Capgemini
CONSULTING.TECHNOLOGY.OUTSOURCING

Getting all of the value from your smart metering investment

A Point of View by Doug Houseman

During the past 12 months we have seen a period of incredible turbulence for the global energy industry. Power blackouts and outages and continuing concerns surrounding security of supply for gas and electricity in the US as well as across Europe have all combined to provide a period of turmoil for many in the global energy industry. The time to build new power plants and new transmission, means that relief for these problems is years away, at the earliest. Adding to the problem is rise fuel prices for these power plants.

And, set against a background of environmental consciousness and growing demand from consumers, governments and regulators for lower emission power generation and investment in energy efficiency schemes, the past year has led many to look again at how energy supply and generation businesses are run.

There is little doubt that this turmoil and the pressure for change will be maintained and for this, and many other reasons, smart metering is gaining increasing currency as one part of a future solution to manage energy supply networks and introduce greater efficiencies into the way we monitor our use of energy and other natural resources.

While basic smart metering technology has been available for a number of years, it has now evolved to the point where it has the potential to empower consumers and enable them to see and manage consumption patterns and energy bills, achieving the holy grail of demand side management in ways that have not been possible to date.

Smart metering also provides a highly powerful network management tool giving utilities a far clearer picture of where and when demand fluctuations occur and enabling them to identify network problems or outages, and fix them before they start to impact on service levels.

Despite these huge benefits, the reality is that very few organizations have either invested significantly in smart metering or use it to its full potential, a situation that looks set to change.

One of the drivers for the global adoption of smart meters is that they are now cheaper than ever. The price per meter has dropped dramatically in the last three years (from around $260 to $60 for a basic unit), and the result has been a renewed interest in this technology.

In North America, California or Ontario have mandated smart meters; many other regulators are looking at doing the same thing.

With no regulatory mandate, Pennsylvania Power and Light (PPL), Wisconsin Public Service (WPS) and Duke Energy have completed smart meter rollouts and Florida Power and Light has started a major deployment of smart meters. Florida Power and Light has a 20 year track record of innovation and industry leadership in demand management, recently winning both Edison Electric Institute and US Government awards for their demand management programs.

The benefit of greater control of energy consumption and pricing provides a strong case for installing smart meters for consumers, while falling unit prices make this a more viable option. Today the investment required is still substantial but the business case for the unilateral implementation of smart metering systems is compelling. While power plants have major regulatory hurdles to build and normally can take a decade from initial design to commissioning, smart meter programs can start returning benefits for demand management in under a year and can typically be fully operational in less than 5 years.

The average business case for smart metering technology starts with metering and billing. Unfortunately experience suggests that a business case that is based on only metering and billing will not get past the internal hurdles put up in most companies against investment in Smart Metering systems. Additionally, creating a system based on just these needs 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. Capgemini has worked with a number of utilities around the world on the installation of Smart meters and developed a view on the value that has been actually harvested in the real world.

Smart metering technology can have an impact on construction and capital expenses, outage management, forecasting and settlement, network maintenance management and around 10 other key distribution functional areas.

In many cases organisations look at the value starting when the deployment of smart meters is complete. Nothing could be, or should be, further from the truth. The value should start flowing from the system as soon as the first meters are deployed.

One of the early steps that can be taken to drive value from the system and to test the ability to communicate more effectively is to start deploying high quality meters at the end or near the end of the laterals. In many cases it means deploying a commercial and industrial quality meters at a residential location. The values derived from doing this early in the project are manifold:

1) Early confirmation that the communications system is working, whether Power Line Carrier (PLC), Broadband over Power Line (BPL), Radio Frequency (including cellular), or plain old telephone line, it is beneficial to get early confirmation that communications will work as planned.

2) It also makes installing the rest of the meters in the area easier, since the communications system is known to work, meaning that the installers can normally get confirmation of the meter working during the installation process, further lowering the number of return visits to the site of the meter for communications or meter equipment failures.

3) An early ability to determine the extent of an outage. The ability to determine at a gross level the operation of a circuit is possible with even one single meter at the end of a lateral. This means that some mapping of outages during a storm is possible early in the deployment cycle. Add a few meters at critical facilities (e.g. hospitals, etc) and prioritization of restoration becomes even easier.

4) The ability to monitor voltage at the end of the lateral. This can provide an early health warning on the power draw on a circuit and help with planning for the addition of meters in the service area, where two or more phases are available. It is possible to balance the load between the phases better by knowing the voltage drop differences between the phases. While not the best choice, it is better than leaving the choice to the installer in the field, who will normally pick the easier connection, and can result in greater imbalance between phases over time.

5) The ability to monitor power factor. This can lead to a better use of capacitor banks in the circuit, reducing power consumption for power factor correction and determination of the sizing and positioning of new capacitor banks based on continuous data.

6) When the additional meters are deployed the fact that communications starts immediately is important, because more than 50% of the tampering of a meter happens within the first month in which it is deployed. In many cases we see the first tamper attempt on the very day the meter is deployed.

With many rollouts scheduled to take three to five years, planning for initial deployment in this fashion means that some benefits are realised two to four years earlier than in the typical business case.

A second good strategy is to deploy on the most problematic circuits early in the programme. This will provide engineering data that underpins planning for any necessary reinforcement of the circuit or rebuild. In many cases it will help with the determination of the status of devices (e.g. is the capacitor bank operating as designed?). Many utilities have deferred the installation of smart meters on these circuits until the upgrade is complete, removing the ability to get better data for engineering and planning.

Once these initial deployment strategies are handled, the key challenge is how best to use the data gained from the smart meters to run the utility business more effectively.

Capgemini has looked at a number of smart metering deployments around the world and concluded that many categories of benefits can be gained and captured using the data from the smart meters. In Figure 1, you can see the range of business areas where smart metering can have an impact.

To date, no company anywhere in the world has attempted to gain all of these benefits. In fact to do so would be a career for a dedicated executive. The number of interfaces and supporting system modifications are extensive and would require a number of years work to complete and test.

Besides that, no utility has urgent needs in all of these functional areas. Rather each utility has a different set of needs driven by the way they operate today, the way they have built their system and their localised costs. There is no single answer for every utility for which benefits to use.

Take the Florida Power and Light (FPL) company. Its cost of meter reading is so low that it will actually cost more to read the meters in an smart metering environment than a traditional one. However, the outage and restoration, combined with demand management are major drivers in the business case that FPL put forward for adopting smart metering.

At other Utilities, on the other hand, the cost of meter reading (including insurance and lost time issues) was one of the key drivers for it installing smart meters. Each utility needs to determine for itself what the right priority is for the implementation of services from the meters.

A survey that was conducted with 31 utilities from around the world showed a wide range of benefits for the utility involved. There was no attempt to normalize the information or to determine how good or bad the utility was at the task listed.

Rather each of the ranges was determined based on actual spend two years prior to the deployment and then two years after the deployment was complete. This means that the time between the first measurement and the second was from four years to nine years apart, since some utilities had a five year deployment window. Money was however normalised to a single year using cost of living adjustments. Note that a number of these utilities added customers during the time period and that this was not factored into the numbers.

Figure 1: AMI and its data flows touch all major process areas within a utility

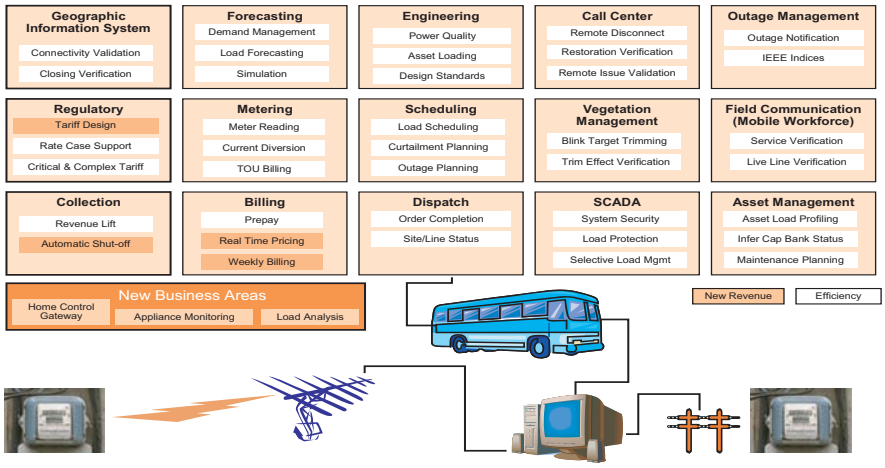
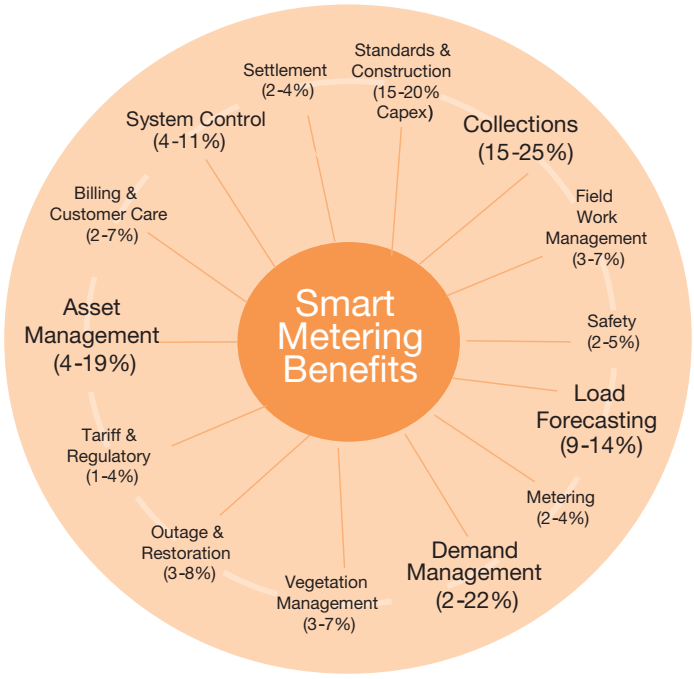


Figure 2 : Smart metering drives benefits



Savings Percentages based on Interviews conducted by Capgemini with North American and European Utilities having deployed by Smart Metering pilot projects. Calculation based on the assumption that Smart Metering is fully integrated and utilized.

Capgemini

Figure 2 shows the areas that were measured and the results.

In many cases there were business cases based on nothing more than improving the cost of reading meters, in most cases after the fact the results are not what were expected. Instead, other values make the business case work.

It is important for utilities to understand what particular values they can derive for their business. If they are short of power generation, then demand management and load forecasting are key business drivers. If their infrastructure is older then the answer may be in field work management and outage/restoration. The business case for smart metering then follows naturally on from there.

One of the best examples of a successful smart demand management strategy is FPL. In the distribution grid alone, over the last 20 years, it has seen savings amounting to more than $1 billion dollars. In addition the company has avoided the construction of several power plants that have saved an additional $3 billion dollars. And to date, the utility has only installed smart demand management with 500,000 of its 4.4 million customers.

Additionally smart metering has enabled FPL to control peak load when it would most need peaking plants that burn hydro-carbon fuels – and as such it has reduced the amount of carbon it produces. With over 2,000 MW of load control, the company can reduce emissions by up to 750 tons of carbon at peak for every hour it uses load control (compared to emissions that would be generated if it had to burn coal instead of reducing the load).

FPL has done such a good job with its smart metering that most customers cannot tell when their load is being reduced. With 19 years of experience in building and running the programme the utility has over a 99% customer retention rate.

The total cost of the programme to the utility is approximately $72 per customer per year and approximately $100 million equipment and installation costs. Finally the utility has the lowest cost to purchase outside power, in the southern US, since it can choose to reduce load when the price of peak power is too high on the market. This has saved additional millions.

These kinds of savings come from using the full capability of the smart metering technology. They also come from gaining experience with the technologies and determining how the customers will react to them best.

In California the regulators are looking at installing smart meters to allow the creation of Critical Peak Pricing tariffs to help California tame its rolling blackouts. This programme will allow the California ISO to pick up to 15 critical days a year (when the power is too short) and let customers decide how much power they want to buy. On a normal day the power may be priced in the 15 cents per kWh during peak times, on a critical day that same power may cost more than $1 per kWh, more than six times the normal peak price. Tests during 2004 show that the programme should achieve the goals of the regulators to reduce the need for new power plants and transmission lines and eliminate the need for rolling black outs.

Other benefits can include:

- Improvement in safety for workers in the field, since they can check the status of power lines from connected meters quickly. They can quickly see where there is and is not power and ensure that all the power is back on when they finish work.
- Engineering analysis where the engineers can get excellent data on what is actually going on in the grid and where power is being consumed and let them focus the engineering spend on areas that really need improvement.
- With the information on momentary outages in the meters, there is an easy way to determine where there are trees rubbing on the lines and causing drop outs.
- The power quality information that is available allows engineers to learn when the capacitor banks are not performing as required. This allows the utility to tune the capacitor banks and reduce power used to manage reactive power.
- Customer billing cycles can be matched to customer pay days, so those who get paid weekly, can be billed weekly.
- And finally the system can be used to track the load on transformers and other field equipment, allowing better maintenance planning and asset management.

The experiences of utility companies and their consumers in North America demonstrate what can be achieved in Europe through utilizing smart metering technology.

However, to do so smart metering technology needs to be used at a strategic level by both utility companies and consumers – if we see this as simply a cheaper way to read meters, it is very difficult to build a business case for the investment.

About Capgemini and the Collaborative Business Experience

Capgemini, one of the world's foremost providers of Consulting, Technology and Outsourcing services, has a unique way of working with its clients, called the Collaborative Business Experience.

Backed by over three decades of industry and service experience, the Collaborative Business Experience is designed to help our clients achieve better, faster, more sustainable results through seamless access to our network of world-leading technology partners and collaboration-focused methods and tools. Through commitment to mutual success and the achievement of tangible value, we help businesses implement growth strategies, leverage technology, and thrive through the power of collaboration.

Capgemini employs approximately 68,000 people worldwide and reported 2006 global revenues of 7.7 billion euros.

With 1 billion euros revenue in 2006 and 8,000+ dedicated consultants engaged in Energy, Utilities and Chemicals projects across Europe, North America and Asia Pacific, Capgemini's Energy, Utilities & Chemicals Global Sector serves the business consulting and information technology needs of many of the world's largest players of this industry.

More information about our services, offices and research is available at **www.capgemini.com/energy**

For more information please contact:
Doug Houseman
+1 (734) 604 0008
doug.houseman@capgemini.com

EUC20070301_031

Capgemini
CONSULTING.TECHNOLOGY.OUTSOURCING

www.capgemini.com/energy