

## **Science and Technology Committee (House of Commons)**

### **Smart Meters Inquiry**

#### **Written evidence from Nigel Orchard, Pilot Systems (London) Ltd**

**April 2016**

#### **Introduction**

I am a director of Pilot Systems, a software business providing interoperability “middle-ware” to the UK energy metering industry since 1990. We license and support standard interfaces and software FLAG and CHIRPS which have allowed energy suppliers and consumers to “interoperate” across meter vendors whilst catalysing innovation. The secret has been a generic approach to the data communicated, allowing new products and functionality to be developed without changing the underlying structure. As such our CHIRPS product is more mature and stable than Microsoft Windows. Our main customers are blue-chip companies in the business of energy and metering, using UK standard meters but largely not yet in the regulated energy supplier downward chain.

#### **Experience**

I have worked on the smart metering program (SMIP) since the outset, starting with the Carbon Trust Advanced Meter Trials in 2004, the Energy Data Reduction Project in 2008, and the specification “Hot-House” in 2010. Since then I have been active on working groups at DECC, and more recently at the DCC as an “Other User” SEC Accredited Party. I am as aware as most in the industry of the SMETS specification, and the details and difficulties of the roll-out.

#### **Evidence**

I gave evidence via my Trade Association, the Energy Systems and Technology Association (ESTA) at the DECC Select Committee in 2013, and this can be seen in Appendix 1 of the government report from Pages EV178 to EV183 “Achieving an Interoperable Implementation”

<http://www.publications.parliament.uk/pa/cm201314/cmselect/cmenergy/161/161.pdf>

I believe smart meters are an essential element to our energy systems of the future; energy reduction, load management, network management, local generation and distribution and storage. They also represent a fantastic opportunity for the connected home, where every premises in the country is equipped with a basic infrastructure (without needing a phone, mobile, cable or internet). The roll-out must be taken seriously; cost is socialised across all energy consumers, effectively every premises in the country. Technical drivers must be considered, as well as economic, political and commercial, and decisions must be made to the best benefit of the energy consumer who in effect is paying for the roll-out. Unfortunately DECC has been too influenced by the commercial ambitions of the major stakeholders (suppliers, meter vendors, banks and consultants) rather than to establish a stable structure for the consumer to benefit from these players. But it is not too late, and my evidence will outline what can be done to rectify what appears to be an intractable problem.

Firstly I will look at the questions the committee are asking, and provide answers based on this backdrop.

#### **Consumer Behaviour**

There is no doubt that displaying consumption rate and cost encourages the consumer to save energy. This was proved by the work DEFRA did pre-2010 with clip-on displays costing less than £30 and providing the same benefits. Those benefits alone cannot justify our current expenditure on smart meters to the consumer, and we must be clear about the additional benefits a proper working smart energy market will deliver. The Carbon Trust Advanced Meter trials showed 5% if basic consumption only were presented. However with analysis and quality feedback, this increased to up to 35%. This emphasises the need for access to the consumption data by the consumer or appointed party. This will allow new equipment and services to be developed (for example energy analysis via internet or mobile phone). We are disappointed that access to data is so restricted with the delay of the CAD (consumer access device) and third-party access to data from the DCC is prohibitively expensive.

I also note that energy suppliers are naturally reluctant to provide this energy reduction services since it reduces their commodity volume, however they seem very insistent to retain control of it. Government policy since 1998 has been “if you don't like your supplier performance then switch” however with a Version 1 smart meter that cannot be done without making the meter dumb. Meanwhile we are still paying the banks smart leasing costs, for every Version 1 meter that becomes dumb on churn. Today that is all of them, just over 2 million and rising monthly. The “utopia solution” has been SMETS2 and associated protocol, the Great Britain Companion Specification (GBCS) which has been “a year away” for the last four years. This is demonstrated in my 2013 evidence paper when SMETS2 implementation was claimed to be completed in December 2014. In a panic, and to justify further charging the DCC prepared a Release 0 for SMETS2, to which no meters comply, and has now been declared obsolete. We await Release 1 (excluding prepayment) and Release 2 (with prepayment) originally promised April 2016, then Summer 2016, now October 2016. The time-lines are shorter, but still moving. But in effect we are currently 2 years late. In the meantime I have attended GBCS workshops and see no evidence that the competing meter vendors are converging towards a compliant solution. I have written twice to the DCC on this subject (see letters and response in Appendix 1) and it is only a matter of time before the DCC will have to admit that they cannot deliver inter-operability and assure innovation based on such a large monolithic design, and with so many stake-holders. However there is no incentive for them to “rock the boat” since they are being paid through socialised energy bills by the consumer, with the continued approval of government, and the whole downward supply chain.

Consumers are now very suspicious about the push for smart meters, since many have now experienced the lack of interoperability when they switch supplier, and furthermore the broken promises of the supplier who sold them the smart meter that they could switch easily. Many see the In Home Display (IHD) as a gimmicky after-thought which gets put in a drawer after a month because the batteries run out, or the power leads get in the way. To keep the IHD on the wall, we will need something more exciting than energy consumption; a flash message to switch to solar / wind-power energy for example when sunny / windy days are predicted.

### **Time of Use Tariffs**

Before 1998 most energy suppliers used complex tariff structures in sub100kW industrial sites, and many domestic sites had dual registers controlled by a time-switch or radio-teleswitch. Used primarily for electric storage heaters, tariffs such as “Economy 7” and “Heatwise” were popular and successful in enabling the incumbent energy supplier to flatten load and reduce costs. Many premises had dual circuits with contactors that could be switched off remotely. This historical evidence demonstrates conclusively that time of use tariffs provided savings to consumer and supplier.

However after 1998 the settlements process removed the direct incentive for energy suppliers to promote this activity, because their costs were then based on “profiles” rather real half-hourly data. This has resulted in gradual decline in domestic multi-tariff metering and new home builds with dual circuits.

This decline can be rectified in three ways. Firstly half-hourly settlements could be mandated for the whole market, not just above 100kW. There has been resistance to this from energy suppliers, because of the size of the systems they would need to develop to accommodate 48 readings per day instead of a single reading per quarter per customer. Secondly, standards for time-of-use consumption could be established between the suppliers to form a charging basis that settlements could use. Attempts to do this were made post 1998, but resulted in so many different time-band scenarios that no consensus could be reached. Thirdly, and I believe the most exciting, is the opening of the market to subsidiary suppliers who buy wholesale on the half-hourly market and then devise tariffs for certain types of customer profiles. This would relieve the large suppliers from building large systems, and would provide new incentives for smaller suppliers and brokers to offer more innovative tariffs. They could rely on fixed half-hourly pricing structures, rather than get involved in the balancing and settlements code, which has frightening penalties for small players. To do this, the smart meters must be flexible enough to provide time of use registers against monthly and seasonal structures. This is not new – industrial meters have been doing this since the first computers in the early 80s.

### **Expected Net Savings**

There are a number of “no-brainer” savings measure that can be implemented independently of smart meters. These include low-energy bulbs, roof and wall insulation, lagging of tanks, double glazing and better zone control of heating space so that people don't open a window if they are too hot in a room, or turn on the whole premises heating on if the room is too cold. Low powered equipment that consumes very little or no “standby” energy with energy efficiency labels is also good and can be done independently.

The real benefit of the smart meter is where the consumer can start to become proactive in his energy best practise. As well as catalysing decisions to invest in measures listed above, he can be innovate himself, or engage a third party to take innovative steps for him. But this can only be done if the consumer has equal access to the technology in the smart meter. Currently there is no evidence that they will have this, despite the fact that they are paying for it.

I believe that with automated systems to email and text alerts to consumers on tariffs, supply offers, and options to switch off circuits, savings comparable to those the Carbon Trust demonstrated in industry could be achieved, i.e. up to 35%.

### **Optimising National Energy Generation and Storage**

This can only be done if customers are able to “trade” on the market under comparable terms to the energy suppliers. My utopia is for a consumer to be able to, for example, fill a shed with deep cycle batteries, cover South facing roofs with solar panels, erect a windmill, and run a combined heat and power boiler. He could pump energy into the grid when he could get a good price, use his own resources if it were expensive to buy, and charge up his batteries himself, or from cheap overnight import. I see business models being built on that “utopia” so that third parties would offer a control system to consumers to maximise their savings. I see energy suppliers playing a large part in this market, but they will not drive it themselves. It will need to come from the innovators, who firstly need to be empowered to start. Again this comes back to an accessible smart meter, but also may

require an intermediary wholesale arrangement, a bit like the “Electricity Pool” used for settlements until around 2002. Such adoption would evolve gradually and the distribution networks DNOs will need to be prepared to make reinforcements where necessary. This may involve great access for the DNOs to the smart meter, to get a better picture of import and export profile

## **Security of Smart Meters**

I covered some issues of security in my 2013 evidence. The security “animal” has aroused some bemusement within the metering industry who have been designing secure prepayment meters with remote and semi-remote billing registers and power shut-off for over 30 years, with little or no breach. That does not mean we must be complacent, but realistic, and build on what we have already with the security experts, with a fully remote system. The security drive is likely to be fuelled by the following;

- energy suppliers wishing to retain exclusivity on access to smart meters
- security consultants achieving high value work
- the IT industry equating a “meter / comms-hub” with a vulnerable PC / workstation
- a monolithic design for which no single party is accountable and/or can remedy
- remotely upgradeable firmware
- precautions from GCHQ and heightened terrorist alerts
- general scaremongery from parties inside and outside the supply chain

We must remember that the meter and Comms Hub are normally designed “from scratch” by the engineers. In other words there are no hidden “holes” in the software or bought-in operating system. This means that the meter vendor can have full control of what is in the sealed box on the wall.

The main problem then becomes remote firmware upgrade, where new software images could be from a rogue source. It is my firm belief that we do not need remote firmware upgrade. Meter firmware can be written to be data configurable with channels, registers, tariffs, energy types, etc. This is how multi-functionality has been achieved in the past. The only reason we have firmware upgrade is because it is used widely on PCs, and mobile phones. We know how often these systems “hang” or more importantly how often new software versions are designed to bring less benefits to the consumer and more to the supplier. The attractiveness of being able to release something quickly comforted by the assurance that it can be updated if bugs are found, together with the above commercial attractiveness must be resisted at all costs. Firmware upgrades just make the metering system more vulnerable to both error and attack. The SMETS and GBCS have taken us long enough to develop (actually almost the stated lifetime of a meter, 10 years) so it is not difficult for vendors to provide a fixed firmware product that is flexible enough to cope with their foreseen market.

I believe security should be the responsibility of the meter vendor. They already know how to implement their own security algorithms, and can do so given a generic communications channel from the DCC. A similar model to the internet, where most security is implemented in the content rather than the protocol. But most importantly this distributes the risk of breach, and also makes the source more traceable and remedy more achievable. If there is a breach, only the vendor of the meter that is breached will need to remedy. Their metering installed base will be vulnerable, but it will be distributed widely nationally, among meters from all the other vendors which do not have that vulnerability. Hackers can be much more easily tracked, and their progress assessed leading to much more controlled remedies.

With the current monolithic approach, if there is a breach, who remedies ? Meter vendor, supplier, Comms Provider, Data Provider, DCC, DECC, GCHQ ? No-one knows, which is why the requirements are so onerous to try and ensure a breach will never happen. But there is always a risk

that it will.

## **Getting Smart Meters back on the Rails**

My recommendation is the DCC provide a generic pathway similarly to how my Company has done with FLAG and CHIRPS. This technique is proven to work and adopted by all the meter vendors. Establishing a fixed interface, rather than a continually moving one will allow vendors to release meters they know will be interoperable. At the moment there is no incentive for them to do this – see my 2<sup>nd</sup> letter to the DCC outlining the various stakeholders.

The DCC essentially has two tasks;

- 1) establish an open standard to which all SMETS2 meters must comply to be accepted by the industry as smart meters. This is called the Great Britain Companion Standard or GBCS and is over 900 pages of highly technical data written by engineers from competing UK vendors. It could be something as simple as the FLAG protocol
- 2) provide interface “glue” between competing energy supplier systems in the enrolment of SMETS1 meters, based on proprietary information and support that the companies are not obliged to provide. A feasibility report is expected by the end of 2016. Pilot Systems have offered to solve this for the DCC within 6 months at a fraction of the cost

## **Conclusion**

My evidence recommends some new, fairly small technical interfaces and initiatives which I am certain will turn smart metering around. I do not want this evidence to become a commercial punt, but it does exemplify the resistance the industry have to a solution which will make all this technology more open and accessible, and therefore much more attractive to a wider market. I am willing to engage with the DCC to help them establish the low level interfaces and standards needed for 1) above. I am also willing to work with the DCC to draw out the best from the existing meter vendors offering, based on the experience I have had from working with the vendors for over 30 years to resolve 2) above. All I ask is for government to endorse this initiative despite the resistance from the energy suppliers and downward procurement chain. It will preclude little or nothing that they have developed so far.

Appendix 1  
Correspondence with DCC

## **References**

Evidence submitted to DECC Select Committee in 2013

Pages EV178 to EV183 “Achieving an Interoperable Implementation”

<http://www.publications.parliament.uk/pa/cm201314/cmselect/cmenergy/161/161.pdf>

**APPENDIX 1  
Hammersmith  
London W6**

11<sup>th</sup> February 2016

David Higgins Esq,  
DCC Program Director,  
2<sup>nd</sup> Floor IBEX House  
42-47 Minories  
London EC3N 1DY

Dear David Higgins,

Thank you for another excellent DCC Industry Day, where presentations, welcome and hospitality were of the highest standard as ever.

I am writing to the DCC privately as a SEC Party (Other User), owner of a smart metering business, local politician representing the consumer, and professional engineer. Whilst I believe the structures the DCC have in place to the point of connection to Comms Hubs and meters are robust I remain concerned about the timely delivery of interoperability that supports innovation in the equipment that is being installed in people's homes.

In answer to my question during the opening session, the DCC claimed it already had two operational SMETS2 meters in the lab from competing vendors. What was not said was that these were Release Zero, which will now be obsolete. The DCC is currently working on three subsequent releases simultaneously, with a fourth as a place-holder. The DCC is still highly reliant on the SMDA to ensure the functionality is what is expected from the DUIS. And there is now a wide matrix of Comms Hubs, where the 868 firmware version has not yet been agreed by the Zigbee Alliance.

Against that the DCC has a commitment to Go Live later this year. My question remains – what will you “go live” with ?

The purpose of my letter is to offer assistance. September 2016 is likely to be the crunch-point, since I believe the DCC have no further bites of the cherry on time-line slippage or budget review. Neither will reducing scope of delivery appease those probing DECC on their benefits analysis.

You may not be fully aware of the business of my Company, Pilot Systems – indeed the patrons of the DCC are anxious to keep the products and services we offer well hidden. Our product CHIRPS, based on the open protocol FLAG has delivered interoperability whilst maintaining innovation over the past 25 years and is reliable and stable. I would like to offer this to the DCC as a “safety net” to ensure the DCC has tangible delivery by the end of the year. Pilot Systems recently bid to DCC (Service Provider for Enrolment Options Testing, EOT) and were unsuccessful, probably due to methodical use of criteria rather than our overall solution provision. In short Pilot offered to solve the SMETS1 problem within 6 months for under £50,000. My understanding is the DCC has not yet selected a bidder, despite promising it would do so in December 2015.

David I would welcome the opportunity to meet with you to explore this further. Ideally we would do this separately, without involving SEC, Ofgem or DECC, but obviously we may need to get others involve if there are commercial / political hurdles to overcome.

Please could you contact me directly to arrange a meeting. I am happy to come over to you.

All Good Wishes,

Nigel Orchard  
[nigel@pilotsystems.com](mailto:nigel@pilotsystems.com)

**APPENDIX 1 (Cont'd)**  
**Hammersmith**  
**London W6**

David Higgins Esq,  
DCC Program Director,  
2<sup>nd</sup> Floor IBEX House  
42-47 Minories  
London EC3N 1DY

4<sup>th</sup> April 2016

Dear David,

Thank you for your letter of 30<sup>th</sup> March 2016. As you may know I look for evidence rather than pay too much attention to “corporate positions” and I attended the GFI Industry day that you held last Thursday. I have to say I was very impressed with what Critical Software have done. They have interpreted the DUIS specifications and we have the list of GBCS services, together with XML files of challenges and outcomes implemented technically in Zigbee. This serves as a useful benchmark for the meter vendors to follow. The main hiccups as far as I could see were security and version control, but I will cover these below.

During such meetings of course you pick up more from engagement with attendees than you do from the meeting business itself, and I would observe the following for you if this is useful.

### **Engagement**

It does appear that Eon and Elster are the only supplier/vendor party to be truly engaged. Both had two representatives who were actively participative throughout the day. The other major parties were either not present, or only attended as what appeared to be a non active/responsible role. This is concerning, and standing back a little you can see why this may be the case. The other stakeholders have more SMETS1 interests. British Gas / Landis + Gyr have 2 million meters installed and are still going for SMETS1 – presumably they believe they will set the interoperability standard themselves. Secure have good success with the small suppliers and can claim their own interoperability anyway across these suppliers. They too are going big guns for SMETS1. EDM I believe they have the leading edge in the North with their work with Arqiva, and presumably have the same gung-ho approach as BG/L+G. They claim they are on track with SMETS2 but I have yet to see their meter operating in the same room as Elster's. So we have roll-out that is continuing to diverge, and in the meantime smart leasing costs are continuing to be charged to the consumer for assets that become dumb on churn.

### **Smart Meter Design Assurance (SMDA)**

In theory of course when SMETS2 is cut in, SMETS1 meters will no longer be permitted, but I am now conscious that the only interested party in this may be Elster. They will have a job to convince their competitors that their implementation is the correct one, against equivalent implementations the others have made in SMETS1. The DCC will play a major part in this, but are still heavily reliant on the SMDA to arbitrate on how the implemented functionality in the communications is implemented in meter hardware. From what I gather from the attendees yesterday, the SMDA is not particularly active, and is operating on a needs-be basis. Since there is only one properly engaged vendor, there will be little need. My fear is that the other vendors will find plenty of reasons to delay agreement of SMETS2.

### **Security**

Without wishing to comment on the onerous security requirements coming out from a single design, the main snags on Thursday were security issues, keys, certificates; most of the competent technical specialists in the room were struggling to grasp the correct methods to get something working. Whilst this may be comforting with the potential of cyber-attack, it is not particularly helpful at this stage in the development. My recommendation would be to go live with SMETS2 relying on the security methods the vendors have already implemented in SMETS1, and cut in additional security if necessary at a date when all can agree and understand it.

## **Versioning, Future Proofing and Innovation**

The other problem I noticed was compatibility across versions. It appeared that later versions of GFI were not compatible with earlier meter implementations. This is very serious because it means that vendors will not roll out meters until they are certain the specification is not going to change again. But if they do, the asset will soon become dumb on later GBCS releases.

This makes it very difficult to see how the industry can innovate going forward. We have already identified functionality that will not be included in the go-live, as well as new functionality the industry have agreed meters should accommodate. How will these be cut-in without making more installed meters dumb ? Are we going to be relying on Over The Air Programming (OTP), and if so how will that be controlled (different software images for the same SMETS2 functionality) ?

I hope this is useful Richard. I also appreciate your needs to be commercially impartial and am grateful for the recognition that Pilot Systems technology may be competitive to the current roll-out strategy. That does not mean I cannot help you further – at the current position of the Program, I suspect the more technical help you can get, the better.

I was however puzzled when you say I am in “regular contact with colleagues on enrolment and adoption of SMETS1” - I am afraid that I have no contact in this regard, apart from the unsuccessful bid that Pilot Systems made. I would welcome further engagement, because it seems this is critical to the ongoing roll-out.

I look forward to hearing from you,

All Good Wishes,

Nigel Orchard  
[nigel@pilotsystems.com](mailto:nigel@pilotsystems.com)