

**Smart meters in Great Britain :  
the next steps ?**

**Paper 3 : Costs of smart meters and benefits to suppliers**

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## **Costs of smart meters and benefits to suppliers**

### **Costs of smart meters**

This section looks at the likely capital and installation costs of smart meters. As with the 2006 report, the focus is on the domestic sector, although similar costs are likely to apply to the smaller end of the commercial sector. The main focus has been to obtain information on options and costs for smarting gas meters, as this had not been covered by the 2006 SF report, nor indeed in any detail in other work, including that by Ofgem. The other focus has been to update and expand the cost information on communications options for gas and electricity smart meters, as these currently represent a significant part of the costs.

Costs can vary considerably depending upon volume and technology assumptions and clearly the only way to obtain definitive costs is in response to a serious prospective purchase enquiry. For commercial reasons, much cost information provided to this study was broadly generic, and accordingly the costs below reflect a synthesis of two main sources of information: known costs where smart metering has been introduced overseas; likely costs in the UK, based on certain volume and technology assumptions. However, the figures come with a significant health warning – there are some very different views about the reasonableness of some costs amongst different parties (meter manufacturers, energy suppliers etc).

### **Costs of non-smart meters – for comparison**

Non-smart gas credit meter - £18-20

Gas Quantum prepayment meter - £75-100

Non-smart electricity meter - £7-8

Electricity key prepayment meter - £45-50

## Cost elements and specifications for smart meters :

### One-off costs

- a. New smart meters (credit and prepay) include interval / data storage (enabling time-of-use) facility; and a customer display on the meter itself (but excluding communications).
  - £25-35 electricity credit/prepay dual functionality (can be changed from credit to prepay remotely by the supplier)
  - £40-60 gas credit
  - £70-100 gas prepay/credit dual functionality (can be changed from credit to prepay remotely by the supplier)
- b. Retrofit options for gas meters – wide range of costs depending upon the meter type but most commonly in the range of £25-35 for pulse activation and data logger. To this cost needs to be added the cost of an in-home Radio transmitter to send data to the electricity meter or smart box. The retrofit option currently would not be suitable for gas prepayment meters.
- c. Low power Radio in-home transmitter capable of sending signals within the property (i.e. to send a message from the gas meter either to the electricity smart meter or to a smart box) £5-10
- d. Radio onward transmitter (to send data from the property to a local data concentrator) - £10-20. Costs for onward transmission medium – from the data concentrator to the energy retailer/data management agent (e.g. via GSM) – assume £5 per meter
- e. Power line carrier (to send data from the property to a local data concentrator) Capital cost of transmission function within meter - £5 per meter. Capital cost of the data concentrator (e.g. at electricity sub-station) – assume £5 per meter. Costs for onward transmission medium - from the data concentrator to the energy retailer or data management agent - £5 per meter.
- f. GPRS/GSM modem to communicate from the property to the energy retailer or data management agent - £30-40
- g. Installation Costs - should not vary according to the type of meter (although GSM/LPR antenna positioning might cause some additional site costs) but will vary with volume installed and whether meters are being rolled out on a geographic basis or more selectively. Post-installation checks and fault handling are assumed to be included in installation-related costs. £25-30 each for electricity or gas only; £40-55 for gas and electricity if smarted together.

- h. Separate customer display (where required) – connected by PLC or wireless to the smart meter but conveniently located for customer use (e.g. kitchen). £20-30.
- i. Data infrastructure/systems These are the systems need to be set up within the energy retailer (or their data management agent) to manage the data. These will vary significantly in terms of cost per meter, depending upon volume, as there will be a high level of set up costs associated even with a small volume of meters installed. Estimate £100 million plus per retailer, spread over electricity and gas smart meters.
- j. Stranding costs – the costs of compensating meter asset owners for early removal of functioning meters would also need to be added if smart meters were to be installed under an accelerated replacement or rollout over a short period. This could add a further £15-17 to capital costs (Ofgem 2006 estimate).

### Recurring costs

- k. Running costs of communications/data transfer - GRPS/GSM direct from the meter to the retailer/data agent. SIM rental £5-10 per annum (at the higher end may include an allowance of “free” messages – e.g. 100 free SMS) SMS communications to (and from?) the meter charged at between 3p and 8p per text.
- l. Charges for use of PLC (i.e. the charges that the DNO would wish to make for use of its network). Costs not yet known.
- m. Running costs of communications/data transfer from data concentrator to retailer/data agent for PLC and Radio (assume GSM) Assuming data from a number of customers is packaged and sent together running costs (in terms of SIM rental and SMS costs) should be spread and hence lower per meter than for direct GSM.
- n. Data management (in house at energy retailer or third party agent) - £5-6 per customer per annum (single fuel or dual fuel)
- o. Maintenance/fault rectification – could be £5-10 per meter per annum over life of meter.<sup>1</sup>

### Tables : Smart meter and communications costs

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<sup>1</sup> Some estimates suggests costs could be lower at £2-3 per year but others that they may be higher, particularly in the early days of a large scale deployment, due to problems with manufacturing, installation, communications, customer misuse, programming error etc.

The figures in the tables are based on a number of different sources in the UK and international experience, assume a reasonable volume purchase (at least 300,000 plus).

Tables 1, 2 and 3 examine the costs of : smarting gas meters independently; smarting electricity meters independently; smarting gas and electricity meters together.

**Table 1 : Options for smarting gas meters independently (meter and communications)**

Gas smart option	Meter costs	Communi- cations to Supplier	Running costs of communications	Total cost
Retrofit (add data logger to existing gas credit meter)	£25-35	GPRS/GSM £30-40	SIM rental £5-10 p.a. 3-8p per text	£55-75 plus running costs
Independent new smart credit	£40-60	GSM/GPRS £30-40	SIM rental £5-10 p.a. 3-8p per text	£70-100 plus running costs
Independent new smart prepay	£70-100	GSM/GPRS £30-40	SIM rental £5-10 p.a. 3-8p per text	£100-140 plus running costs

**Table 2 : Options for smarting electricity meters independently (meter and communications)**

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New electricity smart meter costs	Communications to Supplier(direct) GSM/GPRS	Total cost with GSM/GPRS (columns 1,2)	Communications with PLC or Radio	Total cost with PLC or Radio (columns 1,4)
£25-35	£30-40 for modem plus : SIM rental £5-10 p.a. 3-8p per text	£55-75 plus running costs	<p>PLC to data concentrator £10 ; +GSM onwards £5;</p> <p>Radio to data concentrator £10-20 ; + GSM onwards £5</p> <p>Running costs for PLC and Radio ?</p>	<p>PLC £40-50;</p> <p>Radio £40-60</p> <p>Both plus running costs</p>

**Table 3 : Options for smarting gas and electricity meters together (meters and communications)**

Gas smart option and cost	New electricity smart meter costs	Gas to electricity meter communications	Communications to Supplier(direct) GPRS/GSM	Total cost with GSM/GPRS (columns 1,2,3,4)	Communications with PLC or Radio	Total cost with PLC or Radio (columns 1,2,3,5)
Retrofit data logger £30-35	£25-35	In-home radio £5-10	£30-40 for modem plus : SIM rental £5-10 p.a. 3-8p per text	£90-120 plus running costs	PLC to data concentrator £10 ; +GSM onwards £5;  Radio to data concentrator £10-20 ; + GSM onwards £5  Running costs for PLC and Radio ?	PLC £80-95;  Radio £85-105  Both plus running costs
New £40-60	£25-35	In-home radio £5-10	£30-40 for modem plus : SIM rental £5-10 p.a. 3-8p per text	£100-140 plus running costs	PLC to data concentrator £10 +GSM onwards £5;  Radio to data concentrator £10-20 + GSM onwards £5  Running costs for PLC and Radio ?	PLC £85-120  Radio £85-130  Plus running costs for both

**Note to table 3 :** for gas credit/prepayment meter option, the costs of the meter would be £70-100 (£30-40 higher than for credit only)

## Notes to all the tables

- Separate radio-linked customer display if required would add £20-30 to costs (for linked options this cost would be shared between the gas and electricity meter)
- Add installation costs of £25-30 for one meter or £40-55 for two meters.
- Other costs to be added to all options. One-off costs : data systems; stranding costs. Ongoing costs – data management; maintenance/faults rectification.
- Electricity smart meter costs are assumed to include credit/prepay remote switch functionality, which adds only £3-5 to the base costs.
- Running costs for PLC and Radio are currently still being clarified.

## Conclusions on costs

Smarting electricity meters is cheaper than smarting gas meters and less complicated because electricity meters can be directly connected to a mains power supply, whereas gas meters cannot. For electricity it makes sense in cost terms to fit a whole new smart meter to replace the old meter. For gas, a smart credit meter can be achieved either via retrofit or by installing a new smart meter, although the retrofit option does not appear to be feasible for prepayment gas meters. A new gas smart meter could be linked either directly to the supplier, or via the electricity meter or smart box. The linked approach is being used elsewhere, where gas meters are being smarted. However, there is presently no retail competition in California and limited switching in the Netherlands (the two case studies). The linked approach offers some cost savings, but would necessitate solutions to the complexities that would arise in the GB market.

Electricity prepayment adds little to the base costs and will result in savings in replacing meters when customers change payment method. For gas, the incremental cost of adding prepayment functionality is more significant (though costs should come down if volumes increase significantly) and so a decision as to whether to include this in every meter would need to take account of the relative costs and benefits. For example, it could currently make sense to install gas meters with prepayment functionality in some areas (e.g. social housing estates or multiple occupation dwellings where a high proportion of households would be likely to use prepayment).

We have estimated cost ranges for smart meters for the domestic sector, but would stress that we have not been able to clarify all costs. Estimated capital costs (smart meter and communications) at 300,000 volumes (prices would be lower at significantly higher volumes) are :

- gas credit meters - £55-100, depending upon whether retrofit or new;
- gas prepayment meters - £100-140

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- electricity meters (credit and prepayment functionality) - £40-75, depending upon communications options;
- gas and electricity meters together (credit and prepay functionality for electricity, credit for gas) - £80-140, depending upon communications options and whether new or retrofit gas meter;
- gas and electricity meters together (credit and prepay functionality for electricity and gas) - £110-180, depending upon communications options.

To these costs need to be added installation- £25-30 for one meter or £40-55 for two meters. A separate radio-linked visual display would add £20-30. There are also stranding costs, data infrastructure costs and recurring costs, to take into account.

It is clear that since our 2006 report costs have been coming down and this trend is likely to continue. Further work on costs, particularly related to potential delivery options (e.g. targeted or geographic) is clearly an important task that remains to be undertaken in coming to final decisions about costs and benefits.

### **Benefits of smart metering (gas and electricity)**

In our 2006 report we examined what benefits might accrue from the introduction of smart meters for : suppliers; customers; other energy market participants (e.g. network operators); public policy (security of supply and carbon emissions). In this report we have done some further work on the benefits to suppliers, but looked in more detail at the scope for public benefits (carbon emissions reduction; security of supply) and the social issues – i.e. likely impact on low income households and prepayment meter users. The public policy benefits are dealt with in separate chapters. The supplier benefits are dealt with here.

#### **Supplier benefits of smart meters**

Since the 2006 report it would seem that suppliers are envisaging rather more benefits from smart meters than previously. Whereas in 2006 the only significant supplier benefits were assumed to be savings on meter reading and call centre costs, there is now a recognition that there may be other benefits that are as if not more significant. This recognition is borne out by the fact that many suppliers are now developing smart metering initiatives for some customers. However, it is still the case that many suppliers see the benefits as applying only to targeted customer segments rather than across the customer base.

Capgemini has recently surveyed the experiences of 31 North American and European Utilities that have deployed Smart Metering pilot projects.<sup>2</sup> They point out that the average business case for smart metering starts with metering and billing but that a business case based on only metering and billing will not get past the internal hurdles put up in most companies against investment in smart metering systems. Creating a system based on just these factors ignores most of the value of smart metering. Smart metering technology can be used to support many facets of the distribution, generation and retail business—both regulated and unregulated. Based on their survey Capgemini has produced the following assessment of the distribution of smart metering benefits between different utility operations. They point out that not all these benefits will apply or be realisable in all cases. The calculations are based on the assumption that Smart Metering is fully integrated and utilized.

### **Distribution of smart metering benefits**

- Asset Management (4-19%)
- Billing & Customer Care (2-7%)
- Collections (15-25%)
- Demand Management (2-22%)
- Field Work Management (3-7%)
- Load Forecasting (9-14%)
- Metering (2-4%)
- Outage & Restoration (3-8%)
- Safety (2-5%)
- Settlement (2-4%)
- Standards & Construction (15-20% Capex)
- System Control (4-11%)
- Tariff & Regulatory (1-4%)
- Vegetation Management (3-7%)

(Capgemini, 2007)

Clearly many of the benefits identified by Capgemini would not be realisable directly by suppliers, but by network operators, although clearly suppliers might be able to share the value through agreements with network operators. However, benefits split between different parts of the energy market will be easier to capture in the vertically integrated energy companies (who made up the vast majority of those surveyed by Capgemini) than in the GB situation where most network ownership and operation is mostly separate from retail and generation. The distribution shown above is also an average across many utilities and will clearly vary considerably between them. Nevertheless, it is a useful indication of the key point that the benefits are from a wider range of activities than just metering and billing.

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<sup>2</sup> Capgemini, 2007. Getting all of the value from your smart metering investment by Doug Houseman,

Based on the work by Capgemini and discussions with suppliers and others the following range of main benefits for suppliers has been identified.

- Reduced Meter reading – at present suppliers have to inspect meters at least once every 2 years and in practice most read meters at least once a year. It is assumed that with full AMR and a relaxation of the biennial visual inspection requirement, actual visits to meters would fall substantially.
- Reduced Call centre activity – fewer billing queries, including potentially an end to prepayment meter card and token problems
- Better cash flow/use of working capital – gap between getting an accurate meter reading, billing and collecting money all shortens
- Bad debt reduction - more use of pay as you go; elimination of estimated bills; better (automated) detection of fraud/theft/meter tampering
- More efficient supplier switching - more accurate data processes and transfers; elimination of misdirected payments from card and key prepayment meters
- Prepayment meters with fewer problems leading to call outs
- Potential to eliminate current problems caused by prepayment meter users sharing cards and keys (possible as cards and keys are not unique to specific meters) that lead to mis-directed payments
- Switching between credit and prepayment remotely. This would provide a wide range of benefits to suppliers who would not have to visit properties to change meters or disconnect credit supply (e.g. in empty properties); and benefit both suppliers and customers through reduction of debt build up. For electricity meters it would be cost effective to fit a credit/prepay switch meter in all cases (the incremental cost is less than £5). For gas, the decision would need a fuller assessment of the benefits relative to the costs as at present as the cost differential is greater (£30-40) - although this could reduce if volumes were substantially increased.

Other possible benefits for suppliers :

- Electricity only - Load management/electricity purchasing – better data potentially enables better management of power purchase agreements.
- New retail packages – Ability to offer customers new packages – e.g. time of day or time of use tariffs; energy services micro-generation and increased dual fuel offers.

### **Conclusions on supplier benefits**

It seems that suppliers now see a greater range and higher value for the benefits of smart meters to them than they did a year ago. We have not attempted to put actual figures on these values due to lack of clear data that would enable us to do so. However, a key message from suppliers is that whilst the benefits are greater than previously thought, this does still not add up to a business case for widespread (as opposed to targeted) smart meter installation.