

SMART METERS IN VICTORIA: INFORMATION AND CONCERNS

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What are they?

Victorian ‘smart meters’ are electronic meters which have the capability of measuring electricity consumption in thirty minute intervals, *plus* they are able to broadcast and receive data wirelessly via radiofrequencies (specifically, microwaves).

Why are spinning dial meters (also referred to as accumulation or analogue meters), and electronic non-wireless interval meters, being replaced with smart meters?

The remote reading of meters means that hundreds of meter readers will no longer be required, providing significant savings to the power distributors. They also give power distributors the ability to remotely disconnect and reconnect power at a specific property. Smart meters provide the means to charge different rates for electricity at different times. (This was already possible with the non-wireless interval meters, which are also being replaced).

Background

The Victorian government mandated the installation of smart meters for every household and small business in 2006, after consultation with power distributors, as part of the Advanced Metering Infrastructure (AMI) program. Replacement of meters started in 2009. Power distributors were mandated to use their ‘best endeavours’ to install smart meters at all households and small businesses by the end of 2013.

The Auditor-General concluded in its November 2009 Audit Summary of the AMI project that *‘the cost-benefit study behind the AMI decision was flawed...’* and that there were *‘significant unexplained discrepancies between the industry’s economic estimates and the studies done in Victoria and at the national level’* (Victorian Auditor-General 2009, p. 4). More recently, in *‘Lessons from the Victorian Smart meter roll-out’*, the Productivity Commission’s Electricity Network Regulatory Frameworks draft report states *‘Overall, it appears that the Victorian decision to roll-out smart meters was premature and/or poorly planned with inadequate knowledge about smart meter technologies, their costs and associated risks’* (Australian Government Productivity Commission 2012, Ch. 10, p. 346).

Department of Treasury and Finance (DTF) reviewed the program in 2011. DTF released an Issues paper on 31st May 2011, giving interested parties three weeks in which to respond. DTF’s webpage made it abundantly clear that submissions would become public documents; however none of the ‘around 400 submissions’ from the public have been published. Specifically DTF’s website stated in June 2011:

Submissions should be public documents

DTF will make submissions available for others to read. Any confidential material — such as commercially sensitive data — should be provided under a separate cover and clearly marked IN

CONFIDENCE. Submissions, minus any confidential material, will become publicly available documents once placed on the review website. This will normally occur shortly after receipt of a submission, unless it is accompanied by a request to delay release for a short period.

One must ask why, given the clear instructions, were the public's submissions not released? DTF's webpage claimed it is because *'Many of these submissions contained information of a private and personal nature. Furthermore, in the process of reviewing these submissions it became apparent to DTF that many individuals were unaware that their submission was intended to be made public'* (Department of Treasury and Finance 2012). This ignores the fact that a number of the individuals concerned specifically authorized the publication of their submission. Also, surely, it would have been a simple matter for DTF to have simply blacked out offending details before publishing, if this was a serious concern?

The government announced on 14th December 2011 that it would continue with the program, albeit with some modifications.

What are the concerns about smart meters?

Time-of-Use (TOU) pricing

This allows power distributors to 'shape' customer demand, by imposing higher prices when power distributors want to reduce load. This means power distributors will require less infrastructure, as they won't need to cater for high demand situations. As well as set time-of-use plans, it provides for future **'critical peak pricing'**, (also referred to as dynamic peak pricing) so that, for instance, on 24 hours' notice prices could escalate to, say, **\$2 per/kWh** for a four hour period, as trialled in NSW (Premier of NSW 2007, p. 5). A moratorium was placed on time-of-use pricing in Victoria in March of 2010, after concerns raised by groups including Consumer Utilities Advocacy, Victoria Council of Social Services and St Vincent de Paul. The Brotherhood of St Laurence pointed out in their submission for the review that many low-income and disadvantaged people have *'limited discretionary energy consumption and are therefore unable to switch off unwanted appliances'* (Brotherhood of St Laurence 2011, p. 5). TOU pricing also discriminates against others, such as parents with young children, bedridden people, and the elderly who remain at home during the day.

Questions have also been raised as to the actual effectiveness of time-of-use pricing as a tool to shape customer demand. *'Time-of-use tariffs have had only very modest success in eliciting demand side responses in trials both overseas and in Australia. In California, for example, TOU tariffs achieved only a 4.71% reduction in peak demand in a state-wide pilot during the summer months, while overall consumption actually increased. Moreover, the impact of TOU on consumers' energy loads waned overtime, with TOU tariffs eliciting only a 0.6% reduction in peak demand towards the end of the trial'* (McGann & Moss 2010, p. 62, emphasis added).

TOU pricing has now been re-badged as 'flexible' pricing by the Department of Primary Industries. Presumably this new marketing spin is aimed at making TOU pricing more palatable to consumers. More customers will be offered a choice between 'flexible' pricing and flat tariffs from mid-2013 (Department of Primary Industries 2013 a).

Billing Errors

The introduction of AMI technology has led to a surge in billing errors being reported. The Energy and Water Ombudsman Victoria (EWOV) stated that it opened 648 cases between 1 May 2010 and

31 May 2011 related to higher than expected bills following installation of a smart meter (Energy and Water Ombudsman Victoria 2011, p. 3). The upward trend in cases was expected to continue to escalate. The total number of cases lodged with the EWOV due to customers receiving a higher than expected bill rose from 3,378 cases in 2009/10 to 5,526 cases in 2011/12 (Energy and Water Ombudsman Victoria 2012, p. 7). Errors reported by the media include overbilling due to what are believed to be serious systemic issues (Thomas, 2011), bills soaring by many hundreds or even thousands of dollars due to faults, and moderate increases which are being blamed on either previous underestimation by analogue meters, or the ability of smart meters to detect wider parameters of electrical usage.

Questions have also been raised regarding the wisdom of relying on vulnerable electronic components utilizing wireless two-way communications for the purpose of relaying data. *“There is a very real risk that, unless adequate precautions are taken, smart grids may be more readily damaged by space weather and malicious manmade events than their predecessors”* (Jamieson 2011, p. 17) .

Additional costs being imposed on households without any apparent benefit

The Auditor-General concluded in November 2009 that it was unclear how consumers, in particular, would benefit from the smart meter program (Victorian Auditor-General 2009, p. ix). Nevertheless, electricity retailers have been required to pass on the advanced metering charges to consumers since 1 January 2010. This is regardless of whether or not a particular household has had a smart meter installed, or whether or not remote communications, which aren't due to have full functionality across Victoria until the end of 2013, are in place. This is also **despite the fact that the power distributor owns the meter, not the consumer**. The Association for Independent Retirees pointed out, in their submission to Treasury in June 2011, that *‘at some point in the past, all consumers have had to “pay” for their current metering system. However, there is no compensation to cover “unused life” of current meters, nor any choice about installation of new smart meters, whether wanted or not. This current compulsory meter changeover is an unjustified financial imposition on the householders and small businesses of Victoria. Consumers have to pay up front without the immediate availability of any cost saving or consumer benefit’* (Association of Independent Retirees 2011, p. 4). The Consumer Action Law Centre wrote in its submission to DTF *‘we do not see why consumers should bear the entire upfront cost of the rollout, particularly when there are many unfounded assumptions being made about the extent of the benefits being passed through to consumers’* (Consumer Action Law Centre 2011, p. 2).

DPI held an information session the day following the government's decision to continue with the rollout of AMI in December 2011. Staff repeatedly reiterated that they were *‘putting sharper focus on the consumer’*, and that *‘consumers will be front and centre’* with a focus on *‘consumer benefits’*. The key consumer ‘benefit’ appeared to be bringing forward the availability of in-home display units, as part of Home Area Networks (HANs). These were expected to be marketed to the public starting in 2012.

It appears that the rollout of smart meter infrastructure was aimed at bolstering the profits of the, primarily, Asian-based companies who have majority ownership of Victoria's electricity infrastructure. The mad scramble to identify benefits for consumers seems to be an afterthought.

Smart meters do not contribute to Federal energy market reform

COAG's December 2012 energy reforms, which are designed to *‘help ease electricity price pressures’* (COAG 2012 a, p. 5), encourages the uptake of smart meters across Australia (COAG 2012 b, p. 4). As

a heading in a Frontier Economics Client Briefing succinctly puts it, this amounts to *'spending more to save less'* (Sood & Price 2012, p. 1). As the Victorian experience has amply demonstrated, the introduction of smart meter technology has already resulted in *'adding over \$100 a year on average to what customers pay on top of all the other increases'* (Sood & Price 2012, p. 3).

Dr. Timothy Schoechle, author of *'Getting Smarter About the Smart Grid'* contends smart meter roll-outs essentially do *'nothing to advance what should be the real goal of the smart grid: balancing supply and demand and integrating more renewable sources'* (Schoechle 2012, p. i).

Cost blow-outs

Smart meters, rather than being simple mechanical devices, rely on software which, in Victoria, is required to communicate wirelessly to complex back-end information technology (IT) systems. CitiPower, Powercor's sister company, stated in February 2009 in its *Advanced Metering Infrastructure Budget Application 2009-11* that Victoria was to be a world 'trail blazer' with respect to the IT component of the AMI program, with the adoption of *'relatively immature technologies with attendant risk'* (CitiPower 2009, p. 37, emphasis added).

Already, the Australian Communication and Media Authority (ACMA) has considered shifting the smart meter communications used by CitiPower, Powercor, Jemena and United Energy (between 915 MHz to 928 MHz) to the 928 MHz to 933MHz band due to overcrowding in the current segment, and the likelihood that smart meter communications will **interfere with other users** (ACMA 2011, p. 45).

Examples of other applications using the 915 MHz to 928 MHz band include movement detectors, video surveillance, wireless loudspeakers, wireless microphones, rolling stock tracking (railways), alarm systems and cordless phones (ACMA 2011, p. 24). Anecdotally, there are a number of reports of people experiencing problems because of interference due to smart meter communications. What will it be like when the AMI program is fully up and running?

The ACMA pointed out that it is possible that the level of interference caused by smart meters could become unacceptable. ACMA also points out that use of this band *"is authorised on a 'no interference, no protection' basis. Therefore, services in this spectrum have no quality-of-service guarantees"* (ACMA 2011, p. 45, emphasis added).

Jemena stated, if the move to the higher band is implemented, *'the change means that every meter deployed so far would require the internal radio to be re-tuned to the new frequency'* (Jemena Electricity Networks 2011, p. 31). They also went on to state that it is unclear whether this would involve a hardware or software change in the meter.

Who is going to pay for this? According to CitiPower and Powercor, ultimately it is customers that bear the burden of any redesign costs (CitiPower Powercor 2011, pp. 3-4). And how often will future upgrades need to be implemented? As most people realize, software quickly becomes obsolete.....unlike simple mechanical devices. In addition, Jemena claim if communications are moved to the new proposed segment this will halve their available bandwidth *'potentially lowering performance by increasing collisions and data transmission errors'* (Jemena Electricity Networks, 2011, p. 31, emphasis added).

ABC News reported on 18th May of 2010 that there had been a \$500 million dollar blow-out in the cost of "smart" electricity meters, which the government had conceded individual consumers would

have to pay for (ABC 2010). Around \$800 million was originally budgeted, with a report into the project in 2011 showing a cost of \$2.3 billion (ABC 2011). What will the final bill be for consumers?

Deloitte undertook a reassessment of the costs and benefits of the AMI rollout in 2011 on behalf of the government. They concluded that the rollout was going to result in an overall net COST (in 2008 dollars) to electricity consumers of 319 million dollars (Deloitte 2011, p. 7). However, by ignoring all of the costs that had already been sunk into the rollout, Deloitte were able to arrive at a net benefit to consumers in continuing with the rollout. The government used this analysis as a basis for continuing with the rollout of smart meters.

Tellingly, costs incurred by the Victorian government are NOT included in the analysis as most of these costs are '*passed onto taxpayers*' (Deloitte 2011, p. 40). This begs the question, what would total costs be if this figure was included? And what would total costs be if provision was made for possible health care costs associated with the roll-out?

Privacy concerns

It is reported that collected data, revealing consumer usage of electricity over each 30 minute interval, is to be on-sold for research purposes. This is of concern to a number of people as they believe this information should remain confidential. Dr. Schoechle points out in *Getting Smarter About the Smart Grid* that data collected by smart meters, revealing intimate personal details, is *not* necessary for the basic purpose of a smart grid, and is simply a by-product (Schoechle 2012, p. 17). However the accumulated data represents an immense honey-pot for data mining by interested parties, such as marketeers, insurance companies, law enforcers and the press, as well as a security risk. He goes on to advocate for household controlled gateways, stating that it is '*axiomatic in the data security industry that the best way to limit security risk is to simply not collect, transmit, or store information except where necessary*' (Schoechle 2012, p. 24).

Other areas of concern centre on questions regarding the vulnerability of radiofrequencies carrying usage data to interception.

DPI engaged Lockstep Consulting to undertake a Privacy Impact Assessment of AMI in 2011. Lockstep's report largely sidestepped technical questions regarding the vulnerability of radiofrequencies to interception, relying on the fact that all meter to electricity distributors' communications and all HAN traffic is encrypted (Lockstep Consulting 2011, p. 51). However they did place considerable emphasis on perceived shortfalls regarding '*use and disclosure, and the choices that consumers will have to control secondary usage...*', conceding that some of the community concerns regarding privacy are warranted (Lockstep Consulting 2011, p. 4).

Smart meters in the Netherlands were made voluntary in 2009 after consumer groups raised privacy concerns (Heck 2009).

Certificates of Electrical Safety

These are **not** required for the installation of smart meters because smart meters belong to the power distributor. Energy Safe Victoria (ESV), who are responsible for assessing and approving electricity distributors' safety procedures, concluded in April 2011 that, apart from one instance, meters were being installed safely (Energy Safe Victoria 2011, p. 4).

The public continues to raise questions regarding the quality of installations, and the future impact on insurance policies in the cases where fires have occurred following smart meter installations.

Ongoing safety concerns

Due to additional concerns following a number of smart meter incidents, ESV released another report on the safety of advanced metering infrastructure in July 2012. Prior to this members of the public were given four weeks in which to submit comments on the draft report. ESV concluded that smart meters are safe and don't present a greater safety risk than older electronic or electromechanical meters (Energy Safe Victoria 2012, p. 3).

Sadly, a number of questions which were raised by Stop Smart Meters Australia and other members of the public were not addressed. Under the *Electricity Safety Act 1998* ESV may have regard to the reliability and security of electricity supply in performing some of its functions (*Electricity Safety Act*, s. 7A). Specifically, Stop Smart Meters Australia asked ESV to respond to questions concerning possible risks to the reliability and security of electricity supply as a result of Electromagnetic Pulse (EMP) events, man-made EMP events (such as High Altitude Nuclear EMP [HEMP] and non-nuclear EMP), and the potential to hack the grid (Stop Smart Meters Australia 2012 a, p. 2-4 & p. 12). ESV also side-stepped the question of potential adverse health effects from AMI, which a number of submissions raised, by declaring that this was subject to 'separate regulatory arrangements' (Energy Safe Victoria 2012, p. 8).

This appears to be an extraordinary stance to take. Whilst radiofrequencies (RF) emissions from smart meters may meet the specific requirements of ARPANSA's standard for *Maximum Exposure Levels to Radiofrequency Fields – 3 kHz to 300 GHz*, the standard also stipulates that unnecessary RF exposure should be minimised, provided this can be readily achieved at reasonable expense (ARPANSA 2002, clause 5.7 [e]).

The use of fibre-optic cabling would eliminate RF microwave transmissions. The use of fibre-optic cabling for transmission of data would also confer a more secure and robust system with a considerably longer life as well as lower maintenance (Jamieson 2011, p. 25). It is also arguable, that by piggy-backing on to the NBN rollout, long-term costs associated with a fibre-optic based system would be lower.

Given that one of ESV's objectives under section 6 (a) of the *Electricity Safety Act 1998* is to ensure the electrical safety of transmission systems and installations, as well as, under section 7 (a), having the function of determining minimum safety standards for electrical equipment and installations, where is the evidence that ESV even considered the requirements of clause 5.7 (e) of ARPANSA's standard for *Maximum Exposure Levels to Radiofrequency Fields*, such that unnecessary RF exposure is minimised?

Fire risk

The proficiency of installers is only one part of the safety equation. There are also concerns that the high frequencies transmitted by smart meters may couple on to household wiring, given the close proximity to conductive wiring. Sage and Biergiel stated in a paper that household wiring is simply not designed to carry the high frequency harmonics generated by 'very short, very high intensity wireless emissions' (Sage & Biergiel 2010, p. 1). The higher frequency means higher energy, equating to higher heat, which could lead to a fire situation if there is compromised wiring at any point within a house. The fire could occur a substantial period *after* the installation of the smart meter (Sage &

Biergiel 2010, p. 2). The large number of anecdotal reports attesting to burnt out dishwashers et cetera would suggest, in some instances, high frequencies have indeed travelled along household wiring following the introduction of a smart meter.

It appears that the government, to-date, has not commissioned testing of this possibility. It is also of concern that, although there is legislation in place stipulating both the amount of harmonic distortion (indicating the presence of higher frequencies) that a distributor may introduce on to household wiring, as well as governing how much harmonic distortion a customer may send on to the grid, testing for harmonic distortion is self-governed by the power distributors. This hardly seems to be a satisfactory state of affairs (Stop Smart Meters Australia 2012 a, p. 5).

Health concerns

The government appears to have only paid lip-service to concerns regarding the biological effects of introducing smart meters.

DPI stated in their December 2011 Health fact sheet that *'health authorities around the world, including ARPANSA and the World Health Organization, have examined the scientific evidence regarding possible health effects and, using prescribed exposure limits, concluded that the weight of evidence does not demonstrate the existence of health effects'* .

Wisely, this statement has been omitted from their updated Health fact sheet (Department of Primary Industries 2013 b). Leaving aside the fact that it is far too early to conclusively predict what the health effects might end up being from AMI technology, the World Health Organization has *not* concluded that the 'weight of evidence does not demonstrate the existence of health effects'. On the contrary, the World Health Organization on 31st May of 2011, whilst acknowledging that the evidence is still accumulating, classified *'radiofrequency electromagnetic fields (EMFs) as possibly carcinogenic to humans (Group 2B), based on an increased risk for glioma, a malignant type of brain cancer, associated with wireless phone use'* (IARC 2011). These frequencies are in the *same* bandwidth as that employed by smart meters.

Dr Robert Baan of the WHO International Agency for Research on Cancer (IARC) was the keynote speaker at ENA's 2011 EMF Scientific Workshop in Melbourne. He stated that the decision to extend the monograph to include exposure from wireless devices other than mobile phones was quite deliberate. In reference to children using mobile phones he stated that the average RF energy deposition is two times higher in the brain and up to ten times higher in the bone marrow of the skull, compared with mobile phone use by adults (Baan 2011, p. 21). This statement is echoed in the findings of Gandhi *et al.* (2012). Accordingly, one would assume that the same principle would apply in AMI technology, making children considerably more vulnerable to exposure from radiofrequencies than adults.

Aside from implications for cancer, there are a very wide number of studies pointing to other effects. The authors of *Public health implications of wireless technologies* contend that *'there is credible evidence that RF exposures cause changes in cell membrane function, metabolism and cellular signal communication, as well as activation of proto-oncogenes and triggering of the production of stress proteins at exposure levels below current regulatory limits. There is also generation of reactive oxygen species, which cause DNA damage, chromosomal aberrations and nerve cell death. A number of different effects on the central nervous system have also been documented, including activation of the endogenous opioid systems, changes in brain function including memory loss, slowed learning, motor dysfunction and performance impairment in children, and increased frequency of headaches, fatigue and sleep disorders'* (Sage & Carpenter 2009, p. 234).

In conclusion, the paper states that *'the rapid deployment of new wireless technologies that chronically expose people to pulsed RF at levels reported to cause bioeffects, which in turn could reasonably be presumed to lead to serious health impacts, is a public health concern'* (Sage & Carpenter 2009, p. 241), calling for thresholds or guidelines that are substantially below current ICNIRP standards (which are the initial basis for ARPANSA standards) for whole-body exposure.

The Seletun Scientific Panel, comprising international experts on the biological effects of electromagnetic fields, went even further. The Seletun Scientific Statement, which was released in 2011, stated that *'new, biologically-based public exposure standards, taking into account long-term as well as non-thermal exposures, are **urgently needed to protect public health world-wide'*** (Seletun Scientific Statement 2011, p. 1). It called for standards that are approximately **50,000 to 60,000 times lower** than the current ICNIRP standard on which Australia bases its standard.

Specifically, based on power density measurements, the Panel recommended in *Scientific Panel on Electromagnetic Field Health Risks: Consensus Points, Recommendations, and Rationales* a level of **0.017 microwatts per centimetre squared to replace the ICNIRP and other outdated public safety guidelines and limits in use around the world**. Even so, the Panel acknowledged that numeric limits derived here for new biologically-based public exposure standards are still a billion times higher than natural EMF levels at which all life evolved (Fragopoulou *et al.* 2010, p. 6).

Furthermore, the Panel specifically recommended *'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'*** (Fragopoulou *et al.* 2010, p. 7, emphasis added).

Conclusions reached in the BioInitiative 2012 Report, which reviewed over 1800 new studies since the original 2007 report, are even more alarming. The report says that the **evidence for risks to health has substantially increased since 2007** (BioInitiative Working Group 2012 a). Bioeffects can occur from just minutes of exposure to wireless smart meters that produce whole-body exposure (BioInitiative Working Group 2012 b, p. 87). The report recommends, on a precautionary public health basis, based on 'lowest observed effect level', a limit of **0.003 microwatts per square centimetre** for cumulative outdoor radiofrequency radiation. The report recommends a **further ten-fold reduction** for pulsed radiofrequency radiation levels to allow for considerations such as chronic exposure and exposure to children (BioInitiative Working Group 2012 b, p. 100). Given that Australia's standard for radiofrequencies allows for exposure up to approximately 460 microwatts per square centimetre for the meshed transmissions, and up to 1,000 microwatts per square centimetre for WiMAX transmissions, it is obvious that our standard is not based on biological effects. ARPANSA's standard for radiofrequencies does not even provide protection at the lowest levels reported by studies, let alone allow for long-term exposure and exposure to vulnerable segments of the population, such as children and pregnant women. It allows us to be irradiated with hundreds of thousands of times the BioInitiative 2012 Report recommended levels for radiofrequencies.

Standards for exposure to RF vary dramatically around the world. Whilst all of them in general seriously lag behind emerging scientific evidence, one must ask, is it indeed prudent to permit Australians to be irradiated with approximately 4,600 times as much RF, in the case of Victoria's meshed smart meters, and as much as 10,000 times as much RF, in the case of SP AusNet's WiMAX-based smart meters, as compared to the precautionary limits set by a country such as Austria for pulsed RF? (Aaronia AG, n.d.).

The Victorian government relied on the *AMI Meter Electromagnetic Field Survey* from EMC Technologies in coming to its conclusions regarding the safety of smart meter technology. Emissions from smart meters were tested at sixteen sites. A number of people, including Dr Federica Lamech, have pointed out the anomaly of basing technology, which is going to potentially affect more than five million Victorians, on such a small sample size (Lamech 2012).

DPI's Health fact sheet also describes the study as being 'independent'. Whilst EMC Technologies may give the appearance of being an independent organization, it is concerning that one of the authors of the report has an association with Telstra (Maisch 2012 a). For instance, Telstra has been selected by CitiPower as CitiPower's (and therefore also Powercor's) backhaul communications provider, and therefore will be providing the 3G communications between the access points, which collect the data for a given catchment area, and data centres (CitiPower 2011, p. 78). This gives Telstra a direct interest in the success of the smart meter rollout.

EMC Technologies' report, whilst examining radiofrequency levels from smart meters, as well as electric and magnetic fields in the ELF range from the meters themselves, failed to check building wiring for increased transients and harmonics ('dirty' electricity) as a result of smart meters. If this occurs, it means that *all* household wiring may effectively act as an antenna, radiating high frequencies. A number of people are sensitive to high frequency harmonics, experiencing symptoms resembling radio wave sickness when exposed to them, ranging from headaches, palpitations, asthma, deteriorating vision, and digestive problems through to high blood sugar levels and multiple sclerosis (Havas 2006, pp. 259-268).

Although Section B of the *AMI Meter Electromagnetic Field Survey* claims to be based on the '*best available evidence from Australian and International studies on the safety and health effects of AMI meter EMF*' (EMC Technologies 2011, p. 31), overall conclusions appear to be lightweight. As an example, comment on the Interphone study (referred to in point 5 on page 31), includes little critical analysis of the study itself. These details are widely available on the net, as the methodology used by the study was highly controversial (it also took more than three years for the results to be released due to internal wrangling). Specifically the study defined an exposed person as one who made as little as one call per week for six months, the cut-off point for the heaviest users equalled about ½ an hour per day, ignored cordless phones (thereby skewing both sets of data), and did not include data on children or adults over the age of 59 (both of whom have been deemed vulnerable sections of the community in terms of RF exposure). Even with all these failings, other scientists point to the study's findings which showed that the risk of glioma is increased somewhere between 40% and 96% with as little as 1640 cumulative life time hours, which is a truly alarming figure given that the latency period of brain tumours is generally regarded as being 15-30 years (BioInitiative Working Group 2010).

Point 11 also unnecessarily trivialises IARC's classification of RF as possibly carcinogenic. (Incidentally, although this is a minor error in the paper, the review was conducted in May, not June as stated by EMC Technologies, which explains the press release date of 31st May [IARC 2011].) Dr Baan (author of EMC's reference 26, *Carcinogenicity of radiofrequency electromagnetic fields*) was at pains to state at the EMF Scientific Workshop that the press's spin in comparing the 2B classification for RFs to the same classification for coffee and pickled vegetables '*ridiculed the seriousness of their work*' (Smith, J. 2011, pers. comm., 22 November). (Incidentally the 2B classification is also shared with DDT and lead, although EMC Technologies neglect to mention that). Baan also explained at the workshop why it is so difficult to design animal experiments in this area that mimic human behaviour (rodents don't run around with mobile phones!), stating that it was also very difficult to interpret the results (an attendee at the workshop pointed out that the initial studies into lung cancer also couldn't obtain evidence from animal studies). EMC Technologies however seem to

view this in a different light, raising it in their summary at point 12 as a lack of substantive evidence in this area.

DPI's Health Fact Sheet states that the *'EMC Technologies study found that radiofrequency exposures from Smart Meters are lower than other household devices such as mobile phones and baby monitors'* (Department of Primary Industries 2013 b). This ignores the fact that a significant proportion of Victorians do not use devices such as mobile phones or baby monitors. It also ignores the fact that, depending on one's assumptions, completely different conclusions can be reached.

For instance a report by Daniel Hirsch, a lecturer and expert in nuclear policy at UCSC, showed that in a worst case scenario a smart meter would produce 160 times more cumulative whole body exposure than a mobile phone (Hirsch 2011, p. 6). EMC Technologies' findings also ignore the fact that the effects of radiation are additive and cumulative. One therefore needs to look at the *total* amount of radiation that a given person has been exposed to, in order to put the risk into context.

The Health Services Agency of the County of Santa Cruz views the relationship of AMI technology to existing usage of wireless devices in an entirely different light to that of DPI. Dr Namkung states *'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 a uncertainty with the installation of a mandatory SmartMeter'* (Namkung 2012, p. 11). In her concluding remarks she states *'there is no scientific data to determine if there is a safe RF exposure level regarding its non-thermal effects'* (Namkung 2012, p. 13).

The Board of the American Academy of Environmental Medicine concurs, stating in 2012 that it *'opposes the installation of wireless "smart meters" in homes and schools based on a scientific assessment of the current medical literature...'* (American Academy of Environmental Medicine, 2012, p.1). The Board pointed out that *'existing FCC guidelines for RF safety that have been used to justify installation of "smart meters" only look at thermal tissue damage and are obsolete, since many modern studies show metabolic and genomic damage from RF and ELF exposures below the level of intensity which heats tissues'*. Unfortunately, Australian standards are also *'only designed to protect the body from heat injury'* (EMC Technologies, p. 31). The Board, whilst raising issues such as genetic and cellular effects, hormonal effects, male fertility, blood/brain damage and increased risk of certain types of cancers, also stated *'EMF/RF adds synergistic effects to the damage observed from a range of toxic chemicals'* (American Academy of Environmental Medicine 2012, p.1).

Further, items such as mobile phones entail an element of choice, unlike Victoria's AMI roll-out.

Victorian power distributors such as Powercor have claimed that transmissions will only occur four to six times per day. Transmissions consist of microwaves broadcast from individual smart meters. However this ignores the fact that, with the exception of SP AusNet which utilizes a WiMAX network operating in the 2.3 GHz band (EMC Technologies, 2011, p. 8), other distributors are using Mesh Radio Networks. As pointed out by EMC Technologies this means that *'an AMI Meter does not need to be able to communicate directly with an Access Point'* (also referred to as a collection point or hub.....which in appearance is just a small set of infrastructure hosted on a pole and which also provides the 3G backhaul communications). *'Therefore the network is dynamic and adaptive, but it also means that, other than the periodic transmissions during the routine meter read time, the meter may transmit randomly at other times, either to maintain link with Back Office or to act as relay for neighbouring meters'* (EMC Technologies 2011, p. 7). In other words, in addition to scheduled

transmissions and status checks, microwaves, carrying other households' data, may end up being received and transmitted on by your smart meter, and similarly received and transmitted by succeeding smart meters, until the data reaches collectors which may be three or more kilometres away, as part of a separate duty cycle. So consumers have **no idea** how much traffic is going to be received and transmitted via their own smart meter once the system is operational. EMC Technologies however were satisfied that a duty cycle of 2.5% (equating to a maximum of 36 minutes' transmission per day), represented a worst case scenario (EMC Technologies 2011, p. 2 and p. 14).

Unfortunately, this conclusion gives *no* indication as to how many individual transmissions per day may be occurring at homes and small businesses. Statistics provided by PG&E in response to legal direction to file clarifying information on their smart meter networks show that smart meters emit millisecond-long RF bursts on average 9,600 times a day, with a maximum of 190,000 daily transmissions (Pacific Gas and Electric Company 2011, p. 5). PG&E use smart grid technology from the same vendor (Silver Spring Networks) as CitiPower, Powercor, Jemena and United Energy (Silver Spring Networks, 2012). Testing in Victoria also has revealed frequent RF spiking from smart meters (Maisch 2012 b).

Relay stations (similar in appearance to access points, albeit slightly smaller, and also typically hosted on poles) are being deployed as intermediary collection points between access points and individual smart meters. Distributors such as Powercor and CitiPower have refused to tell us where access points and relay stations are located. They have been reported as saying this is because of 'sabotage' concerns. This seems an astonishing stance to take, given that even the location of mobile phone towers is within the public domain. Locations close to access points and relay stations may be subject to considerably increased RF activity (Klinghardt 2012).

Unfortunately, the Australian standard requires RF exposure to be averaged over a six minute time span (ARPANSA 2002, p. 12). This methodology appears highly dubious when applied to devices such as wireless smart meters, which are transferring their packets of data in millisecond bursts. Obviously high intensity peaks will be 'smoothed' out to the extent that the requirements of ARPANSA's standard will be met with ease. As an analogy, many people enjoy a dim, ambient background light; however a completely different outcome would result from a very high wattage, strobing light. A number of people would find this a disturbing experience, and certainly not one that they would be prepared to sustain 24/7.

Dr. Maret points out that there is a considerable difference between the biological impact of pulsed microwaves, such as that produced by smart meters, and continuous waves. He states '*It is imperative to understand that it is the modulation or pulsation pattern that leads to biological effects at non-thermal power levels*' (Maret 2011, p. 6). Drs Blank and Goodman's research into the effects of EMR on cells clearly shows that electromagnetic fields interact with DNA, inducing the cellular stress response, whilst the energy in the RF range can lead to breaks in DNA strands. They state that '*the current safety standard based on thermal response is fundamentally flawed, and not protective*' (Blank & Goodman 2009 p. 76). ARPANSA's standards acknowledge that there is a '*further and more vexing question*' regarding the effect of non-thermal levels, concluding that more research is needed (ARPANSA 2002, p. 95). In fact '*more than a thousand studies done on low intensity, high frequency, non-ionizing radiation, going back at least fifty years, show that some biological mechanisms of effect do not involve heat*' (Carpenter 2012).

SP AusNet's WiMAX network, although expected to lead to lower duty cycles (EMC Technologies, 2011, p. 15) and with an output radiofrequency power of 0.4 watts (EMC Technologies 2011, p. 8) as compared to 1 watt for the mesh networks, nevertheless represents a particularly intrusive means of

communication. It is believed that 60 to 80 base stations (co-located on towers or placed on monopoles or custom-built towers) will service approximately 680,000 customers in the wide area network (Tindall 2009). Note SP AusNet has since updated this figure to 722,000 smart meters (SP AusNet 2012, p. 22). Apparently, although WiMAX has been implemented in various countries for broadband, in terms of smart meter technology worldwide *'it appears that the only actual or planned rollout is that being done by SP AusNet....'* (Impaq Consulting 2011, p. 12). Whilst as a consequence Impaq Consulting have raised serious questions regarding the risk profile of WiMAX in their review of WiMAX for smart metering, what about the potential health effects on people? WiMAX has been referred to as 'Wi-Fi on steroids' as a result of its signal radius, which can reach about 50 kilometres, blanketing whole cities with microwave radiation. SP AusNet however claim base stations will typically only provide coverage across several kilometres (SP AusNet n.d.). This raises the question: how many towers and monopoles will actually be required to service SP AusNet's WiMAX rollout?

In-home Display unit as part of Home Area Network (HAN)

Interactive devices, such as in-home displays, which form part of a Home Area Network (HAN), received prime billing in DPI's 2011 Fact Sheet on Flexible (a.k.a. TOU) Pricing. Reference to them has since been downgraded to information contained in one Frequently Asked Question (Department of Primary Industries 2013 a).

According to EMC Technologies' report HANs will operate in the 2.4 GHz frequency band using the ZigBee protocol (EMC Technologies 2011, p. 13 ...note that on page 89 EMC give a different frequency for WiMAX meters, instead stating that they will be using 900 MHz for the HAN). This means, if enabled, microwaves will be transmitting between appliances such as fridges, washing machines and air-conditioners that are similarly enabled, and your HAN radio. This provides power distributors further means of shedding load. For instance, if enabled, Powercor would be able to remotely shut down all air conditioners in a certain area.

For electrically sensitive consumers, and consumers concerned about cumulative exposure to electromagnetic fields, the prospect of microwaves bouncing around inside homes is an alarming thought. Promoting microwave traffic within a building is particularly problematical, due to the increased unpredictability of wave movement, due to the likelihood of smooth surfaces (which are found in many kitchens!) causing wave reflection. Alarmingly, even if consumers opt not to purchase an in-home display unit, they may find that new appliances (such as washing machines, clothes dryers and fridges) are *already* periodically emitting radiofrequencies in the microwave range or, even worse, *continuously* broadcasting these high frequencies through their home (Sage, 2011).

Elsewhere in the world many authorities and institutions have taken a precautionary approach in regards to the use of wireless enabled devices. For instance the French national library announced in 2007 that it was replacing all Wi-Fi connections with wired connections due to health issues (Bibliothèque Nationale de France 2008). Russia's peak radiation authority issued a statement in 2012 warning against the use of wireless broadband systems, including Wi-Fi, in kindergartens and schools (Russian National Committee on Non-Ionizing Radiation Protection 2012). The committee stated that electromagnetic radiation from Wi-Fi *'creates an additional burden for the child brain, whose body is in a state of development and the formation of mental activity'*. Are Australian children any less susceptible to radiation from wireless-enabled devices such as smart meters, and the associated appliances that could soon be communicating with them? Power distributors in Victoria continue to install wireless smart meters in Victoria at schools and kindergartens despite these concerns.

Actively promoting wireless communications inside homes also appears to be particularly irresponsible as there is an expectation that the number of people who are electrically sensitive is likely to rise significantly, in line with increasing exposure levels to artificial electromagnetic radiation. Electrohypersensitivity is already fully recognized in Sweden as a functional impairment, entitling sufferers to annual government disability subsidies (Johansson 2011). Shielding is also provided in some instances (McLean 2011, p. 217). In addition, worryingly, *'over time, it appears that sensitivity is increased to smaller and smaller EMF/RFR exposures'* (Sage 2001). Others liken electrical hypersensitivity (EHS) to a peanut allergy: *'just as some vulnerable individuals with peanut allergy can experience life-threatening anaphylaxis from exposure to minuscule amounts of everyday peanuts, some EHS persons can develop debilitating responses to everyday levels of EMR'* (Genuis & Lipp 2011, p. 8). How much will it cost the government if we continue down the AMI path and Australia also recognizes electrohypersensitivity as a disability?

A speaker at the 2011 EMF Scientific Workshop in Melbourne estimated that 516,000 Australian adults would consider themselves to be electrically hypersensitive if a prevalence rate of 3% was assumed (Anderson *et al.* 2011, slide 4). How many of these are in Victoria? How many more will there be in ten years' time? (Some research, such as that by Hallberg, an independent researcher, and Oberfeld, a medical doctor from the Austrian Department of Public Health, has indicated that up to 50% of the population will be electrically sensitive in the near future...Hallberg & Oberfeld 2006). How are these people going to be treated under the AMI program?

DPI's smart meters Health Fact Sheet states that Victoria's Chief Health Officer has endorsed the advice of the Victorian Ministerial Radiation Advisory Committee's March 2012 meeting 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'* (Department of Primary Industries 2013 b). However it is unclear as to how the Radiation Advisory Committee arrived at this decision. Unfortunately, the brief statements contained in the Radiation Advisory Committee's 2012 Annual Report cast little light upon the matter, other than to advise that DPI presented the Committee with EMC Technology's *AMI Meter Electromagnetic Field Survey Preliminary Report* and, under a separate heading, that the committee considered evidence regarding chronic health effects such as cancer from radiofrequency radiation (Department of Health 2012, p. 8 and p. 9). One is left with the uncomfortable feeling that the committee (which met eleven times last year) only had a cursory examination of the issues. Only one of the thirteen people on the committee is listed as having non-ionizing radiation (which is the part of the electromagnetic spectrum relevant to smart meters) as their area of expertise (Department of Health 2013). Dr Maisch notes that the person in question was Director of Global EME [Electromagnetic Energy] Strategy and Regulatory Affairs for Motorola Australia as recently as in 2009; this raises the question as to whether the interests of industry continue to cloud his assessment of the issues (Maisch 2012 c).

No 'opt-out' provision available to customers

The Victorian government has made *no* provision for consumers to opt out. A legal precedent was set in the USA, where due to *'unresolved concerns relating to health, privacy, and cyber security resulting from the installation of wireless meters on their homes'* Maine Public Utilities Commission found it was unjust to refuse customers the right to opt out of having a smart meter (Skelton, Taintor & Abbott, 2011). In early 2012, as a result of numerous complaints concerning smart meters, the California Public Utilities Commission approved the right of Pacific Gas and Electric customers to have analogue meters reinstated (PG&E 2012). Other areas across United States where opt-out programs have been announced include markets in Vermont, Louisiana, Michigan, Connecticut, San Diego and Southern California. Consumers have also won the right to opt out in

Quebec, Canada. The UK government has made the installation of smart meters voluntary, as was the case in the Netherlands in 2009.

According to newspaper reports ten percent of Victorians had taken the unprecedented step of refusing to have a smart meter in 2011. In addition eleven motions against smart meters had been passed by nine Victorian councils in support of their constituents as at the end of 2012. It is not known how consumers will be dealt with if they continue to refuse a smart meter. The government maintains that every Victorian household will have a smart meter installed by the end of 2013. This is at odds with the Prime Minister's statement that *'the devices won't be compulsory'* (Gillard 2012). Instead the COAG recommendation was to implement a market-driven (business-led) roll-out (COAG 2012 b, p. 4). Consumer Action Law Centre pointed out in 2011 that if consumers continue to *'prevent access to the distribution business' asset, the law has not been tested in this respect and the consequences are unknown for consumers'* (Consumer Action Law Centre, p. 8). Further independent legal advice confirms the ambiguity of current legislation as it stands in respect of the obligations which it places upon consumers to allow persons on their property to install smart meters. It also is entirely inconsistent for power distributors to bully or make threats to consumers in fulfilling their obligations of using their 'best endeavours' to install smart meters (Stop Smart Meters 2012 b).

However, even if electrically hypersensitive individuals are eventually allowed to opt out, as has occurred elsewhere, how is that going to help them when they are subject to far-field emissions from neighbouring smart meters? There have been a number of reports of people being severely affected by neighbours' smart meter emissions, even when they themselves have not had a smart meter installed. Dr Lamech's account of her own exposure to neighbouring smart meter emissions provides a graphic description of the possible bioeffects from smart meter emissions (Lamech 2012).

Concern about drying-up of independently sourced funding for scientific research

Whilst it is possible for industry to point to studies that contradict findings of adverse health effects, it is important to bear in mind that it is extremely difficult in the current climate to obtain research which has not been tainted by the far-reaching tentacles of powerful industry interests. For instance, when Dr Henry Lai conducted research into findings on biological effects from mobile phone radiation, he found that industry-funded studies only had a 30% likelihood of finding an adverse effect as compared to independent studies, where the likelihood was 70% (Ishisaka 2011).

Dr Devra Davis contends *'the existence of scientific conflict on this subject is in large part a reflection of the successful efforts of some to manufacture scientific doubt.... if we insist on seeing proof that an epidemic is already under way, before acting to restrain exposures to an agent that damages DNA, weakens the blood-brain barrier, and unleashes destructive free radicals throughout the body, we will condemn ourselves and our families to our lesser angels. There is no virtue in waiting until it is too late'* (Davis 2011, p. 203).

Environmental concerns

Dr Isaac Jamieson's review, *Smart Meters – Smarter Practices*, details a number of possible critical environmental effects from smart meter technology. These are based on research into effects of microwaves on vegetation, amphibians, birds and insects (Jamieson 2011, pp. 137-144). Effects include plant and tree die-off, drastic decline in wild amphibian populations and an increase in the number of deformed amphibians being found, reduced bird density in areas of increased field strength and increased bird aggression, and alteration in worker bees' behaviour and physiology.

ARPANSA's mission statement proclaims 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*' (ARPANSA 2002, emphasis added). However none of the publications in ARPANSA's Radiation Protection Series appear to provide any such standards as might protect the environment from increased radiation levels as a result of the Victorian smart meter rollout.

Concern about erosion of democratic rights

Victoria's Charter of Human Rights and Responsibilities came into full effect on 1 January 2008 (Charter of Human Rights and Responsibilities Act 2006, p. 3). Section 32(1) requires all statutory provisions to be interpreted in a way that is compatible with human rights. Furthermore, Section 32(2) stipulates that international law and judgments of domestic, foreign and international courts and tribunals relevant to a human right may be considered in interpreting a statutory provision.

Section 8(2) states that **every person has the right to enjoy his or her human rights without discrimination.**

The Victorian smart meter roll-out contravenes this overriding right, and is particularly discriminatory in relation to vulnerable segments of the population. The roll-out may result in the rights contained in Sections 9, 10, 12, 13, 17, 20 and 21 being violated.

Section 9 states that **every person has the right to life and has the right not to be arbitrarily deprived of life.**

The mandatory transmission of a Group 2B carcinogenic agent (IARC 2011) may lead to an initiation of cancer (Johansson 2011). Whole-body exposure from wireless smart meters may produce immune system imbalances, and lowered resistance to disease across multiple pathways. (BioInitiative Working Group 2012 b, p. 1409). According to Dr. Klinghardt, in a video called '*Smart Meters and EMR: Health Crisis of our Time*', laboratory results show that exposure to wirelessly communicating smart meters results in altered inflammatory markers, hormone abnormalities and neurotransmitter abnormalization in the entire population, regardless of whether or not individuals have previously been considered to be EHS (Klinghardt 2012). All of these factors may lead to premature death.

Section 10 states a person must not be (a) **subjected to torture** or (b) **treated or punished in a cruel, inhuman or degrading way.**

Dr. Jamieson's discussion in *Smart Meters – Smarter Practices* of this right, which is also embodied in the U.K.'s Human Rights Act, points out that the European Court's definition of degrading treatment appears '*very similar to descriptions provided by some electrohypersensitive (EHS) individuals describing how their condition makes them feel*' (Jamieson 2011, p. 44) .

Many people have posted highly distressing accounts of the effect which smart meter emissions have had on the quality of their lives to Stop Smart Meters Australia's website. Typical experiences include that of Dr. Lamech, outlined in an open letter to the Premier (Lamech 2012), the experience of Desiree (Desiree 2013), and stories such as that of a schoolteacher (Michaela 2012).

Additionally Section 10(c) stipulates that a person must not be **subjected to medical or scientific experimentation or treatment without his or her full, free and informed consent.**

The rapid uptake of new technologies introducing increasing exposure to artificial EMFs simply defies considered investigation as to what the consequences might be for the human race and our planet. *'It should be noted that we are not the only species at jeopardy, practically all animals and plants may be at stake'* (Johansson 2011). Are all Victorians going to be guinea pigs, whether they wish it or not, in what amounts to, an uncontrolled AMI experiment?

Section 12 states that **every person lawfully within Victoria has the right to move freely within Victoria and to enter and leave it and has the freedom to choose where to live.**

Individuals with severe EHS in Victoria have already been forced to vacate their homes due to smart meter emissions in contravention of this basic right.

Section 13(a) states that a person has the right **not to have his or her privacy, family, home or correspondence unlawfully or arbitrarily interfered with.**

These concerns are precisely why privacy watchdogs and consumer groups in the Netherlands persuaded parliamentarians to vote against compulsory smart meters (Heck 2009).

Section 17(2) states **every child has the right, without discrimination, to such protection as is in his or her best interests and is needed by him or her by reason of being a child.**

'When electrical properties are considered, a child's head's absorption can be over two times greater, and absorption of the skull's bone marrow can be ten times greater than adults' (Gandhi et al. 2012, Abstract). Exposure to EMFs may also lead to cellular DNA-damage which can carry down generations (Johansson, 2011). It does not appear that adverse health effects on children have been considered in relation to the rollout of smart meters.

Section 20 states that **a person must not be deprived of his or her property other than in accordance with law.**

The media has already published a number of reports on people who have been forced to move from their homes (O'Connell, 2012), or who have had to abandon parts of their home in order to reduce exposure (Robin, 2012), or have outlaid considerable sums on microwave shielding materials in order to render part of their home habitable. In all these circumstances this has resulted in a loss of enjoyment of property, as well as often effectively denying access to outside gardens (Jamieson 2011, p. 45). Where there has been plant die-back as a result of smart meter emissions, or where emissions have resulted in the pre-mature death of pets or livestock, this represents a further loss of property (Jamieson, 2011 p. 47).

Section 21(1) states that **every person has the right to liberty and security.**

Smart meter emissions, even from neighbouring smart meters, have already prevented people in Victoria from freely moving around due to the impact on their well-being (Lamech 2012).

The introduction of AMI technology also appears to contravene other significant declarations of human rights to which Australia is a signatory, such as the Universal Declaration of Human Rights adopted by the General Assembly of United Nations (Jamieson 2011, pp. 71-76).

Precautionary principle

Surely, the government should be exercising prudence in the rollout of new technology, especially technology which is associated with unknown health risks? It was only in the relatively recent past that shoe shops were allowed to x-ray the feet of children to check whether the shoe fitted. We know better now. The man who discovered the effectiveness of DDT as an insecticide received a Nobel prize in 1948 in recognition. United States banned DDT in 1973, a scant 25 years later. Asbestos was hailed as a wonder material in the 1950s. How many people have now died as a result? We are still paying the price, and will for many years to come.

David Gee, Senior Advisor for Science, Policy, Emerging Issues, Integrated Environmental Assessment at the European Environmental Agency, points out that the World Health Organization's 2011 Group 2B rating set by the International Agency for Research on Cancer (IARC) for wireless transmissions is likely to be upgraded in the future. As he states *'it is worth noting that during over 30 years of classifying cancer risks, covering around 900 agents, IARC very rarely downgrades its judgements: in most cases tentative carcinogens become more certain carcinogens as time since first exposures and further research accumulates'* (Gee 2012, p. 1376).

Given that scientific studies show that cancer is just one of many adverse health outcomes as a consequence of radiofrequency exposure, is continuing with the smart meter roll-out worth the gamble? Surely the Victorian government, given the magnitude of what is at stake, should be heeding the public's call for precaution.

Conclusion

The rollout of smart meter technology is primarily aimed at bolstering shareholder profits. Even so, its success rides on a number of assumptions, many of which appear to be decidedly shaky.

However, overriding all of these individual issues looms the spectre of abetting a health crisis of unknown dimensions. Utilizing public funds in 2011 to check that electromagnetic exposures from smart meters complied with ARPANSA's RF standard (which dates back to 2002) appears to have achieved very little. That is not the issue. The problem is that ARPANSA's standard for radiofrequencies appears to be built on shaky foundations, in terms of addressing current technology, as well as seriously lagging behind emerging findings.

It appears unreasonable to base safety standards on time-averaged radiofrequency exposures when the technologies in use today, such as that used for smart meter transmissions in Victoria, deploy pulsed radiofrequency radiation. Thousands of scientific studies have reported serious adverse health effects at a fraction of the safety limits set in Australia for radiofrequencies.

What will the long-term costs of continuing, lemming-like, down this path be for the Victorian public?

REFERENCES

Note: Links which have broken since publication date have been replaced where possible (8th November 2013).

Aronia AG, n.d., *Exposure Limits and Unit Conversions*, (Online), Available: http://www.spectran.com/grenzwerte_d_en.shtml (16 March 2013).

ABC News 2010, *\$500 million smart meter blowout*, (Online), Available: <http://www.abc.net.au/news/2010-05-18/500-million-smart-meter-blowout/831076>

ABC News 2011, *Smart meters here to stay despite cost blow-out*, (Online), Available: <http://www.abc.net.au/news/2011-12-14/smart-meter-roll-out-continues-despite-cost-blow-out/3730522>

ACMA 2011, *The 900 MHz band—Exploring new opportunities, Initial consultation on future arrangement for the 900 MHz band*, (Online), Available: http://acma.gov.au/webwr/_assets/main/lib312085/900mhz_review-exploring_new_opportunities.pdf

American Academy of Environmental Medicine 2012, *Resolution addressed to the Public Utilities Commission of the State of California*, (Online), Available: <http://aaemonline.org/images/CaliforniaPublicUtilitiesCommission.pdf>

Anderson, Meyer, Simpson & Croft 2011, 'Vitas Ppt Presentation', Development of a provocation test methodology for electromagnetic hypersensitivity (EHS), *ENA EMF Scientific Workshop 2011*, Melbourne, Available (Online): <http://www.ena.asn.au/wp-content/uploads/2013/04/ENA-EMF-Scientific-Workshop-2011-combined-presentations.pdf>

ARPANSA 2002, *Radiation Protection Standard, Maximum Exposure Levels to Radiofrequency Fields — 3 kHz to 300 GHz*, Radiation Protection Series No. 3. (Online), Available: <http://www.arpansa.gov.au/pubs/rps/rps3.pdf>

Association of Independent Retirees (A.I.R. Ltd) 2011, *Submission: The Advanced Metering Infrastructure Program Review By Department Of Treasury And Finance*, (Online), Available: [http://www.dtf.vic.gov.au/CA25713E0002EF43/WebObj/AssociationofIndependentRetireessubmission/\\$File/Association%20of%20Independent%20Retirees%20submission.pdf](http://www.dtf.vic.gov.au/CA25713E0002EF43/WebObj/AssociationofIndependentRetireessubmission/$File/Association%20of%20Independent%20Retirees%20submission.pdf)

Australian Government Productivity Commission 2012, *Electricity Network Regulatory Frameworks draft report*, (Online), Available: <http://www.pc.gov.au/projects/inquiry/electricity/draft>

Baan, R. A. November 2011, *Electromagnetic Fields: Evaluation of Cancer Hazards*, *ENA EMF Scientific Workshop 2011*, Melbourne, Workshop Slides, (Online), Available: <http://www.ena.asn.au/wp-content/uploads/2013/04/ENA-EMF-Scientific-Workshop-2011-combined-presentations.pdf>

Bibliothèque Nationale de France 2008, *Press Release*, (Online), Available: <http://www.next-up.org/pdf/PressReleaseFranceNationalLibraryBNFisGivingUpWiFi03042008.pdf>

BioInitiative Working Group 2010, Press Release, *Ten-Year INTERPHONE Cell Phone Study Reports Increased Risk for Brain Cancer*, (Online), Available: http://bioinitiative.org/freeaccess/press_release/docs/Interphone.pdf

BioInitiative Working Group 2012 a, Press Release, *BioInitiative 2012 Report Issues New Warnings on Wireless and EMF*, (Online), Available: <http://bioinitiative.org/report/wp-content/uploads/pdfs/BioInitiativePressRelease1-1-2013.pdf>

BioInitiative Working Group 2012 b, *BioInitiative 2012 Report*, Conclusions Table 1-1, (Online), Available: <http://www.bioinitiative.org/>

Blank, M. & Goodman, R. 2009, 'Electromagnetic fields stress living cells', *Pathophysiology Vol 16 Issue 2, Pages 71-78 (2009)*, (Online), Available: http://mreengenharia.com.br/pathfisiology/Pathophysiology-2009_M_Blank.pdf

Brotherhood of St Laurence 2011, *Submission to the Department of Treasury and Finance – Review of the Advanced Metering Infrastructure*, (Online), Available: [http://www.dtf.vic.gov.au/CA25713E0002EF43/WebObj/BrotherhoodofStLaurencesubmission/\\$File/Brotherhood%20of%20St%20Laurence%20submission.PDF](http://www.dtf.vic.gov.au/CA25713E0002EF43/WebObj/BrotherhoodofStLaurencesubmission/$File/Brotherhood%20of%20St%20Laurence%20submission.PDF)

Carpenter, D. 2012, 'Smart Meters: Correcting the Gross Misinformation', *La Maison du 21e siècle*, (Online), Available: <http://maisonsaine.ca/smart-meters-correcting-the-gross-misinformation/>

Charter of Human Rights and Responsibilities Act 2006, (Vic), (Online), Available: http://www.legislation.vic.gov.au/domino/Web_notes/LDMS/PubLawToday.nsf/95c43dd4eac71a68ca256dde00056e7b/6a434cad017ac08aca2573b700227912!OpenDocument

CitiPower 2009, *Advanced Metering Infrastructure Budget Application 2009-11*, (Online), Available: <http://www.aer.gov.au/sites/default/files/CitiPower%20-%20AMI%20Budget%20Application%202009-11.pdf>

CitiPower 2011, *Advanced Metering Infrastructure Budget and Charges Application 2012-15*, (Online), Available: <http://www.aer.gov.au/sites/default/files/CitiPower%20-%202012-15%20AMI%20Budget%20and%20Charges%20Application%20-%2028%20February%202011.pdf>

CitiPower Powercor 24 June 2011, *letter to ACMA*, (Online), Available: http://www.acma.gov.au/webwr/_assets/main/lib312085/citipower_and_powercor-900_mhz_review.pdf

COAG 2012 a, *Council of Australian Governments Meeting – Communiqué Canberra, 7 December 2012*, (Online), Available: <http://www.coag.gov.au/sites/default/files/FINAL%20COMMUNIQUE%20-%207%20DECEMBER%202012.pdf>

COAG 2012 b, *COAG Energy Market Reform - Implementation Plan*, (Online) Available: <http://www.coag.gov.au/sites/default/files/COAG%20Energy%20Market%20Reform%20Implementation%20Plan%20-%20FINAL%20-%2028%20November%202012.pdf>

Consumer Action Law Centre 2011, *Submission to Department of Treasury and Finance Review of the advanced metering infrastructure program - Issues paper for public consultation May 2011*, (Online), Available: <http://consumeraction.org.au/wp-content/uploads/2012/11/CALC-submission-Advanced-Metering-Victoria.pdf>

Davis, D. 2011, *Disconnect*, Scribe Publications, Carlton North

Deloitte, 2011, *Advanced Metering Infrastructure Cost Benefit Analysis report*, (Online), Available: http://www.smartmeters.vic.gov.au/__data/assets/pdf_file/0003/138927/Deloitte-Final-CBA-2-August.pdf

Department of Health 2012, *Radiation Advisory Committee Annual Report 2012*, (Online), Available: <http://docs.health.vic.gov.au/docs/doc/Radiation-Advisory-Committee-Annual-Report-2012>

Department of Health 2013, Radiation Advisory Committee, *Committee Members*, (Online), Available: <http://www.health.vic.gov.au/radiation/committee.htm> (16 March 2013).

Department of Primary Industries 2013 a, *Flexible Pricing*, (Online), Available: <http://www.smartmeters.vic.gov.au/flexible-pricing>

Department of Primary Industries 2013 b, *Health*, (Online), Available: <http://www.smartmeters.vic.gov.au/safety/health>

Department of Treasury and Finance, January 2012, *Review of the advanced metering infrastructure program*, (Online), Available: <http://www.dtf.vic.gov.au/CA25713E0002EF43/pages/DTF-projects-past-dtf-projects-review-of-the-advanced-metering-infrastructure-program>

Desiree 2013, *I burst into tears because I can't sleep...*, (Online), Available: <http://stopsmartmeters.com.au/2013/01/15/i-burst-into-tears-because-i-cant-sleep/> (16 March 2013).

Electricity Safety Act 1998, Authorized Version Incorporating Amendments at 1 January 2012, (Online), Available: [http://www.legislation.vic.gov.au/domino/Web_Notes/LDMS/LTObject_Store/LTObjSt6.nsf/DDE300B846EED9C7CA257616000A3571/ECF1BE6384432DFCCA2579750016C79D/\\$FILE/98-25aa061%20authorised.pdf](http://www.legislation.vic.gov.au/domino/Web_Notes/LDMS/LTObject_Store/LTObjSt6.nsf/DDE300B846EED9C7CA257616000A3571/ECF1BE6384432DFCCA2579750016C79D/$FILE/98-25aa061%20authorised.pdf)

EMC Technologies Pty Ltd 2011, *AMI Meter Electromagnetic Field Survey*, (Online), Available: http://www.smartmeters.vic.gov.au/__data/assets/pdf_file/0011/138926/AMI-Meter-EM-Field-Survey-Report-Final-Rev-1.0.pdf

Energy and Water Ombudsman Victoria, 21 June 2011, *Review of the Advanced Metering Infrastructure Program*, (Online), Available: http://www.ewov.com.au/__data/assets/pdf_file/0017/4445/EWOV-comments_Department-of-Treasury-and-Finance_Advanced-Metering-Infrastructure-Program-review_June_2011.pdf

Energy and Water Ombudsman Victoria, 2012, *Letter to Senate Select Committee on Electricity Prices*, (Online), Available: http://www.ewov.com.au/__data/assets/pdf_file/0017/6047/120913_EWOV-comments-Senate-Committee-Inquiry-on-Electricity-Prices.pdf

Energy Safe Victoria, April 2011, *Final Report on Safety Aspects of the Victorian Advanced Metering Infrastructure (AMI) Program Meter Deployment Activities*, (Online), Available: <http://www.esv.vic.gov.au/LinkClick.aspx?fileticket=PE62Of6VSU%3d&tabid=380&mid=2059>

Energy Safe Victoria, July 2012, *Safety of Advanced Metering Infrastructure in Victoria*, (Online), Available: <http://www.esv.vic.gov.au/About-ESV/ESVs-reviews-into-smart-meters>

Fragopoulou, A., Grigoriev, Y., Johansson, O., Margaritis, L., Morgan, L., Richter, E. & Sage, C. 2010, 'Scientific Panel on Electromagnetic Field Health Risks: Consensus Points, Recommendations, and Rationales', *Reviews on Environmental Health*, Vol. 25, No. 4, Available: http://www.sagereports.com/smart-meter-rf/docs/Fragopoulou_et_al_2010b.pdf

Gandhi, O., Morgan, L., de Salles, A., Han, Y., Herberman, R., & Davis, D. 2012, 'Exposure limits: the underestimation of absorbed cell phone radiation, especially in children', *Electromagnetic Biology and Medicine*, March 2012, Vol. 31, No. 1, Available: <http://informahealthcare.com/doi/abs/10.3109/15368378.2011.622827>

Gee D. 2012, 'The Precautionary Principle, 2012 Supplement', *BioInitiative 2012, A Rationale for Biologically-based Exposure Standards for Low-Intensity Electromagnetic Radiation*, Section 23, (Online), Available: <http://www.bioinitiative.org/>

Genuis, S. J. & Lipp C. T. 2011, Electromagnetic hypersensitivity: Fact or fiction? *Science of the Total Environment* (2011), (Online), Available: <http://www.stopumts.nl/pdf/EHS%20Fact%20or%20fiction.pdf>

Gillard, J. 2012, Press Office, Prime Minister of Australia, The Hon Julia Gillard M.P., *Transcript of Interview with Charlie Pickering, Carrie Bickmore & Scott Dooley - The Project*, (Online), Available: <http://pmtranscripts.dpmc.gov.au/browse.php?did=18958>

Hallberg, O. & Oberfeld, G. 2006, 'Will we all become electrosensitive', letter to the editor, *Electromagnetic Biology and Medicine* 25 (3), 2006. pp. 189-91

- Havas, M. 2006, 'Electromagnetic Hypersensitivity: Biological Effects of Dirty Electricity with Emphasis on Diabetes and Multiple Sclerosis', *Electromagnetic Biology and Medicine*, 25, 2006, (Online), Available: http://www.weepinitiative.org/LINKEDDOCS/health/Havas_Electromagnetic_Hypersensitivity-Biological_Effects-MS_diabetes.pdf
- Heck, W. 2009, *Smart Energy Meter will not be compulsory*, NRC.NL, (Online), Available: http://vorige.nrc.nl/international/article2207260.ece/Smart_energy_meter_will_not_be_compulsory
- Hirsch, D. 2011, *Comments on the Draft Report by the California Council on Science and Technology "Health Impacts of Radio Frequency from Smart Meters"*, (Online), Available: <http://www.ccst.us/projects/smart2/documents/letter8hirsch.pdf>
- IARC, 2011, *IARC Classifies Radiofrequency Electromagnetic Fields as Possibly Carcinogenic to Humans*, Press Release No. 208, (Online), Available: http://www.iarc.fr/en/media-centre/pr/2011/pdfs/pr208_E.pdf
- Impaq Consulting, April 2011, *Australian Energy Regulator Review of WiMAX for Smart Metering and other Applications*, (Online), Available: <http://www.aer.gov.au/sites/default/files/Victorian%20AMI%20-%20SPA%20RBA%20-%20consultant%20-%20Impaq%20Consulting%20-%20Review%20of%20WiMAX%20-%2012%20April%202011.pdf>
- Ishisaka, N., January 2011, UW Scientist Henry Lai Makes Waves in the Cell Phone Industry, *Seattle Magazine*, (Online), Available: <http://www.seattlemag.com/article/nerd-report/nerd-report>
- Jamieson, I. 2011, *Smart Meters – Smarter Practices*, (Online), Available: <http://www.electromagneticman.co.uk/index.php/featured-download>
- Jemena Electricity Networks 24 June 2011, *Review of the Advanced Metering Infrastructure Program*, (Online), Available: [http://www.dtf.vic.gov.au/CA25713E0002EF43/WebObj/Jemenasubmission/\\$File/Jemena%20submission.PDF](http://www.dtf.vic.gov.au/CA25713E0002EF43/WebObj/Jemenasubmission/$File/Jemena%20submission.PDF)
- Johansson, O. 2011, *Letter from Dr Olle Johansson of Karolinska Institute to the California Public Utilities Commission Warning of the Dangers of Smart Meters*, (Online), Available: <http://electromagnetichealth.org/electromagnetic-health-blog/letter-johansson-smart-meters/>
- Klinghardt, D. 2012, *Smart Meters and EMR: The Health Crisis of our Time*, Online, Available: http://www.youtube.com/watch?v=b_wxM6IAF1I
- Lamech, F. 2012, Open Letter to the Premier from a Doctor, *Stop Smart Meters Australia*, (Online), Available: <http://stopsmartmeters.com.au/2012/03/30/open-letter-to-the-premier/#comment-2234> (16 March 2013)
- Lockstep Consulting, August 2011, *PIA Report Advanced Metering Infrastructure (AMI)*, (Online), Available: http://www.smartmeters.vic.gov.au/__data/assets/pdf_file/0003/138963/Lockstep-DPI-AMI-PIA-Report-1.2.1.pdf
- McGann, M. & Moss J., 2010, *Smart Meters, Smart Justice? Energy, Poverty and the Smart Meter Rollout*, University of Melbourne, (Online), Available: http://www.socialjustice.unimelb.edu.au/Research/smart_meters_smart_justice.pdf
- McLean, L. 2011, *The Force: living safely in a world of electromagnetic pollution*, Scribe Publications, Carlton North
- Maisch, D. 2012 a, *Who should research reported smart meter health hazards in Australia?* EMFacts Consultancy, (Online), Available: <http://www.emfacts.com/2012/09/who-should-research-reported-smart-meter-health-hazards-in-australia-2/> (16 March 2013).

Maisch, D. 2012 b, YouTube video of smart meter emissions in Melbourne raises concerns, EMFacts Consultancy, (Online), Available: <http://www.emfacts.com/2012/04/youtube-video-of-smart-meter-emissions-in-melbourne-raises-concerns/> (16 March 2013)

Maisch, D. 2012 c, *News Flash: Former Motorola Strategic Director directing the Victorian Government's response to smart meter health complaints*, (Online), Available: <http://www.emfacts.com/2012/11/news-flash-former-motorola-strategic-director-directing-the-victorian-governments-response-to-smart-meter-health-complaints/> (16 March 2013).

Maret, K. 2011, *Commentary on the California Council on Science and Technology Report "Health Impacts of Radio Frequency from Smart Meters"*, (Online), Available: <http://sagereports.com/smart-meter-rf/?p=368>

Michaela 2012, Response to *Former smart meter installer suffers from electro hypersensitivity (EHS)*, 11 October 2012, (Online), Available: <http://stopsmartmeters.com.au/2012/10/10/former-smart-meter-installer-suffers-from-electro-hypersensitivity-ehs/> (16 March).

Namkung, P. 2012, Attachment B, pp. 9-18, *County of Santa Cruz Health Services Agency Memorandum to Santa Cruz County Board of Supervisors*, (Online) Available: http://sccounty01.co.santa-cruz.ca.us/bds/Govstream/BDSvData/non_legacy/agendas/2012/20120124/PDF/041.pdf

O'Connell, B. 2012, *Couple forced to sleep in their car because of electricity meter health fears*, Herald Sun, (Online), Available: <http://www.news.com.au/national/meter-couple-living-in-car/story-e6frfkp9-1226315362750>

Pacific Gas and Electric Company 2011, *Pacific Gas And Electric Company's Response To Administrative Law Judge's October 18, 2011 Ruling Directing It To File Clarifying Radio Frequency Information*, (Online) Available: http://emfsafetynetwork.org/wp-content/uploads/2011/11/PGERFDataOpt-outalternatives_11-1-11-3pm.pdf

PG&E 2012, *PG&E Welcomes CPUC Decision On Analog Alternative To SmartMeter™*, PG&E News Release, (Online), Available: http://www.pge.com/about/newsroom/newsreleases/20120201/pge_welcomes_cpuc_decision_on_analog_alternative_to_smartmeter.shtml

Premier of NSW 2007, *Smart Meters Fact Sheet*, (Online), Available: <http://www.savepower.nsw.gov.au/Portals/0/docs/news/Media07121202.pdf>

Robin, S. 2012, Mornington Peninsula acts on smart meters, *Peninsula Weekly*, (Online), Available: <http://www.peninsulaweekly.com.au/story/369137/mornington-peninsula-acts-on-smart-meters/>

Russian National Committee on Non-Ionizing Radiation Protection 2012, *Recommendations of the Russian National Committee on Non-Ionizing Radiation Protection of the necessity to regulate strictly the use of Wi-Fi in kindergartens and schools*, (Online), Available in Appendix F, Section 22, BioInitiative 2012: http://www.bioinitiative.org/report/wp-content/uploads/pdfs/sec22_2012_Precautin_in_Action_Global_advice.pdf

Sage, C. 2001, *Microwave And Radiofrequency Radiation Exposure: A Growing Environmental Health Crisis?*, San Francisco Medical Society, (Online), Available: www.salzburg.gv.at/sage-sfarticle.doc

Sage, C. 2011, *Appliances Introducing Stealth EMF into Our Homes*, Letter to Stop Smart Meters, (Online), Available: <http://stopsmartmeters.org/2011/05/27/appliances-introducing-stealth-emf-into-our-homes/>

Sage, C. & Biergiel, J. J. 2010, *Wireless Smart Meters and Potential for Electrical Fires*, (Online), Available: <http://eon3emfblog.net/wp-content/uploads/2010/09/Wireless-Smart-Meters-and-Potential-for-Electrical-Fires.pdf>

Sage, C. & Carpenter, D. O. 2009, Public health implications of wireless technologies, *Pathophysiology* 16 (2009) 233-246, (Online), Available: <http://www.arpana.gov.au/RadiationProtection/EMR/literature/march09.cfm>

Schoechele, T. 2012, *Getting Smarter About the Smart Grid*, National Institute for Science, Law & Public Policy, Available: http://www.gettingsmarteraboutthesmartgrid.org/pdf/SmartGrid_Report_PDF-2012-11-26-Final.pdf

Seletun Scientific Statement, 2011, Transcript (Online), Available: <http://electromagnetichealth.org/wp-content/uploads/2010/12/The-Seletun-Scientific-Statement1.pdf>

Silver Spring Networks, 2012, *Our Industry Leading Customers Say It All*, (Online), Available: <http://www.silverspringnet.com/customers/> (16 March 2013).

Skelton, Taintor & Abbott, 2011, *Skelton, Taintor & Abbott Wins Landmark Smart Meter Case*, Firm News, (Online), Available: <http://www.skelontaintorabbott.net/news/85/77/Skelton-Taintor-Abbott-Wins-Landmark-Smart-Meter-Case.html> (16 March 2013).

Sood, R. & Price, D. 2012, *Smart Metering? Dumb Solution*, Frontier Economics, Client Briefing. To request a copy of the client briefing, please contact Marita O'Keeffe at m.okeeffe@frontier-economics.com or call on +61 (0)3 9620 4488

SP AusNet n.d., *SP AusNet Communications Network*, (Online) Available: <http://www.sp-ausnet.com.au/?id=23011140C36913FCE7EB6037CA2579D1001C8D91> (16 March 2013).

SP AusNet 2012, *SPAusNet 2012/13 Half Year Results Release and Presentation*, (Online), Available: [http://www.sp-ausnet.com.au/CA2575630006F222/Lookup/PresentationInvestors/\\$file/ReleaseandInvestorPresentation%209%20Nov%2012.pdf](http://www.sp-ausnet.com.au/CA2575630006F222/Lookup/PresentationInvestors/$file/ReleaseandInvestorPresentation%209%20Nov%2012.pdf)

Stop Smart Meters Australia 2012 a, *Submission to Energy Safe Victoria (ESV): Safety of Advanced Metering Infrastructure in Victoria*, (Online), Available: <http://stopsmartmetersau.files.wordpress.com/2012/06/esv-submission.pdf>

Stop Smart Meters Australia 2012 b, *Legal Advice*, (Online), Available: <http://stopsmartmetersau.files.wordpress.com/2012/12/sm-legal-advice-2012.pdf>

Tindall, S. 2009, *SP AusNet names smart meter suppliers*, ZD Net, (Online), Available: <http://www.zdnet.com.au/sp-ausnet-names-smart-meter-suppliers-339299184.htm>

Thomas, J. 2011, *Power scandal exposed: an explosive investigation into the massive mistakes being made with power bills reveals serious flaws that affect nearly every electricity user*, Today Tonight, (Online), Available: http://au.news.yahoo.com/today-tonight/money/article/-/10241945/TT_Power_scandal_exposed_-_12092011_files/

Victorian Auditor-General 2009, *Towards a 'smart grid' – the roll-out of Advanced Metering Infrastructure*, Audit Summary, (Online), Available: <http://www.audit.vic.gov.au/publications/2009-10/111109-AMI-Audit->