EM-RADIATION
RESEARCH TRUST

www.radiationresearch.org

Reg. Charity No: 1106304

Smart Meters – Smarter Practices

Solving emerging problems A review by Dr Isaac Jamieson

Introduction

This review is composed of items written by the present author and excerpts of scientific papers, reports or articles written by others.

To allow rapid review, important items of information are highlighted throughout this briefing document

Executive Summary

Problems reported with Smart Meters overseas may occur in the UK and could generate health, security and infrastructure difficulties unless appropriate action is taken.

Learning from the successes and mistakes of others, taking suitable precautions, and instigating independent research, UK plc can avoid many such problems.

The UK Energy Sector can carry out a number of measures to help ensure a smooth and efficient Smart Meter rollout that gives positive environmental impact and consumer feedback.

Properly handled, there is a window of opportunity for best practice and innovation to create a better future and new business opportunities for UK plc where 'everybody wins'.

Undertaken properly, the development of bio-friendly 'smart' technology can provide the opening for real progressive change and a truly dynamic revolution where both eco-sustainability and bio-sustainability kick start the future.

Index

Public Perception

Image Source: http://stopsmartmeters.org

United States of America

California

In California several local governments have passed ordinances criminalising new Smart Meter installations. Four of seven counties (Lake County, Marin County, Mendocino County and Santa Cruz County), and seven of the twenty-six cities and towns (Capitola, Fairfax, Rio Dell, Ross, Seaside and Watsonville) have done so to date.

The remaining counties have also taken steps to address concerns on Smart Meter installations:

- In San Francisco its City Attorney, Dennis J. Herrera, filed a petition against the California Public Utilities Commission in June 2010 to block the installation of more Smart Meters until state regulators conclude their investigation into them. Herrera's prime concern is the accuracy of readings provided by the meters.

- In February 2011, Humbolt County requested that alternative options are identified for customers who decline the installation of Smart Meters by 1st January, 2012.

- In March 2011 The Board of Supervisors of San Luis Obispo County agreed to issue a letter to the California Public Utilities Commission (CPUC) calling for a delay in the installation of wireless Smart Meters in that county until questions about the technology's safety, alleged threat to privacy and cost-effectiveness are answered.

Some residents state they would be comfortable with a wired Smart Meter option instead of the wireless standard that has been linked to claims of detrimental health effects.

In November 2010, the Division of Ratepayer Advocates (DRA) of the California Public Utilities Commission (CPUC) filed documentation arguing that the CPUC has a responsibility to ensure wireless Smart Meters do not endanger public health.

The DRA state "Unless the public's concerns can be put to rest, there is a very great risk that Smart Meter deployment will turn out to be a $2.2 billion mistake that ratepayers can ill afford".

References

Baker, D.R. (2010), PUC division pushes for SmartMeter health probe, Business Report. San Francisco Chronicle, The Chronicle with Bloomberg. http://www.sfgate.com/cgi-bin/article.cgi?f=/c/a/2010/11/17/BU8S1GDJ2F.DTL

Cuddy, B. (2011), County supervisors agree to ask for halt to SmartMeter installation, The Tribune, http://www.sanluisobispo.com/2011/03/08/1512608/smart-meter-installation-pge.html

Humbolt County Board of Supervisors (2011), Agenda Item: Letter to California Public Utilities Commission (CPUC) in Support of AB 37 (Huffman: Smart Grid Deployment: Smart Meters. http://co.humbolt.ca.us

DRA Questions Accuracy of Industry-Led CCST Health Report http://stopsmartmeters.org/2011/02/07/dra-questions-accuracy-of-industry-led-ccst-health-report/

Herrera, D.J. (2010), Herrera seeks immediate halt to PG&E's SmartMeter fiasco, City Attorney Dennis Herrera News Release, The City and County of San Francisco, http://www.sfcityattorney.org/Modules/ShowDocument.aspx?documentid=592

Rigley, C. (2011), SLO County weighs in on SmartMeters, New Times, http://www.newtimesslo.com/news/5767/slo-county-weighs-in-on-smartmeters/

Europe

France

Subject: Data on the French "Smart Meter"

By Agnès Fontana (2010), WEEP News, French smart meters, http://weepnews.blogspot.com/2010/09/french-smart-meters-wifi-in-schools.html

Excerpts

… I sent a letter to ERDF, the historical power operator in France, in charge [of] this project. I expressed my worries as an EHS person and asked for precisions.

… I was called [back]… by an ERDF employee who informed me… :

- the Canadian and US experience in smart meters had been taken into account ; an important thing is that in North America, meters are outside homes whereas in France they are mainly inside.

- wireless transmission systems for French smart meters had been contemplated, but dismissed

- the chosen solution is CPL (French for courant porteur en ligne – online bearing power, … data are transformed into power and sent into the power network). The smart meters will not emit wireless radiofrequencies.

The man also told me that the technical executive [of] ERDF is "very conscious" of electromagnetic problems.

Over 35 million wired Smart Meters are to be installed in France (Fontana 2010, Smart Meters 2008) – present author's comment.

References

Smartmeters (2008), Major smart meter pilot project launched in France, http://www.smartmeters.com/the-news/245-major-smart-meter-pilot-project-launched-in-france.html

Fontana, A. (2010), WEEP News, French smart meters, http://weepnews.blogspot.com/2010/09/french-smart-meters-wifi-in-schools.html

European Convention of Human Rights

In 2009, the Dutch government retreated on its former position of making Smart Meters compulsory in all homes. Prior to this their Minister of Economic Affairs, Maria van der Hoeven, had intended that refusing installation would be punishable by either a €17,000 fine or six months in prison. She now backs the installation of such units being voluntary (metering.com, 2009).

Their proposed mandatory rollout was opposed by privacy watchdog groups and consumer organisations, including Consumentenbond (the Netherlands' main consumer organisation), which commissioned a 2008 report into the matter by the University of Tilburg.

That report concluded that Smart Meters could give away sensitive information that might fall into the hands of third parties (including police and insurance companies) on consumers' energy usage habits, including when individuals' leave and return to their homes (which could be particularly useful to burglars).

It also stated that the insights these intelligent monitoring devices would provide into living patterns and relationships could affect individuals' freedom to do as they please within their own homes and therefore be in breach of the European Convention of Human Rights.

'The UK Government might also be challenged under the European Convention of Human Rights over the mandatory rollout of wireless Smart Meters

- **Article 1 of 1st protocol - Protection of property - Every natural or legal person is entitled to the peaceful enjoyment of his possessions**
- **Article 6 - Right to fair and public hearing by an independent and impartial tribunal**
- **Article 8 - Right to respect for private and family life**
- **Article 13 Everyone whose rights under the Convention are violated shall have an effective remedy before a national authority.'**

Source: Powerwatch (2010)

Need for additional stakeholders

Powerwatch on wireless SmartMeters

http://www.powerwatch.org.uk/news/20101018_smart_meter.asp

Excerpts

"… Although the DECC prospectus states that they consulted 'stakeholders', other groups clearly still need to be consulted. The most significant issue which has not been adequately addressed is the proposed use of wireless communication for the smart meter. No UK groups who are concerned by reported problems of chronic RF exposure (e.g. ES-UK, Radiation Research Trust, Powerwatch, Mast Action, Mast Sanity, hese-uk [now bemri.org – *present author's comment*], Cavisoc, Wifiinschools, Wiredchild, etc) have so far been directly consulted. Nor are any of these represented on the Ofgem Smart Metering Implementation Programme Consumer Advisory Group. …

A 2005 report (Irvine, 2005) by the UK Health Protection Agency concluded that electromagnetic hypersensitivity syndrome needs to be considered in ways other than its aetiology; that is, the suffering is real, even if the underlying cause may not be thought [by some – *present author's comments*] to be related to actual exposure to electromagnetic fields. In Sweden electromagnetic hypersensitivity is an officially recognized functional impairment, but it is not regarded as a disease (Johansson, 2006). However, people with functional impairments have the right for their needs to be considered when a government changes the ways things are done in society, especially in their own homes.

The Equality Act 2010 requires provision to be made to support people with a functional impairment.

Regulations may make provision for a condition of a prescribed description to be, or not to be, an impairment.

The effect of an impairment is to be considered long-term if:

- it has lasted for at least 12 months; or
- it is likely to last for at least 12 months; or
- it is likely to last for the rest of the life of the person affected;
- if an impairment ceases to have a substantial adverse effect on a person's ability to carry out normal day-to-day activities, it is to be treated as continuing to have that effect if that effect is likely to recur.

DECC policy should not unnecessarily decrease the well-being and health of people who suffer from EHS syndrome by insisting on the multiple use of RF technology when viable, cost effective, alternatives exist.

The Electricity Act 1989 (with amendments to 2010) states:

- "For the purposes of this section an electricity safety issue is anything concerning the supply of electricity which may affect the health and safety of members of the public;"
- In performing that duty, the Secretary of State or the Authority shall have regard to the interests of individuals who are disabled or chronically sick;
- The DECC Fact Sheet regarding the Energy Act 2010 (energybillfactsheet3.pdf) states: "Whilst promotion of competition is the foundation of consumer protection, Ofgem should consider whether there are alternative or additional measures that might better protect consumer interests before taking action."
- The DECC Fact Sheet also states that this means: "Ensure that the interests of all consumers, future and present, are appropriately taken into account when decisions are made in relation to the gas and electricity markets."

Health Matters

DECC confirms talks with Dept of Health over smart meter risks

by Natalie Evans. Published Tue 25 Jan 201, (http://www.clickgreen.org.uk/news/national-news/121825-decc-confirms-talks-with-dept-of-health-over-smart-meter-risks.htm)

Excerpts

Officials from the UK's Department of Energy and Climate Change have confirmed "discussions" with their counterparts at the Health Department over safety concerns regarding the mass installation of smart meters.

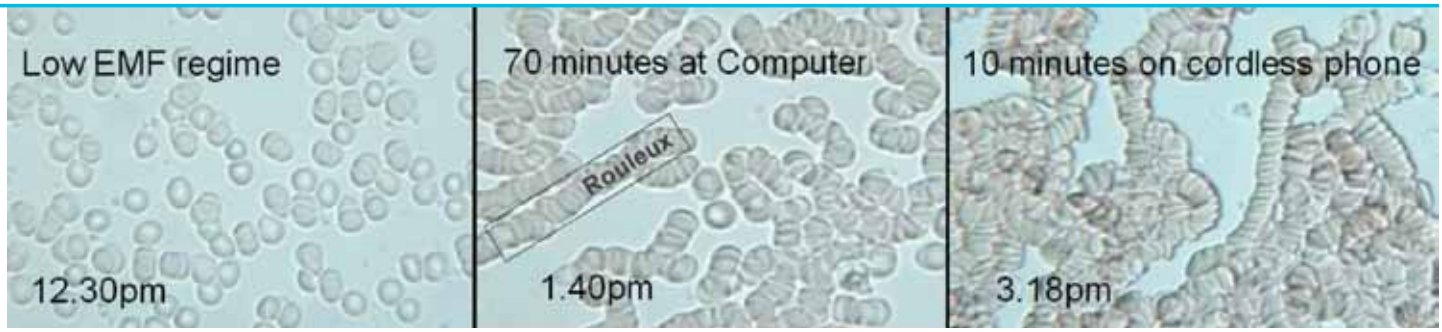
Energy chiefs say talks will continue with the Department of Health as worries grow over research linking smart meter technology and an increased risk of cancer.

The news follows a warning that indoor electromagnetic fields and radio waves emitted by smart meters pose a growing health risk. … now researchers are warning of the risks from the cumulative effect of waves emitted by electric, gas and water smart meters, together with other devices in the home. …

A DECC spokesman said: "We will keep under review any evidence related to the effects of radiofrequency signals on the health of individuals.

"Decisions on the communications requirements for smart meters have not yet been made and a communications technology solution has not yet been selected."

Health Impacts



Source: Havas (2010) http://www.youtube/watch?v=L7E36zGHxRw

Dark field microscopy reveals that some field regimes can cause clumping of red blood cells similar to that found with diabetics, individuals with heart conditions, and cancer patients (Havas 2010).

Rouleaux formation, as shown above (where blood cells stack together) is often a precursor to many serious diseases and can occur when blood is exposed to some microwave regimes and intensities.

Moldan (2009) noted that pulsed microwaves emitted by a single Smart Meter resulted in a power-density of 0.05 μW/cm² at 1 m. This increased to 0.2 μW/cm² at 0.5 m from the unit and 5.5 μW/cm² at 30 cm.

PG&E (2011) recorded a power-density of 8.8 μW/cm^2 (in the 902-928 MHz range) 30.5 cm from a single wireless Smart Meter for electricity. At a similar distance, they recorded a power-density of 0.00166 μW/cm^2 for a single gas Smart Meter operating in the 450-470 MHz range. Units can also operate in the 2.4 GHz range.

Higher power densities will occur nearer individual wireless Smart Meters and when multiple units are in use. Reflections can also occur, causing potential hotspots and increasing local radiation levels. These will increase the exposure of those spending prolonged periods nearby.

At present there exists little in the way of actual measurements and modeling data on how wireless Smart Meters may contribute to background microwave radiation, and little if any proper biological testing.

Since to date only anecdotal evidence appears to exist on the effects emissions from individual wireless Smart Meters may have on health, reference is made to research on other radiation sources at comparable magnitudes.

Studies matrix of power densities at levels caused by wireless Smart Meters

Power Density	Reported Biological Effects	References
0.000000001μW/cm2	Altered EEG in humans' brain waves & behaviour	Bise (1978)
0.002 μW/cm2	Abnormal blood pressure, digestive problems, fatigue, joint & limb pain, nervousness, sleep disorders & weakness	Altpeter et al., (1995, 1997)
0.06 μW/cm2	Altered adrenal hormone levels & enlarged adrenals, disturbed carbohydrate metabolism, altered EEG, structural changes in brain, liver, spleen & testes of animals	Dumanskij & Shandala, (1974)
0.1 μW/cm2	EEG brain waves altered under exposure to cell phone signal	von Klitzing (1995)
0.6 μW/cm2	Cardiac arrhythmias & sometimes cardiac arrest (frogs)	Frey (1986)
1.0 μW/cm2	Headache, dizziness, irritability, fatigue, weakness, insomnia, chest pain, difficulty breathing, indigestion (humans – occupational exposure)	
0.168 - 1.053 μW/cm2	Decrease in newborns & irreversible infertility in mice after 5 generations	Magras & Zenos (1997)
5.0 μW/cm2	Biochemical and histological changes in brain, heart, kidney & liver tissue	Belokrinitskiy, V.S. (1982)
8 μW/cm2	Association between increased incidences of childhood leukaemia & mortality through RF fields	Hocking et al., (1996)

"... the possibility of harm from exposures [to low levels of radio frequency radiation] insufficient to cause important heating of tissues cannot yet be ruled out with confidence. Furthermore, the anxieties that some people feel when this uncertainty is ignored can in themselves affect their well-being."

Sir William Stewart

References

Altpeter, E.S.,Krebs, T., Pfluger, D., von Känel, J., Blattmann, R., Emmenegger, D., Cloetta, B., Rogger, U., Gerber, H., Manz, B., Coray, R., Baumann, R., Staerk, K., Griot, C. & Abelin, T. (1995), Study on health effects of the shortwave transmitter station of Schwarzenburg, Berne, Switzerland. BEW Publication Series No. 55.

Altpeter, E.S., Sprenger, K., Madarasz, K. and Abelin, T. (1997), Do radiofrequency electromagnetic fields cause sleep disorders? In: Proceedings of the IAE meeting, Munster, Germany, Abstract 351.

Belokrinitskiy, V.S. (1982), 'Hygienic evaluation of biological effects of nonionizing microwaves', Gigiyena I Sanitariya 6:32-34, JPRS 81865, pp. 1-5.
Bise, W. (1978), Low power radio-frequency and microwave effects on human electroencephalogram and behavior. Physiological Chemistry and Physics, 10(5), pp. 387-398.

Dumanskij, J.D. & Shandala, M.G. (1974), The biologic action and hygienic significance of electromagnetic fields of super-high and ultrahigh frequencies in densely populated areas. Biologic Effects and Health Hazards of Microwave Radiation, Proceedings of an International Symposium, Warsaw, October 1973.

Frey, A.H. (1986), Evolution and results of biological research with low-intensity nonionizing radiation. Modern Bioelectricity, A.A. Marino, ed., pp. 785-837. New York, NY. Dekker.

Havas (2010), Live blood and electrosmog, http://www.youtube/watch?v=L7E36zGHxRw

Hocking, B., Gordon, I.R., Grain, H.L. & Hatfield, G.E. (1996), Cancer incidence and mortality and proximity to TV towers. Med J Aust 165(11-12), pp. 601-605, 1996. (Published erratum appears in Med J Aust 166(2):80, 1997).

von Klitzing, L. (1995), Low-Frequency pulsed electromagnetic fields influence EEG of man. Physica Medica, 11(2), pp. 77-80.

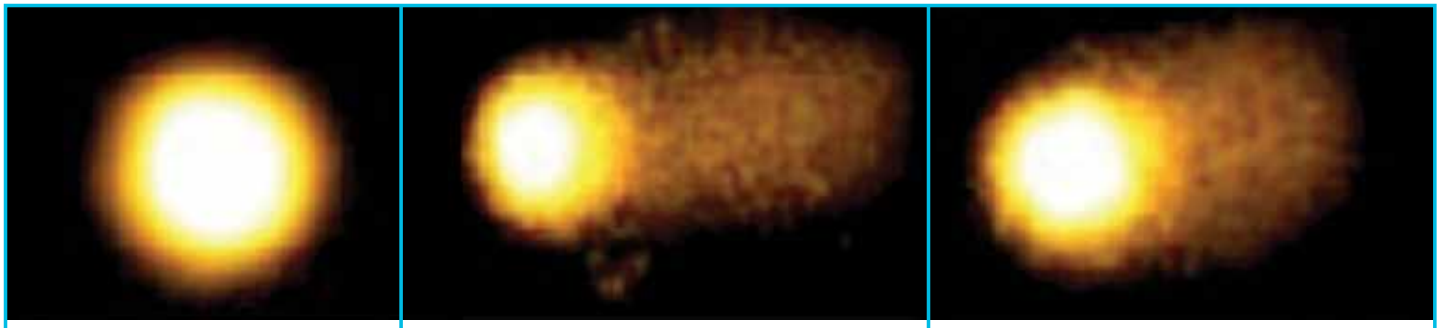
Magras, I.N. and T.D. Zenos, T.D. (1997), RF radiation-induced changes in the prenatal development of mice, Bioelectromagnetics, 18(6), pp. 455-461.

Moldan, D. (2009), Ablesegeräte: Neue Dimension von Funkbelastungen, http://www.diagnose-funk.ch/technik/haushalt-funksysteme/ablesegeraete-neue-dimension-von-funkbelastungen.php#6480269bdb076e70f

Pacific Gas and Electric Company (2011), Radio Frequency FAQ, PG&E, http://www.pge.com/myhome/edusafety/systemworks/rf/faq/

Simonenko, V.B, Chernetsov, A.A. & Lyutov,V.V. (1998) Influence of electromagnetic radiation in the radio-frequency range on the health condition of an organized collective. Voenno-meditsinskiy zhurnal CCCXIX(5), pp. 64-68.

Possible Health Risks – partial listing



Sham	Gamma-irradiation, 0.5 Gy (1,600 chest x-rays)	24 h mobile phone, RF-EMF, 1800 MHz at SAR = 1.3 W/kg. ICNIRP/WHO = 2 W/kg

Comet Assay - a typical picture after RF-EMF-exposition of HL60 leukaemia cells Image Source: Remondini et al. (2006).

The photos above show the effects of different types of radiation on gene expression of human HL60 cells. The effects of radiation from the mobile phone, which is below current ICNIRP/WHO standards, creates a similar effect to the high dosage of gamma radiation (Remondini et al. (2006). It would appear wise to undertake similar tests with Smart Meters.

As no health data is available on Smart Meters, reference is made to research undertaken on other devices emitting pulsed microwave radiation where possible biological effects have been indicated.

Autism risk: An unpublished pilot study by Dr Deitrich Klinghardt MD, PhD, links higher levels of microwave radiation [0.011-0.171 µW/cm^2], in the bedrooms of pregnant women to increased risk of autism and other neurological impairments in their children compared to low field bedrooms [0.0001-0.004 µW/cm^2] (Klinghardt 2008).

Alzheimer's risk: Very weak microwave radiation can change the shape of cellular proteins in the brain causing them to clump together into formations that resemble pathological fibrils associated with this disease (MWN 2003).

Behavioral changes: A study involving 13,159 children found a 54% higher chance of them having emotional and social problems at school age if their mothers used mobile phones during pregnancy, (Divan et al. 2008). Wireless Smart Meters emit similar radiation.

Cancer risk: Eger et al. (2004) found an increased risk of malignant tumours in individuals exposed to radiation from mobile phone base stations. Their work, covering the period 1999 to 2004, indicated that after 5 years the risk of malignant blastoma for those in the vicinity of the phone mast was 3 times that of individuals living further away.

Wolf & Wolf (2004) found relative cancer rates for females living adjacent to a base station were significantly higher ($p<0.0001$) than those living in a low field area and the rest of the city. 4.15 times more cases were found in the area adjacent the base station than for the entire population.

Concentration, accuracy and memory: Increased incidence of concentration difficulties was found in the vicinity of base stations by Bortkiewicz et al. (2004), whilst Hutter et al. (2006) noted that speed and accuracy could also be affected. Poorer memory retention was found by Santini et al. (2002) for individuals living within 100 m of a base station ($p < 0.05$).

Depression: Santini et al. (2002) found a significant increase in depression for people living within 100 m of a base station, as opposed to in lower field regimes. Women were particularly affected ($p < 0.05$). Increased incidence of depression was also noted under similar circumstances by Bortkiewicz et al. (2004).

The cost to the UK economy of depression in terms of lost earning is now over £9bn a year. This represents an increase of £4bn since 1999, and a rise of half a billion over the last year (RSHCL 2010).

Diabetes: Diabetes related care costs the UK upwards of £5 billion (Currie et al. 1997). The cost of diabetes drugs and treatment have risen 40% in the last five years, and since 1996 the number of diagnosed individuals has increased from 1.4 million to 2.6 million.

It is predicted that, unless matters are taken in hand, over four million people will have diabetes by 2025 (Diabetes UK 2010).

'Dirty electricity' - high frequency transients created by a variety of electrical devices and sometimes carried on mains electricity - may be a contributory factor to diabetes and other health conditions.

Wired Smart Meters can create such transients unless they have RF filters. Havas (2006) determined that Type 1 diabetics required less insulin and Type 2 diabetics registered lower blood sugar levels when in electromagnetically clean environments.

Poor sleep is also a contributory factor to diabetes – see related notes on **Fatigue/sleep deprivation**

Dizziness: Santini et al. (2002) found there was a significant increase in individuals complaining of dizziness when they were living within 100 m of a base station, as opposed to living further away ($p < 0.05$). Simonenko et al., (1998) noted increased incidence of dizziness occurred in individuals at occupational exposures of 1.0 $\mu W/cm^2$.

DNA analysis: Microwave exposure can cause DNA damage, including damage in human spermatozoa (De Iuliis et al. 2009, REFLEX 2004). Changes in DNA can be a precursor of cancer and cause genetic mutations.

Fatigue/sleep deprivation: Exposure to some RF/microwave radiation regimes are linked with fatigue and insomnia (Hutter et al. 2006, Bortkiewicz et al. 2004).

Simonenko et al. (1998) noted occupational exposures of 0.1 $\mu W/cm^2$ could cause both fatigue and insomnia in humans, whilst Santini et al. (2002) found a significant increase in individuals complaining of fatigue within 300 m of a base station and sleep disturbances within 200 m of a base station ($p < 0.05$).

Lack of sleep may be a causal factor in premature ageing, high blood pressure, diabetes, obesity, depression and other mental health problems, and can also tax the immune system. The present annual cost to the UK economy of chronic sleep deprivation is estimated at £1.6 billion (Bupa 2010).

27% of UK workers regularly go to work tired and unrefreshed from sleep. Over 50% arrive at work fatigued more than 20 times a year. Those with sleep debt take on average three days a year more sick leave (at an average cost of £93.50 per employee day lost).

When tired, workers are 23% less satisfied with their jobs. As noted by Dinges et al. (1997), individuals with less than 8 hours sleep exhibit reduced decision making abilities, dramatic attention lapses and distinct physiological and cognitive deficits, (including impaired memory). The effects of these deficits increase as sleep debt continues.

Fatigue/sleep deprivation and accidents: Long-term sleep deprivation increases the likelihood of motor vehicle accidents. At present, driver fatigue is responsible for almost 20% of traffic accidents on main roads in the UK (DfT 2011).

"The only real cure for sleepiness is proper sleep." UK Department for Transport (DfT 2005).

Fertility: Research by Magras & Zenos (1997) recorded irreversible infertility in mice after 5 generations at exposures to power densities of 0.168 - 1.053 $\mu W/cm^2$.

Studies on humans also demonstrate a strong link between RF/microwave radiation and infertility/reduced fertility (Falzone et al. 2011). Santini et al. (2002) found a significant loss in libido for subjects within 100 m of a base station ($p < 0.05$).

Dramatically reduced UK birth rates would cause a declining labour force, crucially undermining the UK's economic viability and increasing the burden of supporting the ill and elderly.

Headaches: Hutter et al. (2006) documented a significant link ($p < 0.017$) between headaches and exposures to power densities >0.05 $\mu W/cm^2$ (maximum 0.41 $\mu W/cm^2$) compared to ≤0.01 $\mu W/cm^2$.

Simonenko et al. (1998) recorded increased incidence of headaches at 1.0 $\mu W/cm^2$.

Santini et al. (2002) noted a significant increase in individuals, particularly women, complaining of headaches when living within 200 m of a base station as opposed to further away, or not exposed to radiation from a base station ($p < 0.05$).

Bortkiewicz et al. (2004) also found incidence of headaches related to exposure and distance to base station. This was found for both those who associated their condition with being in proximity to the base station and those who did not.

Headache disorders cost the UK around £7 billion a year in absenteeism and reduced productivity (Thomas 2009).

Irritability: Santini et al. (2002) noted a significant increase in individuals complaining of irritability when living within 100 m of a base station, as opposed to further away or not exposed to radiation from a base station ($p < 0.05$).

Bortkiewicz et al. (2004) also noted that increased complaints of irritability in individuals close to base stations. Simonenko et al., (1998) found occupational exposures of 1.0 $\mu W/cm^2$ were associated with increased irritability.

Obesity: It is estimated that obesity annually costs the UK economy £2 billion (BBSRC 2011). In 1980, 36% of the UK population was categorised as being overweight or obese. By 2004 this figure had risen to 63% of the population, with a third of these being categorized as obese. Almost two of every three individuals in the UK are either overweight or obese (WHO 2005).

Poor quality sleep (as can be created by exposure to inappropriate RF/microwave regimes) is a contributory factor to obesity. Sleep debt can increase fatigue levels making individuals less prone to exercise. It can also increase levels of the hormone grehlin thereby stimulating appetite (Taheri et al. 2004).

Obesity increases risk of many serious diseases: Cardiovascular disease, Cancer, Diabetes, High blood pressure, Osteoarthritis, Psychological problems / Mental Disorders, Urinary incontinence, and Sleep disorders (NIH 2011).

Parkinson's Disease: Very weak microwave radiation can change the shape of cellular proteins in the brain causing them to clump together into formations which resemble pathological fibrils associated with this disease (MWN 2003).

Whilst the indications of such research with regard to biological effects may initially appear alarming, there are also instances, such as in medicine, where precise electromagnetic regimes can be used to create biologically beneficial results. It is proposed that the principles used to do so can be expanded on to great effect (Jamieson et al, 2010), and that existing technology can be made far more biologically friendly.

References

BBSRC 2011, Obesity – BBSRC, Biotechnology and Biological Sciences Research Council, http://www.bbsrc.ac.uk/science/topical/obesity.aspx

Bortkiewicz et al. (2004), Subjective symptoms reported by people living in the vicinity of cellular phone base stations: review. Med Pr., 55(4), pp. 345-351 - article in Polish.

Bupa (2010), Bupa 'How Are You Britain?' report.

Currie et al. (1997), NHS acute sector expenditure for diabetes: the present, future, and excess in-patient cost of care. Diabetic Medicine, 14(8), pp. 686-692.

DfT (2011), Think! Fatigue, Department of Transport, http://think.direct.gov.uk/fatigue.html

DfT (2005), Wake up to the signs of tiredness, Driver tiredness leaflet, http://www.direct.gov/think/prod_consum_dg/

groups/dg_digitalassets/@dg/@en/documents/digitalasset/dg_192568.pdf

De Iuliis et al. (2009), Mobile phone radiation induces reactive oxygen species production and DNA damage in human spermatozoa in vitro, PloS One. 2009 Jul 31; 4(7):e6446

Dinges et al. (1997), Cumulative sleepiness, mood disturbance and psychomotor vigilance performance decrements during a week of sleep restricted to 4-5 hours per night. Sleep: Journal of Sleep Research & Sleep Medicine, 20, pp. 267-277.

Diabetes UK (2010), Diabetes in the UK 2010: Key statistics on diabetes - published March 2010, 21 pp. http://www.diabetes.org.uk/Documents/Reports/Diabetes_in_the_UK_2010.pdf.

Dinges et al. (1988), The benefits of a nap during prolonged work and wakefulness. Work & Stress, 2, pp. 139-153.

Divan et al. (2008), Prenatal and Postnatal Exposure to Cell Phone Use and Behavioral Problems in Children, Epidemiology, 19(4), pp. 523-529.

Eger et al. (2004), Einfluss der räumlichen Nähe von Mobilfunksendeanlagen auf die Krebsinzidenz, Umwelt-Medizin-Gesellschaft, 17, S. pp. 273-356.

Falzone et al. (2011), The effect of pulsed 900-MHz GSM mobile phone radiation on the acrosome reaction, head morphometry and zona binding of human spermatozoa, International Journal of Andrology, 34(1), pp. 20-26.

Havas, M. (2006), Electromagnetic Hypersensitivity: Biological Effects of Dirty Electricity with Emphasis on Diabetes and Multiple Sclerosis. Electromagnetic Biology and Medicine, 25, pp. 259–268.

Hutter et al. (2006), Subjective symptoms, sleeping problems, and cognitive performance in subjects living near mobile phone base stations, Occupational and Environmental Medicine, 63, pp. 307–313.

Jamieson et al, (2010), Building Health: The Need for Electromagnetic Hygiene?, IOP Conference Series: Earth and Environmental Sciences – http://iopscience.iop.org/1755-1315/10/1/012007

Klinghardt (2008), PowerPoint presentation, http://www.lymeinducedautism.com/images/KlinghardtLIA_II.pdf

Magras & Zenos (1997), RF radiation-induced changes in the prenatal development of mice, Bioelectromagnetics, 18(6), pp. 455-461.

MWN (2003), Changes in Protein Folding: A Nonthermal RF Mechanism – Is there a risk of neurological disease?" Discussion article on the work of Dr. David de Pomerai of the University of Nottingham. Microwave News, May/June 2003.

NIH (2011), Obesity increases risk for many serious diseases, NIH Obesity Research, http://www.obesityresearch.nih.gov/Health/public.htm#5

REFLEX (2004), Risk Evaluation of Potential Environmental Hazards From Low Frequency Electromagnetic Field Exposure Using Sensitive in vitro Methods – Final Report, Project funded by the European Union under the programme Quality of Life and Management of Living Resources.

Remondini et al. (2006), Gene expression changes in human cells after exposure to mobile phone microwaves. Proteomics, 6, pp. 4745–4754.

RSHCL (2010), New Government figures reveal the economic burden of depression has risen to £9bn a year. Research Service of the House of Commons Library commissioned by J. Swinson MP, http://www.mentalhealth.org.uk/our-news/news-archive/2010/2010-11-22/

Santini et al. (2002), Investigations on the health of people living near mobile telephone relay stations: Incidence according to distance and sex, Pathologie Biologie (Paris), 50(6), pp. 369-373.

Simonenko et al. (1998) Influence of electromagnetic radiation in the radio-frequency range on the health condition of an organized collective. Voenno-meditsinskiy zhurnal CCCXIX(5), pp. 64-68.

Taheri et al. (2004), Short Sleep Duration Is Associated with Reduced Leptin, Elevated Ghrelin, and Increased Body Mass Index, PloS Medicine, 1(3), pp. 210-217.

Thomas (2009), Chief Executive of The Migraine Trust and Chair of Headache UK, www.acnr.co.uk/may_june_09/ACNRMJ09_awards.pdf

Wolf & Wolf (2004), Increase incidence of cancer near a cellphone transmitter station, International Journal of Cancer Prevention, 1(2), pp. 123-128.

WHO (2005). What is the scale of the obesity problem in your country? World Health Organisation www.who.int/infobase/report.aspx?rid=114&iso=GBR&ind=BMI

Smart Meter Health Impacts Testimonials

Image: Grant Cochrane / FreeDigitalPhotos.net

Source:http://emfsafetynetwork.org/?page_id=2292

Excerpts

The following comments about how the new wireless utility Smart Meters have [apparently – *present author's comment*] affected people's health were sent to the EMF Safety Network, or publicly posted. Most are posted anonymously.
…

"… My patients, Shivani Arjuna and her husband Dan Small, have asked me to write to you with regard to how Shivani is affected by exposure … I share their concern.

People who are aware of experiencing symptoms as soon as they are exposed to radio (RF) and microwave (MW) frequencies are currently termed "electrically hypersensitive," or EHS.

… However, these individuals are by no means the only people actually being affected by such exposure, … chronic [RF/MW] exposure causes health damage to people who note no immediate symptoms.

Please see, for example, the bibliography of reported biological phenomena associated with radio-frequency and microwave radiation compiled by the US Navy Medical Research Institute in 1971, with over 2,000 references., at: www.dtic.mil/cgibin/GetTRDoc?AD=AD750271&Location=U2&doc=GetTRDoc.pdf
Also, please see the summary of EMF effects at: www.icswebsite.com/emf/emfissues.html with 62 more recent references.

Here is brief information regarding a few known mechanisms:

• It is established from multiple, independent studies that EMR from ELF to RF/MW reduces melatonin in animals and human beings.
Melatonin is not only vital for healthy sleep, it is the most potent, naturally produced antioxidant that helps to protect cells from genetic damage that leads to cancer, neurological, cardiac and reproductive damage, illness and death.

• Exposure to intensities and field strengths that are extremely low cause a biological effect called calcium ion efflux. Calcium ion alteration of cells by EMR is linked to neurological degeneration, to cancer and many other health effects. The heart is also an electromagnetic organ, with an electric pulse initiating a cascade of calcium ions that cause the cells in the heart to contract and produce a heartbeat. Exogenous electromagnetic signals can interfere with this regular, electrical pulse leading to heart disease and heart attack of the arrhythmic kind.

The most commonly reported symptoms from exposure to wireless Smart Meters are: difficulty concentrating, dizziness, fatigue, headaches, heart palpitations, irritability, short-term memory loss, nausea, difficulty sleeping and tinnitus.

• Physiological changes that are bedrock indicators of allergic response and inflammatory conditions that are stimulated by EMF exposures include: overreaction of the immune system; morphological alterations of immune cells; profound increases in mast cells in the upper skin layers, increased degranulation of mast cells and larger size of mast cells in EHS individuals; presence of biological markers for inflammation that are sensitive to EMF exposure at non-thermal levels; changes in lymphocyte viability; decreased count of NK cells; decreased count of T-lymphocytes; negative effects on pregnancy (uteroplacental circulatory disturbances and placental dysfunction); suppressed or impaired immune function; and inflammatory responses that can result in cellular, tissue and organ damage if exposure occurs on a continuing basis over time.

Mast cells are also found in the brain and heart, and this might account for some of the other symptoms commonly reported: headache, sensitivity to light, arrhythmias and other cardiac symptoms.

• Many studies have shown that RF/MW radiation and ELF fields cause increased DNA strand breakage and chromosome aberrations. …" Roy D. Ozanne, MD, HMD

"… Five people have reported symptoms in my home: My father has experienced headaches and visual migraines. My mother reported having pressure on the upper part of her chest and palpitations. One neighbor exposed to these 16 cluster meters is experiencing headaches and chest tightness. Another neighbor has difficulty opening her eyes in the mornings after 8 hours by the meters. Her ophthalmologist could find no explanation. She said she uses her fingers to open her lids. All of the above symptoms have occurred since the smart meter installations. The symptoms are worsening for everyone. …" R.H., San Diego CA

The following letter is from a prominent doctor in Napa:
"I have a patient who is being injured from the SmartMeter. She has a history of Cardiomyopathy from infection and was doing well until the SmartMeter went in last fall. She is now back in Atrial Fibrillation and needs meds she does not tolerate well. It is all a result of the extra EMF. I will send you copies of

articles about how EMF affects patient's heart rate. Is there are special complaint form I could send off to the SmartMeter company that you use? I was going to dictate something for my patient and reference the EMF and heart rate issue". …

"I have been in the ER overnight three times this week, with unexplained sickness. I have had a CT Scan of the brain, Stress Test, CTA, EKGs, Ultra Sounds, Blood work and still no definite answer. We recently had a Smart Meter installed and these symptoms began about a week after: Extreme Stress, diagnosed TIAs, dizziness, headaches, nausea and fainting. I mentioned this to a doctor and he suggested that the Smart Meters may have something to do with it because the hospital has had quite a rise in illness of this kind reporting to the ER. "J.W. (anon). …

There are numerous other comments posted about the suggested health impacts of wireless Smart Meters at the above site – present author's comment.

Some SmartMeter Customers Say Devices Make Them Sick

Source:http://www.kcra.com/station/25639450/detail.html

Excerpt

Thousands Of Complaints Roll Into Utilities Commission

'SEBASTOPOL, Calif. -- Some California coastal communities have placed moratoriums on Pacific Gas and Electric's SmartMeters after customers raised concerns about potentially harmful health effects.

Homeowners addressed the California Public Utilities Commission in September, asking the commissioners to place an emergency moratorium on PG&E's wireless gas and electric Smart Meters. The CPUC told KCRA 3 that it has received more than 2,000 health-related complaints but said the health issues are not its jurisdiction and referred customers to the Federal Communications Commission and state health officials.

A Sebastopol-based group, the EMF Safety Network, studies the health impacts of electromagnetic fields and radio frequency radiation. The group said it is collecting data that proves PG&E Smart Meters are hazardous to human health.

A number of the people who said they are getting sick said they suffer from a condition called electrical sensitivity or electromagnetic hypersensitivity, or EHS. The World Health Organization said EHS is not a medical diagnosis. However, people who claim to suffer from electrical sensitivity said their symptoms are very real. …'

If the percentage of the UK with EHS is the same as that indicated by Schrier et al., (2006) for Switzerland, this would amount to approximately 3,090,000 individuals. EHS is officially fully recognised in Sweden as a functional impairment and not regarded as a disease - present author's comments.

References

Schreier, N., Anke Huss, A. & Röösli, M. (2006), The prevalence of symptoms attributed to electromagnetic field exposure: a cross-sectional representative survey in Switzerland. Sozial- und Präventivmedizin, 51(4), pp. 202-209.

Health Impacts of Radio Frequency from Smart Meters

California Council on Science and Technology (2011), www.ccst.us/publications/2011/2011smartA.pdf

Excerpts

Page 6…

… CCST agreed to compile and assess the evidence available to address:

1. Whether FCC standards for Smart Meters are sufficiently protective of public health taking into account current exposure levels to radiofrequency and electromagnetic fields.

2. Whether additional technology specific standards are needed for Smart Meters and other devices that are commonly found in and around homes, to ensure adequate protection from adverse health effects.

… It is important to note that CCST has not undertaken primary research of its own to address these issues.

Page 5…

"Non-thermal effects ..., including cumulative or prolonged exposure to lower levels of RF emissions, are not well understood. Some studies have suggested non-thermal effects may include fatigue, headache, irritability, or even cancer,…

Additional research and monitoring is needed to better identify and understand non-thermal effects."

Pages 7-8…

Findings

Given the body of existing, *generally accepted scientific knowledge* regarding smart meters and similar electronic devices, CCST finds that:

1. The FCC standard provides an adequate factor of safety against thermally induced health impacts of smart meters and other electronic devices in the same range of RF emissions. …

2. At this time there is no clear evidence that additional standards are needed to protect the public from smart meters or other common household electronic devices.

… CCST notes that in some of the studies reviewed, contributors have raised emerging questions from some in the medical and biological fields about the potential for biological impacts other than the thermal impact that the FCC guidelines address.

A report of the National Academies identifies research needs and gaps and recommended areas of research to further understanding of long-term-exposure RF emissions from communications devices, particularly from non-thermal mechanisms that are not currently addressed by the FCC guidelines (NRC 2008).

References

National Research Council (2008), Identification of Research Needs Relating to Potential Biological or Adverse Health Effects of Wireless Communication, The National Academies Press, Washington, D.C.

Commentary on the California Council on Science and Technology Report "Health Impacts of Radio Frequency from Smart Meters"

By Dr. Karl Maret (2011), http://sagereports.com/smart-meter-rf/docs/letters/Maret_-_CCST_Commentary_1-31-2011_final.pdf

Excerpts

Page 2… The biological effects of low-level, non-thermal electromagnetic fields have been researched for over 30 years. The respected … Handbook of Biological Effects of Electromagnetic Fields edited by Barnes and Greenebaum … states on page 377:

"*The biophysical lore … and lingering to this day is that, unless the amplitude and frequencies of an applied electric field were sufficient to trigger an excitable membrane (e.g. heart pacemaker), produce tissue heating or move an ion along a field gradient, there could be no effect. …. However, this position had to be changed as the evidence for weak (non-thermal) EMF bioeffects became overwhelming.*"
Prof. Arthur Pilla, PhD, Professor of Biomedical Engineering, Columbia University [and Director of the Bioelectrochemistry Laboratory, Mount Sinai School Of Medicine, New York].

There are numerous reports on the potential health effects of non-thermal electromagnetic fields. Early reports include papers by Frey (1993), Lai (2000) and Hyland (2000), among many others.

An international working group has delineated many additional scientific findings (Bioinitiative Report, 2007). … Recently, the European Journal of Oncology published an entire monograph … outlining non-thermal effects on living systems (Giuliani & Soffritti 2010).

… there is now a large body of scientific literature describing several key mechanisms for the action of weak electromagnetic fields.

These include, among others:

- removal of calcium ions bound to cellular membranes, leading to their weakened structure and changed cellular functioning
- change of calcium ion leading to changes in metabolic processes in cells,
- the leakage of calcium ions into neurons generating spurious action potentials,
- fragmentation of DNA in cells seen through the Comet assay
- changes in the blood-brain barrier in animals after microwave exposure
- defined cellular stress response, including the production of heat shock proteins (HSP), that are triggered electromagnetically at non-thermal levels that require much less energy than when triggered by heat (so-called thermal considerations)
- activation of specific genes by exposure to non-thermal electromagnetic fields leading to gene transcription to form RNA, the first stage in the synthesis of proteins

All these biological effects are well substantiated in the scientific literature and occurred at much lower exposure levels than current FCC standards [which wireless Smart Meters are designed to comply to – present author's comment].

Page 11… It is requested that the current Smart Meter deployment be halted pending a more comprehensive scientific investigation of the biological response and health impacts of the non-thermal aspects of this technology.

References

Bioinitiative (2007), BioInitiative Report: A Rationale for a Biologically-based Public Exposure Standard for Electromagnetic Fields (ELF and RF), http://www.bioinitiative.org/freeaccess/report/index.htm

Frey, A.H. (1993), Electromagnetic field interactions with biological systems. The FASEB Journal, 7, pp. 272-281.

Giuliani, L. & Soffritti, M. (Eds.) (2010), Non-Thermal Effects and Mechanisms of Interaction Between Electromagnetic Fields and Living Matter, Parts I & II. Monograph for the European Journal of Oncology, Library Vol. 5, National Institute for the Study and Control of Cancer and Environmental Diseases, Italy.

Hyland, G. (2000), Physics and biology of mobile telephony. The Lancet, 356, pp. 1833-1836.

Lai, H. (2000), Biological Effects of Radiofrequency Radiation from Wireless Transmission Towers. In: Levitt, B.B. (Ed.), Cell Towers: Wireless Convenience? or Environmental Hazard? Proceedings of the "Cell Towers Forum" State of the Science/State of the Law, New Century Publishing, Sheffield, MA.

Pilla, A.A. (2006), Mechanisms and Therapeutic Applications of Time-Varying and Static Magnetic Fields. In: Barnes, F.S. & Greenebaum, B. (Eds.), Handbook of Biological and Medical Aspects of Electromagnetic Fields (Third Edition), CRC Press, Boca Raton, FL.

Smart Havas Submission to CCST "Report on Smart Meters"

http://www.magdahavas.com/2011/01/18/havas-report-on-smart-meters-for-ccst/

Present author's note: Associate Professor Havas researches the biological effects of electromagnetic fields. She was invited by the California Council on Science and Technology (CCST) to submit a written report on Smart Meters which is shown below:

Excerpts

"[CCST] Item 1. Whether FCC standards for Smart Meters are sufficiently protective of public health taking into account current exposure levels to radiofrequency and electromagnetic fields.

In my opinion, the FCC standard for Smart Meters is not sufficient to protect public health. This is based on the following facts:

1.1 Thermal vs. Non-thermal Debate: The FCC standard is based on a thermal effect. It was originally based on the amount of radiation that would heat an adult male in the US military exposed to radar. While the heating effect is not disputed, biological effects … occur well below the thermal guideline (Inglis 1970). As a consequence various countries in the world are opting for a "biologically" based guideline rather than a "thermal" guideline, which takes into account not only adult males in peak physical conditions but children, pregnant women, the elderly, and those who have developed electrohypersensitivity (EHS). …

1.2 Guidelines in Russia, Switzerland, Poland, and China are well below the FCC standard (i.e. 10 vs. 1000 microW/cm^2 or 1% of FCC guidelines). …

1.4 I work with people who have become electrically hypersensitive (EHS) and I have received emails and phone calls from those who have had smart meters placed on their homes. They complain of ill health…

… many are unable to use the room closest to the smart meter. Sickness contributes to time off work and away from school, growing medical costs and a general poorer quality of life.

… Children are particularly vulnerable as are pregnant women and those with compromised immune systems.

…In Switzerland about 5% of the population has EHS. If the same fraction of the population has EHS in the US that would come to a staggering 15 million people!

[CCST] Item 2. Whether additional technology specific standards are needed for Smart Meters and other devices that are commonly found in and around homes, to ensure adequate protection from adverse health effects.

2.1 Technology specific standards are definitely needed for Smart meters as well as cordless phones, DECT baby monitors, wireless routers, and all of the other devices that emit radio frequency radiation. …

2.2 We have evidence that pulsed microwave frequencies, that are generated by WiFi and cordless phones are more harmful than continuous wave and yet this is not considered in the FCC guidelines (Reno 1975)… They should be replaced by wired phones or cordless phones currently available in Europe, which are "on-demand" phones that radiate only when the handset is not in the cradle of the base station.

2.3 An additional point I would like to make relates to dirty electricity.

> **"Wires can act like antennas and the radiation produced by radio frequency generating devices can flow along and reradiate from wires both inside and outside the home. This contributes to dirty electricity and localized radiation exposure."**

Dirty electricity has been associated with cancers (Milham & Morgan 2008); health and behavior problems in schools (Havas & Olstad 2008); and both diabetes and multiple sclerosis (Havas 2006).

In conclusion, I have great concern regarding the current levels of microwave radiation in North America. Instead of promoting wireless technology, we should be promoting wired technology and reserving wireless for situations where wired in not possible (while one is traveling for example)."

References

Havas, M. & Olstad, A. (2008), Power quality affects teacher wellbeing and student behavior in three Minnesota Schools. Science of the Total Environment, 402, pp. 157-162.

Havas, M. (2006), Electromagnetic Hypersensitivity: Biological effects of dirty electricity with emphasis on diabetes and multiple sclerosis. Electromagnetic Biology and Medicine, 25, pp. 259- 268.

Inglis, L.P. (1970), Why the double standard? – A critical review of Russian work on hazards of microwave radiation. IEEE International Symposium on Electromagnetic Compatibility, 14-16 July, 1970.

Milham, S. & Morgan, L.L. (2008), A New Electromagnetic Exposure Metric: High Frequency Voltage Transients Associated With Increased Cancer Incidence in Teachers in a California School. Amer. J. Ind. Med.

Reno, V.R. (1975), Some considerations concerning the use of magnetron generators in microwave biological research. Naval Aerospace Medical Research Laboratory, Pensacola, Florida.

Commentary on Safety Guidelines

Council of Europe / Conseil de L'Europe
The potential dangers of electromagnetic fields and their effect on the environment

CE (2011), The potential dangers of electromagnetic fields and their effect on the environment, Parliamentary Assembly Assemblée parlementaire, Council of Europe / Conseil de L'Europe, http://assembly.coe.net, Doc. 12608.

Draft resolution adopted unanimously by the committee on the Environment, Agriculture and Local and Regional Affairs on 11 April 2011.

Excerpts

… While electrical and electromagnetic fields in certain frequency bands have fully beneficial effects which are applied in medicine, other non-ionising frequencies … appear to have more or less potentially harmful, non-thermal, biological effects on plants, insects and animals, as well as the human body when exposed to levels that are below the official threshold values.

One must respect the precautionary principle and revise the current threshold values; waiting for high levels of scientific and clinical proof can lead to very high health and economic costs, as was the case in the past with asbestos, leaded petrol and tobacco.

The Parliamentary Assembly has repeatedly stressed the importance of states' commitment to preserving the environment and environmental health, …. [including] Recommendation 1885 (2009) on drafting an additional protocol to the European Convention on Human Rights concerning the right to a healthy environment and Recommendation 1430 (1999) …

… As regards standards or threshold values for emissions of electromagnetic fields of all types and frequencies, the Assembly recommends that the ALARA or "as low as reasonably achievable" principle is applied, covering both the so-called thermal effects and the athermic or biological effects of electromagnetic emissions or radiation.

… According to the [European Environment Agency] EEA, there are sufficient signs or levels of scientific evidence of harmful biological effects to invoke the application of the precautionary principle and of effective, urgent preventive measures.

… In connection with the proven or potential risks of electromagnetic fields, it should also be noted that after a Lloyd's report, insurance companies tended to withhold coverage for risks linked with electromagnetic fields under civil liability policies, in the same way as, for example, genetically modified organisms or asbestos, which is hardly reassuring …

… the rapporteur wonders whether it might not be expedient and innovative to try and develop new wireless communication technologies … but more energy-efficient and above all less problematic in terms of the environment and health than the present microwave-based wireless communication.

Such systems … are reportedly being developed in the United States and Japan and could largely replace the present technologies. Should such changes in transmission and communication systems [or others – *present author's comment*] prove realistic, it would then be a case of technological and economic innovations not to be missed or obstructed.

The precautionary principle and the right to a healthy environment, particularly on behalf of children and future generations, must be key factors in all economic, technological and social development of society.

United States Environmental Protection Agency

Hankin, N. (2002), Center for Science and Risk Assessment, Radiation Protection Division, US EPA. Response to letter from J. Newton, President of The EMR Network.
http://www.emrpolicy.org/litigation/case_law/docs/noi_epa_response.pdf

Excerpts

… The guidelines used by the FCC were adopted … in 1996. [They] were recommended by the EPA with certain reservations …

The FCC's current exposure guidelines, as well as those of the [IEEE and ICNIRP (which the UK follows – present author's comment)], are thermally based, and do not apply to chronic, nonthermal exposure situations. … The FCC's exposure guideline is considered protective of effects arising from a thermal mechanism but not from all possible mechanisms.

… the generalization by many that the guidelines protect human beings from harm by any or all mechanisms is not justified.

… The exposure guidelines did not consider information that addresses nonthermal, prolonged exposures, i.e., from research showing effects with implications for possible adversity in situations involving chronic/prolonged, low-level (nonthermal) exposures.

Since the EPA's comments were submitted to the FCC in 1993, the number of studies reporting effects associated with both acute and chronic low-level exposure to RF radiation has increased. … exposures that comply with the FCC's guidelines generally have been presented as "safe" by many of the RF system operators and service providers, even though there is uncertainty about possible risk from nonthermal, intermittent exposures.

…health and safety agencies have not yet developed policies concerning risk from long-term, nonthermal exposures… Incorporating information on exposure scenarios… with an exposed population that includes children, the elderly and people with various debilitating physical and medical conditions, could be beneficial in delineating appropriate protective exposure guidelines.

Disability Discrimination

Powerwatch response to DECC / GEMA / Ofgem Smart Meter Consultation of 29 July 2010
www.powerwatch.org.uk/.../20100928_powerwatch_smartmeter_response.pdf

Excerpt

The DECC Impact Assessment DECC0009 reported on Equality IA
'This test highlighted the Government's general duties for disability, race and gender equality. However this test did not consider those with certain medical conditions/heath problems, such as those with pacemakers and other medical implants and those suffering from electrical hypersensitivity. These consumers might challenge use of RF radiation in wireless smart meters under Disability Discrimination Act 1995 and Equality Act 2010.

Disability Discrimination Act 1995. Those who find their medical conditions/health problems are incompatible with smart meters using wireless technology, could challenge Government policy under the Disability Discrimination Act 1995 (DDA 1995). Under the DDA 1995 service providers have an obligation to make reasonable adjustments to the way they provide a service to make a service accessible.

Equality Act 2010. Challenges to the Government policy could in the future be made under the Equality Act 2010 (EA 2010), coming into force in 1st October 2010. The EA 2010 provides protection against direct and indirect discrimination, harassment and victimisation in services and public functions; premises; work; education; associations, and transport.

The DECC Impact Assessment DECC0009 reported on Health
This test did highlight *"communications technologies which are selected to support smart metering may produce radiofrequency signals (e.g. from mobile communications technologies). Some consumers have concerns about the impacts of these. We will keep under review any evidence related to the effects of radiofrequency signals on individuals health."*

In view of the potential health implications, an alternative method of communications needs to be considered at the pre-design stage.'

The use of fibre-optic, power-line or telephone communications technology should be actively considered – *present author's comment*.

Environmental Concerns

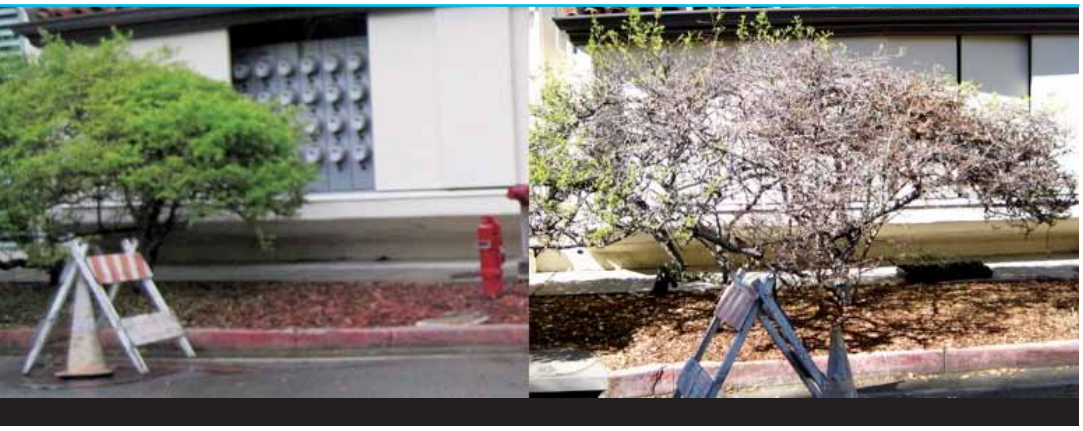


Image source: http://stopsmartmeters.org/2011/04/08/shrubs-dont-lie/

In the photos shown, taken 20 days apart in the US in 2011, severe die off of the bush is noted after the installation of wireless Smart Meters. It was reported that none of the other plants or trees in the area (further away from the units) were affected.

Similar was found in Canada after a wireless Smart Meter installation in 2010. The meter was in place less than two months at the time the photo was taken. Prior to installation, leaves were green and healthy.

Image source: http://www.youtube.com/watch?v=lsuP_WBBr2c

The possible validity of such conjectures is indicated in research by Roux et al. (2007), Sandu et al. (2005), Selga & Selga (1996), Magone (1996), Balodis et al (1996), Brauer (1950) - and that discussed by Firth (2010) - some of which indicates that RF/microwave radiation may damage vegetation even at levels below those typically emitted by wireless Smart Meters.

The use of wired Smart Meters (with transient filters), or retention of existing meters until problems are solved, would appear prudent - Smart Meters need not be wireless and can be safe and smart.

References

Balmori, A. (2004), ¿Pueden afectar las microondas pulsadas emitidas por las antenas de telefonía a los árboles y otros vegetales? Ecosistemas, www.hese-project.org/de/emf/WissenschaftForschung/Balmori_Dr_Alfonso/Ecosistemas_(Alfonso).pdf

Balodis, V., et al (1996), Does the Skrunda Radio Location Station diminish the radial growth of pine trees? The Science of the Total Environment 180:57-64.

Brauer, I. (1950), Experimental studies on the effect of meter waves of various field intensities on the growth of plants by division. Chromosoma 3, pp. 483-509.

Firth, N. (2010), Is Wi-Fi killing trees? Dutch study shows leaves dying after exposure, http://www.dailymail.co.uk/sciencetech/article-1332310/Is-Wi-Fi-killing-trees-Dutch-study-shows-leaves-dying-exposure-Wi-Fi-radiation.html#ixzz1LI541Xrk

Magone, I. (1996), The effect of electromagnetic radiation from the Skrunda Radio Location Station on Spirodela polyrhiza (L.) Schleiden cultures. The Science of the Total Environment 180, pp. 75-80.

Onthelevelblog (2011), Shrubs Don't Lie- We Should Listen When They Die, http://stopsmartmeters.org/2011/04/08/shrubs-dont-lie/

Roux, D., Vian, A., Girard, S., Bonnet, P., Paladian, F., Davies, E. & Ledoigt, G.(2007), High frequency (900 MHz) low amplitude (5 V m–1) electromagnetic field: a genuine environmental stimulus that affects transcription, translation, calcium and energy charge in tomato, Planta, 227, pp. 883–891.

Sandu, D.D., Goiceanu, C., Ispas, A., Creanga, I., Miclaus, S., Creanga, D.E. (2005), A preliminary study on ultra high frequency electromagnetic fields effect on black locust chlorophylls, Acta Biologica Hungarica, 56, pp. 109–117.

Selga, T. & Selga, M. (1996), Response of Pinus sylvestris L. needles to electromagnetic fields. Cytological and ultrastructural aspects. The Science of the
Total Environment 180:65-73, Elsevier Science BV.

Tkalec, M., Malarik, K., Pevalek-Kozlina, B. (2007), Exposure to radiofrequency radiation induces oxidative stress in duckweed Lemna minor L., Sci. Total Environ. 388, pp. 78–89.

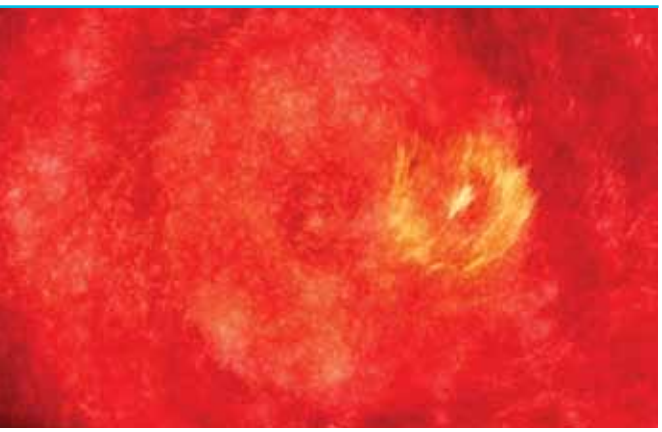
Weatherall, M. (2010), Stratford - Death by Smart Meter and Wi Fi, http://weepnews.blogspot.com/2010/09/stratford-death-by-smart-meter-cbc.html

Weatherall, M. (2010), Stratford Smart Meter Killing Shrub, http://www.youtube.com/watch?v=lsuP_WBBr2c

Security of Supply

The development of appropriate solutions to threats to security of supply should be carried out before large-scale UK rollouts are undertaken.

Vulnerability to Solar Flares



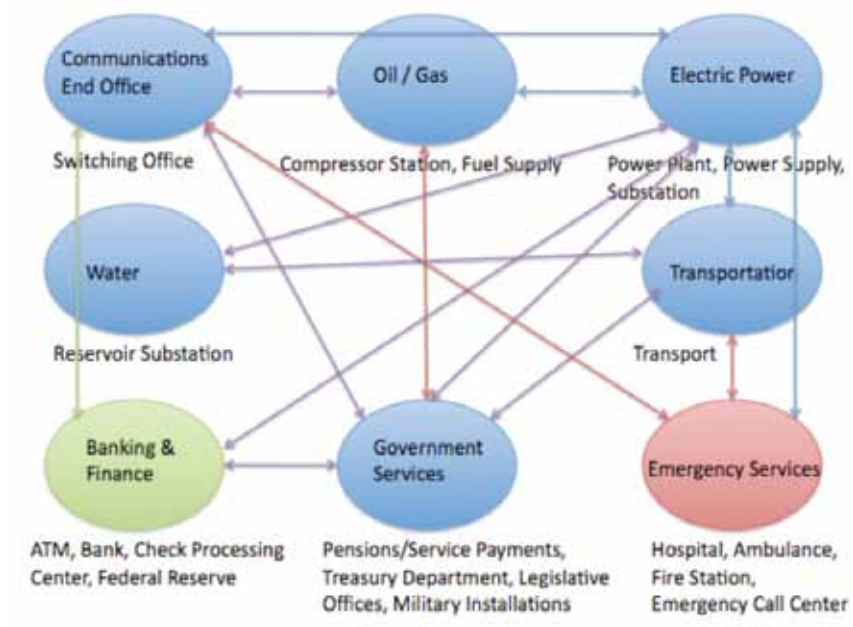
According to NASA, and the US National Oceanic and Atmospheric Administration (NOAA), the Sun is entering a particularly vicious solar maximum, similar to that in which the Solar Super Storm of 1859 occurred.

During that event, the most powerful solar storm ever recorded caused the telegraph systems in North America and Europe to short out, creating numerous fires.

According to Dr Richard Fischer, director of NASA's Heliophysics Division, the next solar storm of such a magnitude "*will disrupt communication devices such as satellites and car navigations, air travel, the banking system, our computers, everything that is electronic. … There is a severe economic impact from this. We take it very seriously. … It will cause major problems for the world.*"

Such an event would cause individuals to be without electricity for hours or days. In the worse case scenario, large areas of the Earth would be without electricity for longer periods, possibly several months. Countries with "*fragile*" grid infrastructures are likely to be affected most.

It is predicted that upcoming solar flares could endanger national security and take down key services such as electricity grids, electronics and communications for prolonged periods.



The UK has experienced significant effects during past solar storm events.

NASA warns that a solar storm, similar to the 1859 event (which was ten times greater than the 1989 solar storm which caused the Canadian Hydro-Quebec power grid to go down - and also affected the UK) could occur in solar cycle 24 during 2013.

Erinmez et al., (2002) noted that whilst the power transmission systems of UK's National Grid are "*generally designed to operate reliably under challenges mainly related to terrestrial weather conditions … the measures* [used to increase their] *robustness have also made transmission systems more vulnerable to the risk of space weather through geomagnetic storm activity.*"

NASA suggests precautions such as creating back-up systems for hospitals and power grids should be encouraged.

UK Government Expert Opinion

The UK Government is aware of the threat of solar storms and has already taken various contingency measures, including allowing some transformers to be switched off if necessary.

The UK's National Risk Register has contingency plans to cope with a complete national outage and regional outage of electrical supplies. It states that "*In the event of a national outage (which has never occurred), and provided there had been no damage to the system, the objective would be to restore supplies throughout Great Britain within three days*." Some question whether such measures are adequate.

Professor Sir John Beddington, the UK Government's chief scientific adviser when speaking at the annual meeting of the American Association for the Advancement of Science (AAAS) in Washington DC earlier this year noted that solar storms could cause catastrophic damage to the world's economy.

He was quoted as saying "*The potential vulnerability of our systems* [to space weather] *has increased dramatically. Whether it's the smart grid in our electricity systems or the ubiquitous use of GPS*."

Similar concerns were raised by UK Defence Secretary, The Right Honourable Liam Fox MP, in 2010 when he warned that with our heavier reliance on technology our way of life is now more at threat from such solar events than ever before.

It is estimated that the cost of what Sir John called a potential "global Katrina", caused by the increased solar storm activity that is occurring, could be up to $2 trillion (£1.2 trillion) as a result of various technologies being knocked out unless suitable precautionary measures are undertaken.

As Smart Meters are more vulnerable to stray high-energy electrical fields than the units they replace, a delayed rollout till after 2013 may be worth considering for this reason alone.

US Expert Opinion

In similar vein, Jane Lubchenco, head of the National Oceanic and Atmospheric Administration (NOAA), is on record as having said at the AAAS meeting that the US also needs to be better prepared than at present to avoid loss of electrical power and communications as a result of solar flares.

She stated that "*This is not a matter of if, it's simply a matter of when and how big. We have every reason to expect we're going to be seeing more* [potentially harmful] *space weather in the coming years, and it behooves us to be smart and to be prepared*."

Tom Bogdan, Director of the US Space Weather Prediction Center, too has said that forthcoming individual solar events could be particularly powerful. He noted "*What's at stake are the advanced technologies that underlie virtually every aspect of our lives*."

References

American Association for the Advancement of Science, http://www.aaas.org/meetings/ NASA

NASA (2009), Severe Space weather, http://science.nasa.gov/science-news/science-at-nasa/2009/21jan_

severespaceweather/

Erinmez, I.A., Kappenman, J.G. & Radasky, W.A. (2002), "Management of the Geomagnetically Induced Current Risks on the National Grid Company's Electric Power Transmission System", Journal of Atmospheric and Solar Terrestrial Physics, 64, pp. 743–756. Special Addition for NATO Space Weather Hazards Conference June, 2000.

High-Impact, Low-Frequency Event Risk to the North American Bulk Power System. A Jointly-Commissioned Summary Report of the North American Electric Reliability Corporation and the U.S. Department of Energy's November 2009 Workshop. NERC, http://www.nerc.com/files/HILF.pdf

Hough, A. (2010), Nasa warns solar flares from 'huge space storm' will cause devastation, http://www.telegraph.co.uk/science/space/7819201/Nasa-warns-solar-flares-from-huge-space-storm-will-cause-devastation.html

Lovett, R.A. (2011), What If the Biggest Solar Storm on Record Happened Today? National Geographic News, 2 March 2011, http://news.nationalgeographic.com/news/2011/.../110302-solar-flares-sun-storms-earth-danger-carrington-event-science/

Solar Superstorm, http://science.nasa.gov/science-news/science-at-nasa/2003/23oct_superstorm/

National Risk Register 2010, http://interim.cabinetoffice.gov.uk/media/349003/nrr2010-chapter2.pdf

Severe Space Weather Events - Understanding Societal and Economic Impacts

http://books.nap.edu/catalog.php?record_id=12507

This US National Research Council (NRC) workshop report is based on research supported by NASA and the US National Academy of Sciences.

Excerpts

Pages 2-3... **SUMMARY: The Collateral Impacts of Space Weather**

Because of the interconnectedness of critical infrastructures in modern society, the impacts of severe space weather events can go beyond disruption of existing technical systems and lead to short-term as well as to long-term collateral socioeconomic disruptions.

Electric power is modern society's cornerstone technology, the technology on which virtually all other infrastructures and services depend. Although the probability of a wide-area electric power blackout resulting from an extreme space weather event is low, the consequences of such an event could be very high, as its effects would cascade through other, dependent systems.

Collateral effects of a longer-term outage would likely include, for example, disruption of the transportation, communication, banking, and finance systems, and government services; the breakdown of the distribution of potable water owing to pump failure; and the loss of perishable foods and medications because of lack of refrigeration.

The resulting loss of services for a significant period of time in even one region of the country could affect the entire nation and have international impacts as well.

Page 77…

POWER GRIDS: Future Vulnerability

Severe space weather has the potential to pose serious threats… … These assessments indicate that severe geomagnetic storms pose a risk for long-term outages … … John Kappenman remarked that the analysis shows "not only the potential for large-scale blackouts but, more troubling, … the potential for permanent damage that could lead to extraordinarily long restoration times."

While a severe storm is a low-frequency-of-occurrence event, it has the potential for long-duration catastrophic impacts to the power grid and its users.

Impacts would be felt on interdependent infrastructures, with, for example, potable water distribution affected within several hours; perishable foods and medications lost in about 12-24 hours; and immediate or eventual loss of heating/air conditioning, sewage disposal, phone service, transportation, fuel resupply, and so on.

Kappenman stated that the effects on these interdependent infrastructures could persist for multiple years, with a potential for significant societal impacts and with economic costs that could be measurable in the several-trillion-dollars-per-year range.

Pages 108-109 ...

SPACE WEATHER IMPACTS ON THE ELECTRIC POWER SYSTEM

Frank Koza, PJM Interconnection

Exposure and Vulnerability

The impacts of space weather events on the power system have been well documented. The fact that the major elements of the power system are exposed and particularly vulnerable to space weather can be disconcerting to power system operators. The superposition of extraneous currents onto the normal operational flows on power system equipment can create conditions that are capable of causing damage in a very short period of time, such that operator action cannot respond in time. Fortunately, most events have relatively benign power system impacts. However, the occasional serious event can have wide- ranging impacts.

March 1989 Event

During March 1989, a solar superstorm created severe impacts on the power system. Most notably, the province of Quebec was blacked out, and there were less severe but serious impacts in other portions of the system. In Quebec on March 13, 1989, a large solar magnetic impulse caused a voltage depression that could not be mitigated by automatic voltage compensation equipment. The failure of the compensation equipment resulted in a voltage collapse in the province in an event that took only 90 seconds to propagate.

Also, during this storm, a large step-up transformer failed at the Salem Nuclear Power Plant, located in southern New Jersey. That failure was the most severe of approximately 200 separate events that were reported during the storm on the North American power system. The other events ranged from generators tripping out of service, to voltage swings at major substations, to other lesser equipment failures.

Assessment of Risk

The operators of the North American power grid constantly review and analyze the potential risks associated with space weather events. Grid operators have access to space weather forecasts, monitor voltages and ground currents in real time, and have mitigating procedures in place. PJM, as an example, has monitoring devices in place at key locations on its system, which are monitored in real time. At the onset of significant ground currents at the monitoring stations, PJM will invoke conservative operations practices that will help mitigate the impacts if the solar event becomes more severe.

What has changed on the power system since 1989? The evolution of open access on the transmission system has fostered the transport of large amounts of energy across the power system in order to maximize the economic benefit of delivering the lowest-cost energy to areas of demand.

The magnitude of power transfers has grown, and the risk is that the increased level of transfers, coupled with multiple equipment failures, could aggravate the impacts of a storm event.

The "Perfect Storm"

In trying to conceive of an event that could pose serious implications to the power system, one would think that the peak load case could produce the most severe impacts. However, at peak loads, almost all of the generators are running and there is a lot of spinning mass on the system. Loss of multiple facilities at this time, while problematic, can be handled with emergency procedures and other well-established practices.

The situation that could be more troublesome is a light load case with unusually heavy transfer patterns, as is prevalent in the middle of the night. Loss of multiple facilities at lighter loads and high transfers sets up the potential for voltage collapse with minimal ability for mitigation. (The 1989 Quebec blackout occurred at 2:45 a.m.) It would take the loss of several elements at strategic locations, but if such losses happened at about the same time, a voltage collapse and associated blackout would be possible.

Seven months after that meeting NASA found a giant breach in the Earth's protective shield that will increase the impact of solar storms above those discussed in the report above - present author's comments.

Reference

Phillips, T. (2008), Giant breach in Earth's magnetic field discovered, NASA Science, Science News, http://science.nasa.gov/science-news/science-at-nasa/2008/16dec_giantbreach/

Practicality, Security, War, Terrorist or Cyber-Attack

ELECTRICITY GRID MODERNIZATION: Progress Being Made on Cybersecurity Guidelines, but Key Challenges Remain to be Addressed. United States Government Accountability Office (2011), Report to Congressional Requesters

Excerpts

Page 9…
'The smart grid vision and its increased reliance on IT systems and networks expose the electric grid to … cybersecurity vulnerabilities … which in turn increase the risk to the smooth and reliable operation of the electricity grid. …

… increasing the use of new system and network technologies can introduce new, unknown vulnerabilities …

Page 24…
… our experts stated that smart grid home area networks—used for managing the electricity usage of appliances and other devices in the home—do not have adequate security built in, thus increasing their vulnerability to attack.

Without securely designed smart grid systems, utilities will be at risk of not having the capacity to detect and analyze attacks, which increases the risk that attacks will succeed and utilities will be unable to prevent them from recurring.

Money trumps security in smart-meter rollouts, experts say

By Elinor Mills (with Martin LaMonica), InSecurity Complex, cnet NEWS, http://news.cnet.com/8301-27080_3-20007672-245.html?tag=mncol;txt
June 15, 2010 4:00 AM PDT

Excerpts

In a rush to take advantage of U.S. stimulus money, utilities are quickly deploying thousands of smart meters to homes each day -smart meters that experts say could easily be hacked. … Security appears to be a casualty of this haste, experts say.

"Right now a lot of utilities are in a mad grab for money because of the stimulus package. Billions [of dollars] are on the table, so they are moving forward with metering projects and they're spending money as fast as they can.

…The security isn't where it should be, but the vendors aren't going to turn down orders." Jonathan Pollet, founder of Red Tiger Security.

Utilities … are relying on vendors to provide security in the meters, sources said. But vendors have a disincentive to provide strong security features because that tends to increase the cost to develop and manufacture, making the meters more expensive and less competitive in the market …

… Already there are devices available … that allow people to change meters so they register less power consumption than was actually used. …and you don't need physical access to the device to do this…

Some utilities are creating Web interfaces to the smart-meter system that could allow someone to change billing or take control of a meter over the Internet and then interfere with the grid, …. "The bad guys will figure out a way to leverage this." Stuart McClure, head of McAfee 911 division.

Fred Cohen, chief executive of Fred Cohen & Associates consultancy [http://all.net/security], painted a scary scenario where people could exploit security holes in smart meters … "We're throwing out millions of these systems and deploying them in a broad scale knowing that these problems exist." …

Smart Meters - smart idea - not so smart implementation

Powerwatch 2010, http://www.powerwatch.org.uk/news/20101018_smart_meter.asp

Excerpts

"Powerwatch has significant concerns about the security of electricity supplies in times of war or against a serious terrorist attack. The UK Government has just announced that Tier One threats include cyber and other terrorism.

Wireless meters are much more vulnerable to cyber-attack (hacking) and to electromagnetic pulse damage.

Wireless systems are almost impossible to protect against an electromagnetic pulse attack and civilian systems are not protected. Source Region Electromagnetic Pulse (SREMP) is produced by a low-altitude nuclear burst such as would come from a air-burst EMP cruise missile.

A single such pulse could cause most electronics in a 30 km area to permanently fail. The electricity supplies for wide areas of the UK could be disabled with ease. There have been many wars in the last 100 years and terrorism is increasing.

The old electromechanical rotating-disk meters would not be damaged. The industry has already been allowed to install simple electronic meters - are they EMP protected in any way? Probably not. Changing them to wireless meters will make them far more vulnerable.

Meters must be designed to fail in a "supply on" mode. This issue was not addressed in the DECC/Ofgem specification documents and must be properly addressed in the design process." …

Smart Grids Offer Cyber Attack Opportunities Hackers are likely to exploit the 440 million potential targets researchers predict smart grids will offer by 2015.

Mathew J. Schwartz InformationWeek October 12, 2010
http://www.informationweek.com/news/security/vulnerabilities/showArticle.jhtml? articleID=227701134

‘Is your home electricity meter the next device you have to worry about getting hacked? Researchers at last week’s IEEE Smart Grid Comm 2010 conference in Gaithersburg, Md., warned that as utilities transition to greater use of smart grids, their increased two-way communication would leave consumers and suppliers open to more forms of cyber attack. In fact, by 2015, they estimated, the smart grid will offer up to 440 million potential points to be hacked.

Why mess with someone’s home heating bill? One significant worry is that intercepting and manipulating smart grid data could provide attackers with the means to benefit financially, said Le Xie, an assistant professor of electrical and computer engineering at Texas A&M University.

For example, utilities typically plan their energy requirements one day in advance. An attacker who manipulated apparent energy demands, forcing utilities to turn to emergency -- and more expensive -- energy resources could likewise place safe bets in the energy market. “The virtual trader basically gambles against the price difference between the day-ahead market and the real-time market,” said Xie.

Beyond financial remuneration, other leading attack scenarios include causing chaos, studying consumers’ usage patterns to determine when they’re on vacation and then burgling their house, or taking out sensitive facilities.

Another difficulty is that … today’s smart grid systems may have a lifespan of 10 or 20 years. During that time, their built-in security, if any, will become widely known and disseminated. In other words, today’s new smart grid meter could be 2030’s cyber-catastrophe, or at least give rise to some new variation on Stuxnet.

Accordingly, numerous moves are afoot to help nail the security of smart grids in their infancy. The National Institute of Standards and Technology, notably, has been developing a framework for creating interoperable as well as secure smart grids and related systems.

Last month, the Department of Energy also announced awards of more than $30 million to utility cybersecurity projects. “These awards help us make a significant leap forward to strengthen the security and reliability of the nation’s electric grid, in a climate of increasingly sophisticated cyber attacks,” said US Energy Secretary Steven Chu in a statement.’

Smart Meter Data

Every electrical appliance has its own energy fingerprint readable by Smart Meters. Those accessing such information have indications of the appliances individuals have and how often they use them.

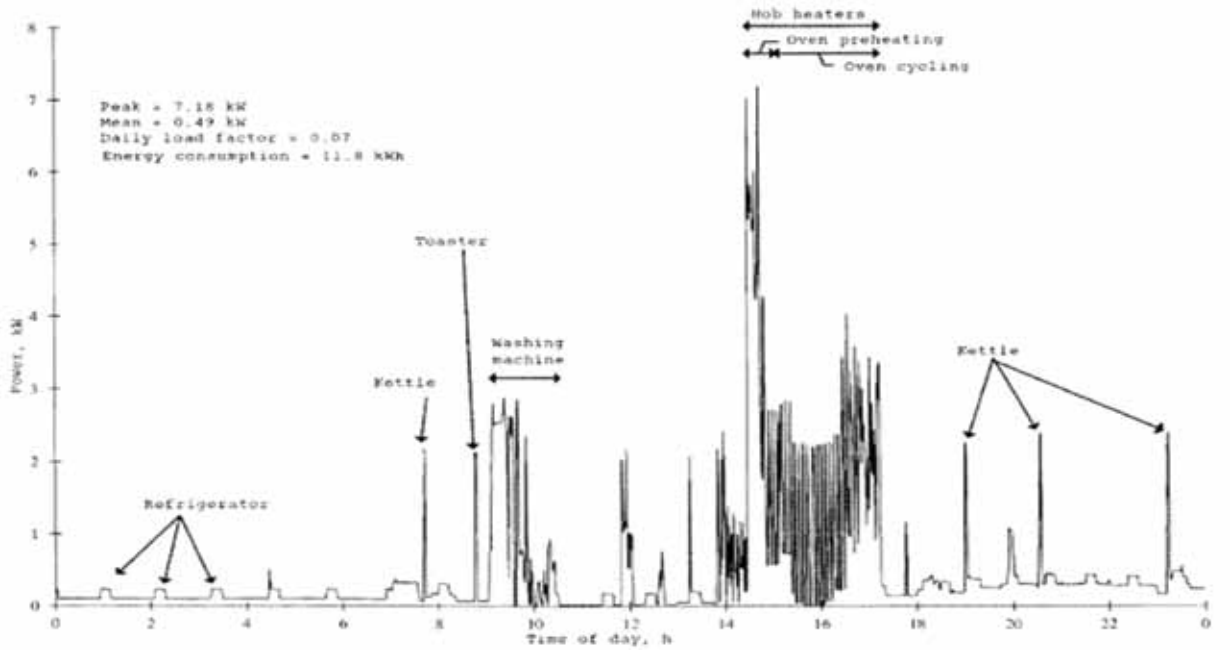


Image: National Institute of Standards and Technology

Parties wishing Smart Meter data?	Potential use (partial listing)
Utilities	Efficiency analysis, monitoring of electricity usage & load for forecasting & bills
Electricity usage advisory companies	To promote energy conservation & awareness measures
Insurance companies	Determining health care premiums based on unusual behaviours (such as sleep problems*), that might indicate illness
Marketers	Profiling for targeted advertisements
Law enforcers	Identifying suspicious or illegal activities
Civil litigators	Determining when home occupied, by how many parties & activities undertaken
Landlords	To verify lease compliance
Private investigators	Monitoring for specific events
The Press	Information on famous individuals' movements & lifestyle
Creditors	Determination of behaviour that might indicate creditworthiness
Criminals	To identify the best times for burglary or to identify high-priced appliances to steal

Original source: SGIP (2010) *Emissions from wireless Smart Meters can cause sleep problems.

Reference

SGIP (2010) NISTIR 7628, Guidelines for Smart Grid Cyber Security: Vol. 2, Privacy and the Smart Grid, The Smart Grid Interoperability Panel - Cyber Security Working Group, National Institute of Standards and Technology, Vol. 2, pp. 30–32, http://csrc.nist.gov/publications/nistir/ir7628/nistir-7628_vol2.pdf, pp. 30-32.

The need for 'opt outs' and wired alternatives

Implications for industry, Government and citizens over wireless Smart Meters

Excerpt

'Insurance Companies will not insure [have tended to withhold coverage for risks related to electromagnetic fields under civil liability policies (CE 2011) – *text in bracket added by present author*] cell phone providers (whose systems emit similar types of radiation to wireless smart meters) because of incalculable health risks. Lloyds Insurance Company is reviewing their risk assessment on this technology, so companies could be charged with WILFUL NEGLECT in future if they do not inform their customers adequately about the health risks of wireless microwave technology. Two recent Italian High Court judgements make this a real possibility. So the neglect to mention these important points in a `public information' leaflet on wireless smart meters, or have at risk groups represented in the stakeholder process, is unacceptable and points to a deeply flawed consultation process. Utility Companies offering smart meters without full explanation of the facts involved should be aware of this!'

Smart Metering Implementation Programme. Response to Prospectus Consultation. Supporting Document 3 of 5. Design Requirements, March 2011

Department of Energy and Climate Change and the Office of Gas and Electricity Markets. http://www.decc.gov.uk

Excerpt

'3.7 A small number of responses to the consultation expressed concerns about electromagnetic sensitivity relating to smart meter communications technologies, particularly to wireless technologies. At this stage communications technology solutions have not been selected for the smart metering system.

Both wired and wireless technologies exist that could be used and, for practical and technical reasons, both will need to be utilised by installers during the roll-out.'

Why 'opt outs' don't always work

180 Smart Meters installed in US apartment complex

180 wireless Smart Meters installed in a large apartment complex. If the individual who lives immediately above them opts out she is still exposed to microwaves from the remaining 179 units (OTLB 2011).

Wired Smart Meters, such those used in France, Italy, Poland, Russia, Switzerland, and in some areas of Canada and the US, would prevent such potential problems.

References

Maret, K. (2011), Commentary on the California Council on Science and Technology Report "Health Impacts of Radio Frequency from Smart Meters" http://sagereports.com/smart-meter-rf/docs/letters/Maret_-_CCST_Commentary_1-31-2011_final.pdf

OTLB (2011), Why Opt Out is a Cop Out, Posted on March 23, 2011 by onthelevelblog http://stopsmartmeters.org/2011/03/23/why-opt-out-is-a-cop-out/

Smart Meters - smart idea - not so smart implementation

Powerwatch 2010, http://www.powerwatch.org.uk/news/20101018_smart_meter.asp

Excerpts

Wireless will not work from inside screened homes

Increasing numbers of people are reporting electrical sensitivity (ES or EHS) problems. Many of these people are choosing to screen their homes against RF signals from outside. Many electricity meters are well inside a house (often under the stairs). Wireless Smart Meter WAN networks will not connect to a meter located inside an RF screened home. So this needs to be addressed - maybe by offering to relocate the meters to the outside of a house [or using appropriate wired alternatives? – *present author's comment*] when requested. …

Wireless is not necessary - just cheaper and easier to implement

… the [UK] electricity industry has been intelligently working away at determining the requirements of proper Smart Meters and how they can best be implemented. ... They also have prepared and published a number of detailed examinations of the communications possibilities and comparisons - including wired options (though there is no mention of the needs of electrically hypersensitive people). Their reports are detailed and quite technical and **clearly show that wireless is not essential** - their assessments support Power Line Communications (PLC) for outside communications and M-Bus for inside the home (available as wired or wireless) as being valid and suitable options.

However, they currently avoid suggesting PLC and are only promoting wireless networks as the best way forward.

The Home Area Network (HAN) inside your home

Here [in the UK] all the current proposals are for wireless networks - though one, the wireless M-Bus was actually designed as a simple wired network especially for Smart Meters and is already used as a wired home network in some European countries, including Germany. This would be an ideal choice as the meters could be supplied with an alternative wired M-Bus port and with a way of disabling the wireless function. Then we could easily choose to have a single screened wire connection in our homes instead of wireless.

Unlike some other countries, the UK forbid any directly wired connections to a gas meter. This would require either a opto-isolated coupling at the outside of the gas meter enclosure (as is required for industrial intrinsically safe installations) or a short length of fibre-optic cable as the final connection to connect from a point near to the gas meter into the enclosure and meter. Nowadays, that is not difficult or expensive.

M-Bus networks are already well proven in practice.

As a matter of best practice, when hard-wired Smart Meters are used, filters should be placed on them to reduce high frequency transients and harmonics that may otherwise create 'dirty electricity' (Milham 2010, Havas 2006), which have been shown to negatively impact on health – present author's comment.

References

www.powerwatch.org.uk/library/downloads/smart-meters-20110109.pdf

Havas, M. (2006), Electromagnetic Hypersensitivity: Biological Effects of Dirty Electricity with Emphasis on Diabetes and Multiple Sclerosis. Electromagnetic Biology and Medicine, 25, pp. 259–268.

Milham S. (2010), Critique of Critique of CCST's report, "Health Impacts of Radio Frequency from Smart Meters. Sam_ Milham_MD_Letter.pdf

Financial implications of Smart Meters

Will Smart Meters save money?

The UK deployment of Smart Meters is already set to become the most expensive in the world (Datamonitor 2010).

Proper investment is required for them to save energy suppliers' money over the duration of their operational lifespan - the challenges discussed in this document need to be addressed if their operation is to be truly successful.

Consumers will not necessarily make savings unless they more actively monitor and reduce their energy usage.

In some instances, huge rises in bills have been reported abroad. This is primarily due to faulty units, inappropriate billing systems, shortcomings in consumer education, and unusual extremes in weather conditions prompting extra energy usage (Burbank ACTION 2011, CBS 5, Zeller 2010).

Darby (2010) notes that whilst real-time displays of usage can be of benefit, there is little evidence that the rollout of Smart Meters will result in an overall reduction in energy demand, so savings are not guaranteed. Experts already voice concerns over this.

"If consumers don't reduce usage then the UK system becomes an expensive white elephant." Jon Lane, Energy Director at The Datamonitor Group*

*Datamonitor is a world-leading provider of premium global business information, delivering independent data, analysis and opinion.

Research by van Dam et al., (2010), indicates that initial savings created through the use of home displays may lessen over time. Their 15-month study found that initial electricity savings of 7.8% after four months were not sustained medium to long-term.

Education and improved 'smarter' technology appear key in creating financial success, as does ensuring that Smart Meters are rolled out at the appropriate time and that they do not create health problems for the nation.

The possible damage that health problems related to wireless Smart Meters might have on national productivity, and the level of burden these may place an already overstretched NHS, have yet to be properly assessed.

The use of wired Smart Meters (as adopted in some other countries), should be seriously considered.

Taking into account Life Cycle Costing (LCC)*, it appears the higher initial costs of wired Smart Meters can be mitigated through achieving greater national productivity and wellbeing using such units over their lifespan than would be the case with having mandatory wireless units.

It is now recognised that poor indoor environmental quality (IEQ) can greatly impact health and productivity, possibly at a cost of up to hundreds of billions of dollars per year (Kats et al. 2003).

The change in IEQ created by some wireless Smart Meter emissions, as demonstrated by existing rollouts, may markedly affect individuals' productivity and wellbeing (EMFSN 2011, Schreier et al. 2006).

LCC, taking into account health and productivity, should be used to help determine which types of Smart Meter systems are required to optimise the investments and financial returns of UK Plc. The need for independent assessment is urgently required. Having cost benefit appraisals carried out independently will also benefit the industry as it will not be able to be accused of bias.

***[LCC is a methodology used to identify the most financially viable solution to save money through estimating the total cost of ownership of a product, structure or system over its useful life based on a variety of factors].**

References

Burbank ACTION (2011), Smart Meter Consumers Anger Grows Over Higher Utility Bills, Burbank ACTION (Against Cell Towers In Our Neighborhood), http://sites.google.com/site/nocelltowerinourneighborhood/home/wireless-smart-meter-concerns/smart-meter-consumers-anger-grows-over-higher-utility-bills

CBS 5 Investigates Smart Meter Complaints, http://www.youtube.com/watch?v=csvmw2frBws

Darby, S. (2010), Smart metering: what potential for householder engagement? Building Research & Information, 38(5), pp. 442-457.

Datamonitor (2010), Me-too mindset drives smart metering to $5.7 billion, http://about.datamonitor.com/media/archives/5095

EMFSN (2011), Smart Meter Health Impacts-comments, EMF Safety Network, http://emfsafetynetwork.org/?page_id=2292

Kats, G., Alevantis, L., Berman, A., Mills, E. & Perlman, J. (2003), The Costs and Financial Benefits of Green Buildings: A Report to California's Sustainable Building Task Force, http://www.ciwmb.ca.gov/greenbuilding/Design/CostBenefit/Report.pdf.

Schreier, N., Anke Huss, A. & Röösli, M. (2006), The prevalence of symptoms attributed to electromagnetic field exposure: a cross-sectional representative survey in Switzerland. Sozial- und Präventivmedizin, 51(4), pp. 202-209.

van Dam, S.S., Bakker, C.A. & van Hal, J.D.M. (2010), Home energy monitors: impact over the medium-term, Building Research & Information, 38(5), pp. 458-469.

Zeller, T. (2010) 'Smart' Meters Draw Complaints of Inaccuracy, Business Day, New York Times.
http://www.nytimes.com/2010/11/13/business/13meter.html

Creating sustainable environments

There appears an urgent need for robust, credible multi-disciplinary research and design to improve the bio- and eco-sustainability of Smart Meter options before they are rolled out en masse. Timing is also important. Responsibly undertaking such measures may greatly benefit UK plc, and create numerous innovative solutions and technological breakthroughs that benefit the World's Smart Meter rollout and the next generations of electronic technology.

The Council of Europe / Conseil de L'Europe (2010) suggest 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.*"

They further propose the following with regard to risk assessment and precautions:

"Risk assessment should be more prevention oriented.

- improve risk-assessment standards and quality by … making the indication of the risk level mandatory, commissioning several risk hypotheses and considering compatibility with real life conditions;

- pay heed to and protect "early warning" scientists; formulate a human rights oriented definition of the precautionary and ALARA principles; increase public funding of independent research, inter alia through grants from industry and taxation of products which are the subject of public research studies to evaluate health risks; …"

Ensuring that Smart Meters, and other types of electronic technology, are more biologically friendly can have direct beneficial financial impact on the UK's finances. Such 'best practice' measures can be directly recouped by UK plc through savings on overall healthcare expenditure and increased workforce productivity.

"A single change to local 'circumstances' can have far greater health impact than a thousand individual choices." Diabetes UK (2004).

References

CE (2011), The potential dangers of electromagnetic fields and their effect on the environment, Parliamentary Assembly Assemblée parlementaire, Council of Europe / Conseil de L'Europe, http://assembly.coe.net, Doc. 12608

Diabetes UK (2004), Choosing health? The response of Diabetes UK to the Department of Health consultation on action to improve people's health. 6 pp., http://www.diabetes.org.uk/Documents/.../chosing%20health_consultation.doc

Conclusion

If the matters raised in this review are addressed correctly, UK Plc can create an environmentally friendly Smart Meter system that is the envy of the World.

Whilst some Smart Meters - *in their present form* - may adversely affect health, and there are concerns about system security and the timing of rollouts; more suitable alternatives are available - or can be created. Smart Meter rollout should not be rushed in the UK.

As noted by an industry expert:

This is a once in a lifetime opportunity and if the UK gets it right it will genuinely be the case that 'everybody wins' …

It will be those … who look to be part of the 'smart scene' by seeing these challenges as a means of opening up new business opportunities who will benefit. …

This is a unique opportunity for those professionals associated with developing the 'intelligent' buildings of tomorrow, and who themselves are smart enough to help make the 'smart revolution' happen."
Terry Rowbury, Director-Energy Sector, BEAMA*

***The British Electrotechnical & Allied Manufacturers Association (BEAMA) is the independent expert knowledge base & forum for the electrotechnical industry in the UK & Europe.**

Reference

Rowbury, T. (2011), Terry Rowbury discusses the challenges and opportunities of the 'smarter future', http://www.wholebuild.co.uk/building-product/energy-and-utility-provision/news/terry-rowbury-discusses-the-challenges-and-opportunities-of-the-smarter-future.
Dr Isaac Jamieson, Email: isaac.jamieson@live.co.uk

Author biography:

Dr Isaac Jamieson is a scientist, architect and built environment consultant specialising in the creation and enhancement of bio-sustainable environments using innovation, best practice and proven scientific concepts. He has over 25 years experience in design and environmental matters and has lectured internationally on such topics. He was Honorary Secretary and Treasurer of the Electrostatics Group of the Institute of Physics (2008-2011), and is presently a scientific advisor on stakeholder groups involved in policy decisions for the creation of healthy environments at national and international level. In addition to this, he has in the past undertaken work for the Lifelong Health Project at Imperial College London related to the development of environmental design factors and preventive interventions aimed to encourage healthy ageing and enhance wellbeing. He undertakes freelance consultancy work, private commissions and international research collaborations.

He organised the International one-day conference 'Electromagnetic Phenomena and Health – a Continuing Controversy?' at the Institute of Physics in London in 2008.

His recent research papers and reviews include:

Jamieson, Jamieson, ApSimon & Bell (2011), Grounding & Human Health – A Discussion. IOP Conference Series: Earth and Environmental Sciences – *in press.*

Jamieson (2010) Visible Light Communication (VLC) Systems, bemri.org/visible-light-communication.html

Jamieson, Holdstock, ApSimon & Bell (2010), Building Health: The Need for Electromagnetic Hygiene?, IOP Conference Series: Earth and Environmental Sciences – http://iopscience.iop.org/1755-1315/10/1/012007

Jamieson (2010), Intelligent Communication: The Future of EMF Discourse and Risk Governance?, IOP Conference Series: Earth and Environmental Sciences – http://iopscience.iop.org/1755-1315/10/1/012009

Jamieson & Briggs (2009), Towards Effective Risk Discourse: the Role of Stakeholder Partnerships. International Journal of Risk Assessment and Management, 13, (3-4), pp. 276-293.

Disclaimer