Arthur D Little

Energy & Utilities INSIGHT
December '08

Advanced Metering Management

Why Smart Meters demand Smart Planning

Regulatory pressure is forcing a growing number of utilities worldwide to consider introducing smart metering – advanced systems capable of monitoring energy use remotely via telecommunications. However the sheer scale of investment required to implement these systems, the complexity of the deployment process and its potential to disrupt commercial operations, and the significant impact on key business processes means utilities need to undertake careful and detailed planning before moving ahead. By being clear about what they want to achieve through smart metering, utilities can maximise their chances of a successful deployment that will deliver benefits in the long term.

Smart metering (SM) is not new. Most European utilities have been using advanced remote metering for very large customers ever since the liberalisation of energy markets started over 15 years ago. In addition, a number of utilities have deployed SM systems for retail customers over the last decade. Smart metering technology has been readily available, but in many markets there has been no real drive for deployment. Economics have been the main barrier; most utilities have been unwilling to make the substantial investment required. However, over the last five years, changes in the economics of smart metering, in market competition and in the regulatory environment have driven numerous utilities to seriously consider deploying large SM systems.

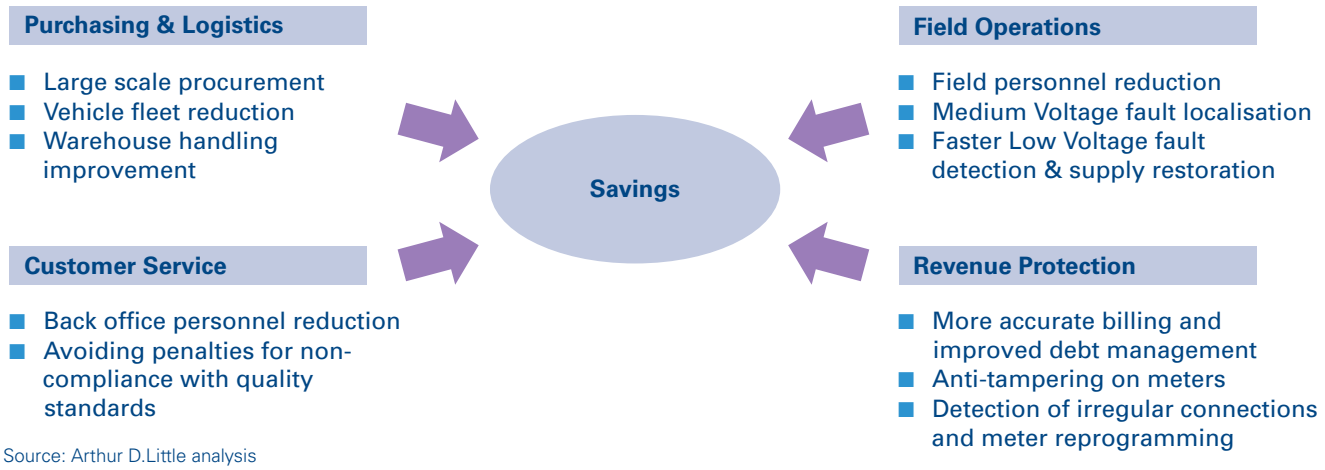
What's driving smart metering?

The economic reasons driving the uptake of smart metering include the high operational costs and the theft levels associated with traditional metering. Italy and Brazil both offer examples of how smart metering can be profitable despite the high level of investment required. In other cases, increased competition has driven some players to deploy smart metering as a differentiating factor, allowing the utility to provide new offers and additional services to consumers (see figure 1 overleaf).

Where the economic rationale is not clear, regulatory measures are now driving smart metering deployment. A drive for energy efficiency, the potential to manage demand and a desire to improve supply quality are all reasons used by regulators to justify smart metering deployment. In many instances, the energy-efficiency benefits of smart metering are indirect and therefore significant effort is required to quantify them. In these cases regulatory pressure ensures deployment, as is currently the case in the Spanish and Nordic markets. Similarly, the recently announced UK government plans to have smart meters installed in all households by 2020 was seen as vital in introducing feed-in tariffs for domestic micro-renewable generation, facilitating wider sustainability objectives.

This all adds up to a rather mixed picture. The market for energy varies from country to country and, as a result, so too do the opportunities utilities have to use smart metering as a differentiator or to offer value-added services. Likewise, the regulatory environment is evolving, with different models creating different sets of challenges and opportunities for utilities and other stakeholders as a result. Nevertheless, it is clear that trend towards smart metering is gaining momentum.

Figure 1. Typically, savings obtained in the first years of Smart Metering deployment are related mainly to a reduction in back office and field personnel and faster Low Voltage & Medium Voltage fault detection



Source: Arthur D.Little analysis

Smart Metering: the key considerations

For organisations considering deploying a smart metering system, the significant amount of money (and effort) involved must be the first consideration. The cost of meters, communications and systems is around €80 per client (see figure 2 overleaf) but could easily exceed €100 per client. This investment will have a lasting impact on the organisation. Once new meters are deployed, they are expected to operate for between 8 and 15 years, possibly up to 30 years, so getting it right first time is a must. Utilities also need to be aware that in addition to investment costs, they will also face ongoing operational costs, which will evolve significantly after deployment.

A close second to the cost of smart metering is the sheer complexity of the deployment process. This involves not only installing a large number of meters and an information management system, but in some cases also putting in place a brand new telecommunications network. Furthermore, the SM system must be integrated with existing commercial (billing, contracting) and technical (field operations management) systems. Good deployment management at both micro and macro levels is a key requirement if overall investment is to be kept under control.

Finally, the impact of a smart metering system on operations means that the utility will have to redefine its key business processes, which will, in turn, have an impact on human resources. Since deployment can span several years, post-deployment processes may have to run in parallel with existing ones for some time, complicating reorganisation and resource allocation. This complexity is augmented by the fact that the changes to processes and systems also have implications for other players, such as suppliers and regulators, who need to access specific data.

Given the potential business impact and complexity of deploying an SM system, it is clear that utilities must take extreme care in defining and planning their approach in order to keep control of investment and ensure commercial operations are not disrupted. Arthur D. Little believes that any utility considering deploying smart metering should start by stating clearly what its strategic objectives are in relation to smart metering. The utility will need to define its desired positioning and the functionalities it requires to meet both immediate and longer-term regulatory, product/service and operational needs, and use this as a basis for assessing the technical options available.

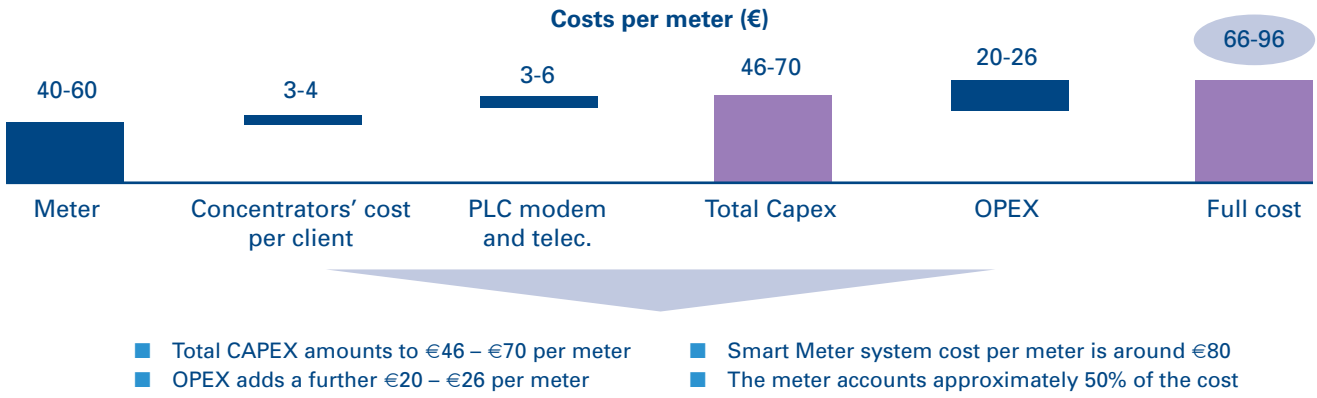
Which system?

Smart metering technical solutions – encompassing technology, telecommunications and IT systems – are as varied as the reasons for their deployment, and the relative immaturity of the solutions and their ongoing development creates uncertainty for utilities attempting to identify which solution is most suited to their long-term needs.

Despite several initiatives to develop standards, most of the solutions deployed are either custom made or heavily customised to cover local regulatory and business requirements. A wide range of requirements has resulted in a wide range of functionalities, although the fundamental technologies are fairly homogeneous.

Choosing a system may appear to be simply a case of selecting functionalities. However, issues such as integration with low-tension network management can greatly complicate the exercise. For example, consider how supply quality and distributed generation management can complicate the cost-benefit analysis of network management capabilities.

Figure 2. The cost of a smart metering system is around €80 per client, including meter, concentrator, modems, telecommunications and OPEX



- Total CAPEX amounts to €46 – €70 per meter
- OPEX adds a further €20 – €26 per meter
- Smart Meter system cost per meter is around €80
- The meter accounts approximately 50% of the cost

Source: Arthur D.Little analysis

Some companies might take a leap of faith and deploy very advanced systems with limited economic justification, while others will opt for more basic ones. In our opinion, both extremes are risky; companies choosing the first option risk never being able to recover the investment while those choosing the second option run the risk of having to make potentially expensive updates as new needs arise. When possible, Arthur D. Little would recommend an intermediate solution in which some key system components can be upgraded to include more advanced functionalities as the need arises. This limits the risk of the system not being able to cope with future requirements,while delaying investment that is not essential in the short term.

Given this and the broad range of requirements that different utilities have, we believe that deploying an off-the-shelf solution is usually not the answer, since a certain degree of customisation will always be needed. In any case, existing initiatives to develop standard solutions aim to cover all possible needs and tend to exceed most utilities' needs as a result. On the other hand, building a complete proprietary solution from scratch is not the answer either. The deployment and operational experience acquired by companies already operating SM systems can be extremely valuable, and their proven systems can probably be adapted, at a price, to cover specific market needs.

Once a specific solution has been selected the next logical step is to plan its deployment. A comprehensive plan will cover many areas, from logistics and economic planning to organisational and process redesign.

Planning deployment

Getting smart metering implementation right is not easy and, given the level of investment involved, mistakes can have a severe impact on utilities' results. There are a number of key issues that utilities must address and carefully plan for in order to deploy and operate a smart metering system successfully.

The first is to establish a working technological solution, from meter to concentrator, linked to commercial and technical systems. This process, which will vary in length depending on the level of customisation involved, the maturity of the solution selected, and the complexity of integrating the solution with existing systems, usually sets the timing for the whole deployment effort. Untried solutions require extensive field trials, but even evolved solutions have to be checked; the electricity network and the available telecommunications solutions vary from market to market and need to be taken into account. In practice, post-trial adjustments are usually the norm. It is far more preferable to identify problems before rather than after half a million meters have been deployed.

Only once technical trials and planning for system integration is complete can the other pieces of the puzzle be put into place. The system integration plan should include a thorough process impact analysis. At an early stage, the process impact analysis may focus only on data collection and transmittal, but at some stage a much more detailed one must take place, including an analysis of the impact of smart metering deployment on organisational and resource allocation. Smart metering deployment can affect key processes such as meter reading, billing, field service operations, fault detection, connection and disconnection.

Additionally it may demand new processes, such as meter and concentrator monitoring and telecom network management. The transformation of processes will drive significant organisational changes, with deployment tasks absorbing most of the utility's resources and traditional roles being made obsolete. The allocation and profile of required human resources will therefore change significantly, with important implications for training, hiring policies and redundancies.

Actual field deployment also requires detailed planning, particularly since the process may span several years and involve a large number of internal and external partners. Planning should cover the development of formal processes for meter and concentrator deployment, contractor management and equipment logistics. Detailed deployment plans need to take into account meter densities, ease of access, value of clients and regulatory constraints, as well as accounting for contractors' current and potential operative capacity. Field operations also have to be carefully planned, considering all potential hurdles, from access to meters to network quality and telecoms availability.

Expert support from ADL

Coupling the deployment of a new technology with the transformation of business processes clearly presents substantial investment and operational risks for any utility; small deviations in the complex planning process for deploying smart metering can have major long-term economic implications. Seeking expert support can help ensure accurate planning and smooth deployment, and help to protect commercial returns.

Arthur D. Little has deep expertise in smart metering technology, spanning all aspects from strategy and technology to deployment. Our experience covers every stage of smart metering projects, from conception to field deployment, encompassing both strategic and operational perspectives. Our smart metering expertise is complemented by expertise in electricity generation, distribution and retail, and we have a long track record of working with key international companies in the energy sector.

Contacts

Jesús Ruiz
Spain
+34 91 702 74 00
ruiz.jesus@adlittle.com

Lars Meckenstock
Germany
+49 211 8609-514
meckenstock.lars@adlittle.com

Annette Berkhahn
Sweden
+46 8 5030 6525
berkhahn.annette@adlittle.com

Murray Hartley
United Kingdom
+44 870 336 6645
hartley.murray@adlittle.com

David Lyon
United Kingdom
+44 870 336 6754
lyon.david@adlittle.com

Arthur D. Little

Arthur D. Little, founded in 1886, is a global leader in management consultancy; linking strategy, innovation and technology with deep industry knowledge. We offer our clients sustainable solutions to their most complex business problems. Arthur D. Little has a collaborative client engagement style, exceptional people and a firm-wide commitment to quality and integrity. The firm has over 30 offices worldwide. With its partner Altran Technologies Arthur D. Little has access to a network of over 16,000 professionals. Arthur D. Little is proud to serve many of the Fortune 100 companies globally, in addition to many other leading firms and public sector organizations. For further information please visit **www.adl.com**