Smart Meters and Economic Instruments

'Polluter pays principle'

Marshall (2010) suggests that this principle, adopted for atmospheric pollution by CO_2, should also be applied to electromagnetic pollution; with possibly a tax being placed on all products that do not conform to the internationally adopted EMC Standards.

Introducing the 'polluter pays principle' would provide welcome incentives for industries to create more 'environmentally friendly' technologies (*particularly if extended to be more in line with existing WHO policies on Health Promotion*) and would provide further incentive for improved science-based stakeholder processes and technological innovation – a true 'Win/Win' situation. Refer also to Appendices 5 and 6.

Other EMF researchers suggest that such measures should also apply with regard to the more rigorous national standards that already exist in some countries and environmental and public health safeguards.

"*National Authorities should endeavour to promote the internalisation of environmental costs and the use of economic instruments, taking into account the approach that the polluter, should in principle, bear the cost of pollution with due regard to the public interest and without distorting international trade and investment*."
Principle 16 of the Rio Declaration - the 'polluter pays principle.' (UNEP 1992).

The EU's environmental policy is based on the precautionary principle and that "the polluter should pay" (CVTFEU 2010).

Infrastructure design

The infrastructure chosen to support Smart Meters, and the design of the units themselves, may have marked effects on the environment and the economy.

Creating 'eco-sustainable' and 'bio-sustainable' environments

Economic instruments can be used as a means of better considering 'external costs' to provide increased understanding of signals in trends for Smart Metering and possible 'knock on' effects.

It is important to ensure that comprehensive cost benefit analyses are undertaken so that correct and informed decisions can be taken by authorities and individuals.

Economic Instruments influence activities and/or effect change from their impact on market signals. They take on board a variety of policy tools including deposit-refund systems, marketable permits, performance bonds and pollution taxes.

Possible 'external costs' to consider for different Smart Meter regimes may include:

- health impacts to the public
- wellbeing impacts
- indirect impacts on work efficiency
- costs to other industries
- disability discrimination
- natural resource depletion
- environmental degradation
- biodiversity issues
- human rights claims
- security of supply
- timings of rollouts
- cyber security, etc.

Economic Instruments can be devised in a number of ways to encourage end objectives: Increasing the cost of goods and services which harm health and the environment, in addition to increasing financial returns for those adopting more sustainable approaches which promote more environmentally-friendly results (WHO 2011).

Relevance of Economic Instruments to policy-makers

Economic instruments assist the implementation of the 'polluter pays principle'. They are frequently compared to 'command and control' policy approaches which define allowable control technologies (via regulations or laws) and determine pollution reduction targets.

Subsidies

"*Subsidies, usually provided by government … often create perverse economic incentives; they can encourage producers to generate higher levels of environmental pollution -- and higher levels of associated health impacts*." WHO (2011).

"*Such subsidies conflict with the polluter and user pays principles by sending false price signals. They also … distort competition and inhibit the development of substitutes that are more environmentally-friendly*," WHO (2011).

Providing incentives for investments in innovation and improved environmental technology for smart grids and related technologies allow both environmental and financial benefits to be created.

There is a need to investigate ways environmentally harmful subsidies to smart grid related industries or enterprises can be reduced.

As noted by the WHO (2011), "*Tax breaks or other financial incentives might be offered to groups, individuals or industries investing in cleaner technologies*." It appears appropriate that these are applied to the development of Smart Meters and related technologies to help optimise returns.

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Optimising energy usage

The real need is for consumers to reduce their energy usage. This can be encouraged by a number of different measures in addition to Smart Metering – *Refer to Appendix 2*. 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.

The UK already charges 50% more for daytime electricity use than at night (Anderson & Fuloria 2010) - so savings are not guaranteed by the change in system. Experts already voice concerns over this.

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

There is also debate over how many people will actually use in-home displays (IHD). Ogi Kavazovic Vice President of Marketing and Strategy at OPOWER (a customer engagement platform for the utility industry) appears highly sceptical about IHDs being a success (Berst 2011).

Jesse Berst, chief analyst of Smart Grid News, agrees stating: "*[IHDs] will never catch on. If the average electricity bill is, let's say, $100 and the average savings is, let's say, 10%, then we are talking $10 per month [In the UK it is reckoned that on average £1.92 will be saved per month (approximately £0.06 per day) by households (DECC 2011) – present author's comment]. For that amount, most homeowners will scan a report every month or three and then make tweaks to pre-programmed settings. That's it*," (Berst 2011a).

In apparent response to this suggested consumer apathy Google recently axed its PowerMeter electricity monitoring tool due to poor sales (LaMonica 2011).

As noted by Berst (2011a), companies that are unrealistic about future trends, or belief overly optimistic forecasting "*could literally put themselves out of business*."

It is vital that the energy market is better understood so that products and services can be properly developed and specified for the end consumer.

Consumer Focus, the statutory consumer champion for the UK, is particularly concerned that poorer households could bear increased hardship under time-of-use Smart Meter tariffs, as they may be less able to change their patterns of use or determine how to save money from altering their usage. It states "*Consumers must not be forced on to time-of-use tariffs and must have the option to switch back to standard tariffs if they find themselves worse off,"* (Webster 2011).

The effectiveness of consumer monitoring versus advising customers to simply "*turn off electrical items when not in use*", more energy efficient building design, having simple tarrif schemes, and industry creating more energy efficient (and biologically and environmentally friendly) devices appear not to have been fully assessed. *Additionally, research indicates that <u>manually</u> operating appliances when the price is low is the consumers' favoured way of optimising energy consumption* (Paetz et al. 2011).

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Cost of securing critical electric infrastructures

There is a very real risk that, unless adequate precautions are taken, many Smart Meters, in their present formats, may be more readily damaged by space weather and malicious manmade events than their predecessors. Governments worldwide are taking such threats very seriously (EIS 2011, 2010). Industry is now starting to address this matter.

Smart grids (and Smart Meters) may need to be protected against electromagnetic pulse (EMP) damage to comply with the International Infrastructure Security Roadmap developed to secure power supplies. It seems the costs of such measures for different metering systems have yet to be obtained. Additionally ensuring that Smart Meters cannot be disconnected remotely would greatly help reduce risk of blackouts caused by hackers and rogue states.

Where/if appropriate, it is proposed that customers should be allowed the option of paying for upgrades for hardening their Smart Meters. Whether this could be recouped in the long term through reduced insurance premiums remains to be seen.

The option also exists of delaying further rollouts of Smart Meters until the main risk period from solar EMP subsides, whilst undertaking appraisals as to the best ways to proceed to optimise their performance and address consumer concerns (whilst also educating the public on energy saving measures and asking them to reduce their energy usage).

Future proofing investments

For Smart Meters to meet the international Electric Infrastructure Security Council (EIS) requirements and be a financial success, they need to be “future proofed’ and made more desirable to the end user. One way to help achieve this may be through providing a mainly fibre-optic system. This reduces health and security issues and makes smart grid more attractive for investors.

Anderson & Fuloria (2010)’s suggestion of bringing on board additional highly qualified IT professionals and systems engineering staff (at the earliest possible opportunity) to help further recognise and address potential IT problems and optimise Smart Meter solutions to could be of great benefit.

Possible cost effects of Smart Meters on health and productivity

Rigorous research has to be undertaken to investigate claims on the effects of different types of Smart Meters and Smart Metering regimes on health and the environment – *ideally before they are installed – Refer also to 'Healh Matters' and Appendix … .*

The alleged change in Indoor Environmental Quality (IEQ) created by some wireless Smart Meter emissions, as demonstrated by some existing rollouts, may adversely affect individuals' productivity and wellbeing (EMFSN 2011, Schreier et al. 2006). These matters need to be appropriately addressed and solutions applied.

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

It is vital to ensure that Smart Meters and related technologies are biologically friendly and do not harm IEQ.

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

The possible effects of emissions on Nature - *if proven true* - too have to be considered. Ideally empirical or theoretical studies should be undertaken on the potential economic effects on the environment of the rollout of different types of Smart Meter system.

Cost benefits of ensuring human rights are recognised

The possible costs of human rights challenges to various Smart Meter configurations should be addressed before further large scale rollouts are undertaken so that the likelihood of challenges are reduced through the specification/development of appropriate units.

Failure to adequately address human rights issues has already stalled Smart Meter installation in the Netherlands (metering.com 2009).

Cost benefit analysis

The UK's Department of Energy and Climate Change (DECC) have estimated in the past that Smart Meters may deliver "*a net benefit to consumers of around £5.98 billion over 20 years,*" (Ofcom 2009).

This works out to around an average of £299 million annually.

The above sum appears significantly less than the damage that might be inflicted on human health, productivity, national security and the environment if the wrong types of Smart Metering system and infrastructures are specified.

Transparent and detailed cost benefit analyses are urgently required taking into account the potential effects (beneficial or detrimental) of different Smart Meter regimes, as related to the billions countries spend on health, the environment and security of their supply and data - *all of which may be effected by Smart Metering decisions*.

As an example: as RF/microwaves are now recognised as being a potential human carcinogen (WHO/IARC 2011), the possible effects of RF/microwave emissions emitted from some types of unit should also be factored into such analysis. The annual cost to England alone (not the UK) from cancer is £18.33 billion - *with figures set to rise to £24.72 billion over the next ten years* (Featherstone & Whitham 2010). *Refer also to 'Health Matters' and Appendix 1.*

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Life Cycle Costing

Life Cycle Costing (LCC)*, taking into account health and productivity, as determined by multifactoral Environmental Impact Assessments (EIA) and Health Impact Assessments (HIA), should be used to help determine which types of Smart Meter systems are best for optimising overall investments and financial returns.

*[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].

Creating financial opportunities

In 2009, Ernst & Young warned that the UK Government at that time that it had underestimated the cost of a nationwide Smart Meter rollout and stated that the end cost could be £13.4 billion.

"*Very big and complex projects of this sort always cost more than anticipated," … [the Government's figures appeared to rely] on an assumption of absolute efficiency*."
Tony Ward, Power and Utilities Partner in Ernst & Young (Pagnamenta 2009).

As indicated earlier in this document, once Health Impact Assessments (HIA), Environmental Impact Assessments (EIA) and Life Cycle Costings (LCC) factors are taken into consideration (alongside potential customer savings over time and security issues); *there is very little opportunity for countries such as the UK to make financial gains from installing Smart Meters, unless radical changes are undertaken.*

One such way of achieving financial viability and addressing potential public health concerns appears to be through investing in innovative fibre-optic smart grid networks similar to those used in Chattanooga, Tenesee – *Refer to section on 'Smart Alternatives'*.

The higher initial costs of fibre-optic Smart Meters might be mitigated through countries achieving greater national productivity and wellbeing over their lifespan than might be the case with widespread use of wireless units (in their present format). Their infrastructure is also less vulnerable than wireless alternatives and can provide additional sources of income from broadband providers.

Challenging financial perceptions

"*There is only one difference between a bad economist and a good one: the bad economist confines himself to the visible effect; the good economist takes into account both the effect that can be seen and those effects that must be foreseen*."
Frédéric Bastiat (1801-1850) political economist and leading advocate of free markets and free trade in the 19th century.

In the past wishful thinking, over simplification and incomplete understanding of the matters at hand have often prevented optimum solutions being achieved.

Such approaches can be tremendously counterproductive to all concerned, particularly where risks are high, and appropriate stakeholders and technological solutions that could be brought in are virtually ignored or dismissed out of hand.

It is already evident that billions of dollars have been misspent worldwide in the rush to implement smart metering. It is time to address this issue properly with robust interdisciplinary research and the ability to "*think outside the box*" and also take onboard other measures can also help reduce energy usage.

Benefits of investing in innovation

By investing properly in the smart grid infrastructure, it can be made far safer and used in highly innovative ways, including Internet provision (through leasing fibre-optic capacity to providers of general broadband services).

"*The internet is a tremendous opportunity for innovative UK companies. The UK internet economy was worth £100 billion in 2009 … That's roughly 7.2% of gross domestic product, making the internet a larger factor in the UK economy than construction, mining, tourism, agriculture and a number of other industries. And the internet is expected to be worth 10% of UK GDP in 2015*."
Eric Schmidt, Executive Chairman of Google.

As the introduction of smart grids using fibre-optic technology has already been shown to improve business investment over other types of system and optimise/'future-proof' Internet connections; it is proposed that their adoption should be seriously considered.

No-one has yet fully assessed the potential benefits of introducing a fibre-optic smart grid and broadband network for a whole country. The bringing onboard of other energy saving measures too should be considered - *Refer also to Appendix 2.*

Improving revenue streams

It is important to secure a meaningful sustainable growth strategy for the smart grid by opening up its revenue streams. As noted by Lord Green, UK Minister of State for Trade and Investment (when discussing infrastructures) growth can be provided from investment by external sources seeking business opportunities (Parsley 2011).

There is a window of opportunity for increased investment by external sources in the UK's smart grids; possibly through creating new Electric Market Reforms (EMR), as a first step towards creating a robust 'future-proof' national infrastructure of smart grids – *present author's comments*. Other energy saving concepts and technological innovations could provide further opportunities for sound investment.

"… *we have to all think more proactively about where opportunities are*."
Lord Green, UK Minister of State for Trade and Investment (Parsley 2011).

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