. He completed his PhD in Epidemiology in 2000 and was awarded an NHMRC Career Development Award in Population Health in 2006. He is currently a chief investigator with the NHMRC funded Project grant 'Do mobile phones affect cognitive development in children'. He has collaborative links with research groups based in Adelaide, Brisbane, Perth and Sydney. Geza has extensive international collaborative links and is the Australian representative on three international exposure assessment committees. Geza is a chief investigator in the Australian center of the the EU-NHMRC funded MobiKids Mobile phone and brain tumor study, co-ordinated by CREAL in Barcelona, Spain. He has presented numerous invited talks regarding RFR exposure and health at conferences and workshops, which include the Plenary session at the Australian Radiation Protection Society conference (Brisbane, 2007), the MTHRM workshop (Royal Society, London, UK, 2007) and the FGF workshop (Stuttgart, Germany, 2008). Geza was President of the AIOH in 2008 and was chairperson of the Institutes Ethics committee for six years. Between 1999 and 2008 he was a member of the Victorian Department of Human Services Radiation Advisory Committee which advises the Minister regarding research involving radiation exposure to humans. Geza has authored over 80 peer reviewed journal papers, book chapters and government reports.

Appendix 5 ARPANSA Literature search

Prior to the formation of the Expert Panel, ARPANSA collected studies on RF and health/biological outcomes that have been published since the year 2000. To find the studies, ARPANSA initially searched the EMF Portal database (http://www.emf-portal.de/) and the IEEE/ICES[10] EMF literature database (http://www.ieee-emf.com/index.cfm) which, are databases dedicated to papers related to electromagnetic fields. In order to find papers that may have been missed by the specialist databases, ARPANSA also searched the PubMed biomedical literature database (http://www.ncbi.nlm.nih.gov/sites/entrez?db=pubmed). Finally, ARPANSA searched the references of all the major reviews on RF and health since 2000 for any papers that were not captured by the previous databases.

The RF literature database assembled by ARPANSA includes all studies with health/biological outcomes from January 2000 till August 2012. The database includes all studies whether they have been peer-reviewed or not as well as all publication types. Non-English-language papers were also included. Papers included, were all types of in vivo, in vitro, human/provocation and epidemiological studies as well as meta- and pooled analyses. The database also includes all the major reviews as well as specialist reviews on in vivo/in vitro research. The RF literature database generally does not contain editorials, methodological papers, case reports, letters or comments[11], although some of these may have been considered in preparing this report. The database generally does not include papers on therapeutic effects. The RF literature assembled in the database between January 2000 and August 2012 includes 298 epidemiological, 238 human/provocation, 453 in vivo and 365 in vitro research papers and 72 general or in vivo/in vitro reviews.

[10] Institute of Electrical and Electronics Engineers/ International Committee on Electromagnetic Safety.
[11] There are some letters and comments included in the RF literature database because they contained results from original research.

Australian Government
Australian Radiation Protection and Nuclear Safety Agency

ARPANSA Preliminary Measurements of Radiofrequency Transmissions from a Mesh Radio Smart Meter

Don Wijayasinghe and Ken Karipidis

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Contents

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1. Summary

Smart meters have been deployed in buildings initially in Victoria and increasingly across other areas of Australia. They utilise radiofrequency (RF) electromagnetic energy (EME) at levels very much below the levels permitted in the RF Standard. Despite the low levels of RF EME, there is some public concern about exposures from smart meters and whether the RF transmissions may cause a variety of health effects.

ARPANSA has undertaken some preliminary RF measurements of an installed mesh network smart meter at the home of a staff member in a suburb of Melbourne. It must be emphasised that these measurements by ARPANSA cannot be considered representative of all smart meters.

A typical RF pulse from the smart meter had an average intensity of 7 mW/m^2 measured at a distance of half a metre from the smart meter with the door to the meter box open. This is 0.00015% of the instantaneous exposure limit in the Australian RF standard for the general public. The measured level with the meter box door closed, or on the other side of the wall on which the meter was mounted, was about 20 times lower. The RF transmissions that were measured were not continuous and occurred less than 0.08% of the time that the measurements took place.

The RF electromagnetic energy transmitted in a single pulse from the smart meter is similar to that from a car remote unlocking fob and much less than a single GSM SMS transmission.

The measurements do not provide any indication of why smart meter transmissions would provoke symptoms in people otherwise unaffected by other wireless technologies such as mobile phone handsets. Indeed the low levels and short transmission times make any effects highly unlikely.

2. Background

One of the wireless technologies being used in the deployment of Advanced Metering Infrastructure in Victoria is a mesh radio system that uses the 915-928 MHz ISM (industrial-scientific-medical) band, very close to the frequency bands used by GSM mobile phones throughout Australia. The AMI meters, commonly called smart meters, operate in this frequency band without a specific spectrum allocation and must share it with a variety of other devices. The radio transmitter is typically of 1-watt power. The antenna distributes this power a little more in some directions than others.

A continuous transmission from the 1-watt transmitter would be expected to produce an intensity of approximately 300 mW/m^2 at a distance of 0.5 m if spread uniformly in all directions. Intensities up to twice this might be expected in some directions, and perhaps 10 to 50 times less in others, due to the directional characteristics of the antenna. Scattering of the radio transmissions from the ground, fences and buildings are also expected to produce local increases and decreases in the intensity.

The ARPANSA *Radiation Protection Standard for Maximum Exposure Levels to Radiofrequency Fields - 3 kHz to 300 GHz (2002)* provides three separate limits within which the smart meter should operate:

- the localised specific absorption rate (SAR), less than 2 W/kg or 20 mW/10g
- the whole body instantaneous electric and magnetic field strength, or equivalent plane-wave power flux density, less than 1313 V/m, 3.47 A/m, and 4,575 W/m^2 respectively
- the whole body, 6-minute time averaged, electric and magnetic field strength, or equivalent plane-wave power flux density, less than 41.4 V/m, 0.11 A/m and 4.574 W/m^2, respectively.

Typically, for devices like the smart meter, operated away from the body, measurements of just the electric field provide sufficient reassurance of compliance. The electric field is often converted to the equivalent plane-wave power flux density for comparison with limits.

The transmissions from the mesh radio smart meters have been measured on behalf of the Victorian Department of Primary Industries by the NATA accredited EMC Technologies Pty Ltd. Their report demonstrated that exposures from the 1-watt transmitter contained within the smart meters clearly met current exposure standards by a large margin. (http://www.smartmeters.vic.gov.au/__data/assets/pdf_file/0011/138926/AMI-Meter-EM-Field-Survey-Report-Final-Rev-1.0.pdf).

3. ARPANSA Measurements

In the light of the public concern about exposures from smart meters and to provide some information on, ARPANSA undertook some measurements of an installed smart meter at the home of a staff member in suburban Melbourne. The mesh radio component was a Silver Springs device and operated within the AMI network provided by the electric supplier, Jemena.

Measurements were taken during parts of several days with a NARDA SRM 3000 portable spectrum analyser at distances of approximately 50 cm from the outside of the meter box, with the steel meter box door open or closed, and at 50 cm from the inside of the wall on which the meter box was mounted. Additional measurements were made with a simple on-off microwave detector and recordings made every 12.5 microseconds of the transmission status.

It must be emphasised that the measurements by ARPANSA cannot be considered representative of all smart meters and do not replace the more systematic measurements undertaken by EMC Technologies.

4. ARPANSA Spectrum Analyser Results

The spectrum analyser measurements identified the transmissions as occurring in the 915-928 MHz frequency band, consisting of very short, frequency-hopping, bursts. The spectrum analyser averages the intensity of a pulse over 1/10 second. A typical pulse showed an average intensity of 7 mW/m^2 at a distance of 0.5 m from the smart meter with the door to the meter box open.

This result is consistent with the smart meter transmitting for only 7/300 of 100 milliseconds (ms), or about 2.3 ms. This agrees with the timing measurements given below.

The measured level with the meter box door closed, or on the other side of the wall on which the meter was mounted was about 20 times lower.

Table 1: RF Field Power Density Measurements for a smart meter in a Jemena Mesh Network

Location	Power Flux Density (mW/m^2)[1]
50cm (meter box door open)	7.2
50cm (meter box door closed)	0.33
50cm (inside garage, directly behind meter box wall)	0.29

[1] Average over 100 ms from a single transmission pulse.

5. ARPANSA Timing Measurement Results

The spectrum analyser does not provide information on the duration of such short transmissions or of the number of individual transmissions, so a special piece of equipment and system was assembled to detect, and time, the transmissions but without giving a precise measure of intensity or radiofrequency. Timing measurements were collected over three periods of 4:10, 5:26 and 25:58 hours duration for the initial assessment. The results are summarised below.

Table 2: RF transmission timing measurements for a smart meter in a Jemena Mesh Network

	1/Jul/2012	30/Sep/2012	24/Jan/2013
Duration of measurement (h:mm)	4:10	5:26	25:58
Total no. of pulses	2177	2611	15,139
Total transmission time (s)	9.5	11.3	68.4
Average duty cycle (%)	0.064	0.058	0.073
Maximum pulse duration (ms)	82.8	82.8	82.8
Average pulse duration (ms)	4.4	4.3	4.5
Maximum transmission in 1 s (s)	0.17	0.11	0.53
Maximum transmission in 10 s (s)	0.20	0.23	1.68
Maximum transmission in 1 m (s)	0.41	0.29	1.75
Maximum transmission in 6 m (s).	1.46	1.41	2.46
Maximum duty cycle over 6 m (%)	0.41	0.39	0.68

6. Comparison with public exposure limits

The instantaneous exposure at 0.5 m expected from the 1-watt transmitter is less than 1/15,000 of the instantaneous exposure limit, and actually much lower still because only part of the body can be exposed to the highest value.

Based on the timing measurements, the maximum duty cycle over any 6 minute period (including the periods when the maximum length pulses were transmitted) was less than 0.7%. The average duty cycle was 0.07%. The maximum 6-minute average exposure expected at 0.5 m is 2.1 milliwatt/m^2 (0.21 microwatt/cm^2). This represents 0.046% (1/2,180) of the public exposure limit.

Exposures (6-minute average) at more typical distances from the smart meter of, for example 5 metres, would be expected to be a factor of 100 lower, or less than 21 microwatt per square centimetre.

The measurements over a few hours may have missed the main communications periods but 24-hour measurements showed several periods when the longest pulses of 83 ms were transmitted. At 16:20, a group of 18 such pulses were transmitted within a few seconds. As mentioned, scattering and antenna directionality may increase these values by factors of 2 – 5, perhaps.

7. Conclusion

The measured and calculated exposures are all well below the public exposure limits. The radiofrequency used is similar to the frequency used by GSM mobile phones and the peak transmission power is somewhat less. Many other wireless technologies have pulsed structure to their transmissions and many transmit throughout the whole day. The radiofrequency electromagnetic energy transmitted in a single pulse from the smart meter is similar to that measured from a car remote unlocking fob and much less than measured from a single GSM SMS transmission. The measurements do not provide any indication of why smart meter transmissions would provoke symptoms in people otherwise unaffected by other wireless technologies such as GSM mobile phone handsets.

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References

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