



The Case for Utility-Owned Smart Grid Networks

A Technology Partners White Paper

The demand for energy is forecast to grow by over 70% across the Middle East by 2020. All utilities in the Region are looking at ways to improve efficiency to support and ease the inevitable production increase required - even the Region's oil producers would rather sell oil and gas rather than burn it. Smart Grid technology delivers proven efficiency enhancements by matching hourly demand cycles with appropriate real time response across the entire electricity supply chain. The key question is how to deliver this real time measurement and control.

Building a Smarter Grid

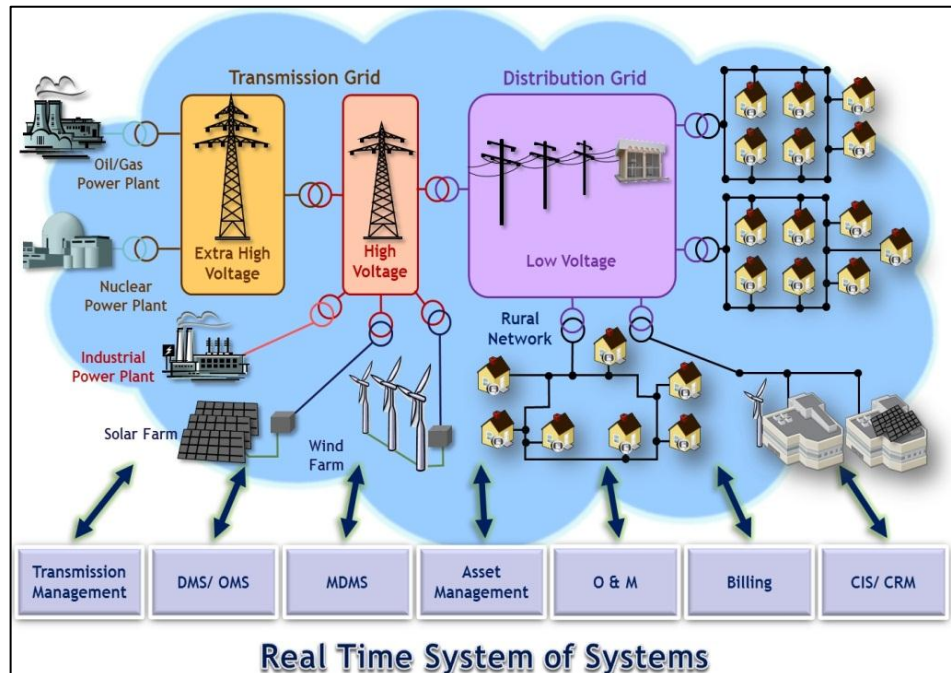
The grid encompasses all elements of the electricity supply chain, but it still cannot effectively store energy. Simply put, when you need it, you have to make it, and when you make it, you use it or lose it.

Effective grid management, therefore, starts with predicting demand, a task that is being made significantly harder with the introduction of "green" technology such as prosumer-owned solar panels and wind generators. In most parts of the world it is impossible to reliably predict how much the sun is going to shine or the wind going to blow.

Developments such as electric vehicles add further complications with their ability to dramatically change consumption patterns.

Management of this complex supply chain requires the integration of multiple grid systems, from generation to distribution and customer relationships.

The starting point to manage this "system of systems" in real or near-real time is the ability to measure and understand what is happening inside the grid in real or near-real time. This can only be achieved by connecting all the grid's "end-points", from process control at the generation stage through transmission and distribution SCADA devices, right up to the end-user's electricity meter.

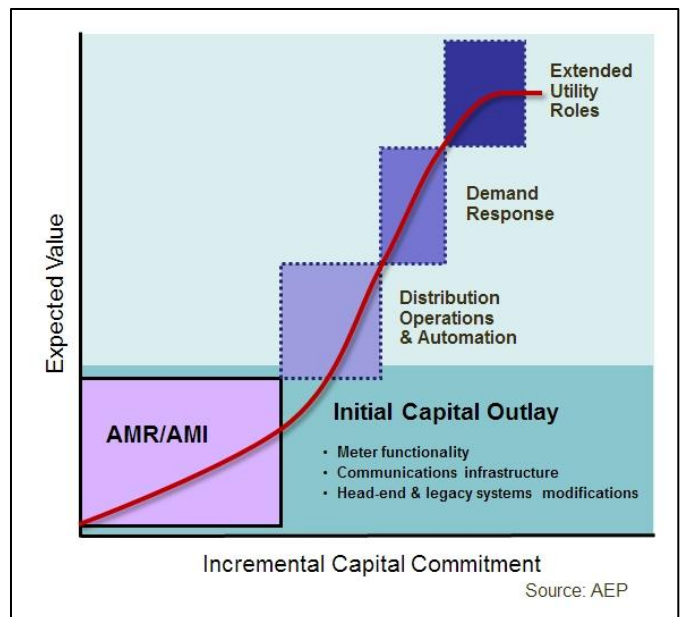


Smart Grid and Meter Reading

Automated Meter Reading (AMR), the replacement of conventional, read-once-a-month mechanical meters with smart meters that can be remotely read every ten minutes or so, is often the starting point for Smart Grid implementations.

AMR, and its two-way enhancement Advanced Metering Infrastructure (AMI), is often the most costly component of a Smart Grid because of the hundreds of thousands of meter end-points. In some parts of the world, there has been a tendency to consider an AMR/AMI system and its communications requirements as an independent solution rather than as part of the entire Smart Grid infrastructure.

This view has been particularly prevalent in Europe, where the European Union has forced utility companies to “unbundle” their operations. All EU countries have separate generation, transmission, distribution and retail sales utility companies. Although aimed at increasing competition and providing more consumer choice, a major side effect of this policy is that no European utility now has visibility into the entire supply chain. This makes the realisation of key Smart Grid benefits such as peak shaving using demand response very difficult, if not impossible. The end result has been the preponderance of European AMR/AMI-only systems designed around low bandwidth, high latency telecommunications solutions such as GPRS or 3G. These were never designed to deliver stringent communications service, availability and resiliency levels for real time applications, and are unsuitable for the management of mission critical infrastructure such as sub-station SCADA control.



Middle East utilities, like their counterparts in the USA, have not been hampered by such legislation, and are free to take advantage of the cross supply chain benefits that true Smart Grid communications can deliver. Studies indicate strongly that initial AMR/AMI investments based on a utility-owned network are not only readily justified, but can be leveraged to support many distribution and operational efficiency enhancements. *The key is to design and build the right communications infrastructure in the first place.*

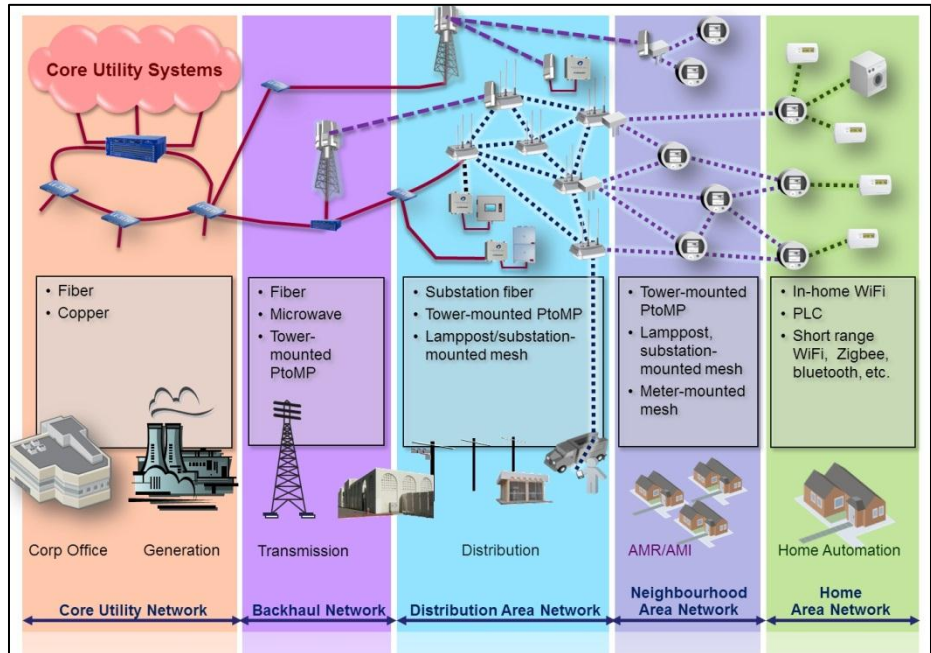
Smart Grid Communications

A service area-wide, Smart Grid network is a complex “network of networks” infrastructure that invariably requires multiple communications layers and technologies such as fibre and metro-scale wireless infrastructure. It has to have “utility grade” resiliency, security and reliability, and must deliver complete connectivity to all grid components, including customer meters located throughout the service area. It also needs to be a true “multi-use” infrastructure, allowing traffic over the network to be segmented by application-defined priority, bandwidth and security policies. Fortunately, such technology is now available, proven and cost effective, with many deployment examples around the world, including in the Middle East.

In fact, such technology is not new at all. Telecommunications companies and service providers have been delivering service-area wide networks for years. They provide segmented, or “virtualized” networks to provide voice, data and television services over a common infrastructure at multiple levels of priority and security.

So should they not be ideal for Smart Grid communications, too?

The answer to this question lies in core business model differences between telcos and utilities.



Telecommunications companies make their money by selling voice and data services to as many subscribers as possible. They also bank on the fact that not every subscriber will be making a call or accessing data at the same time. They provide services based on an “oversubscription rate” of, typically, around 40 or more to 1. This means that the network data capacity is one fortieth of that which would be required if all subscribers called or downloaded data at the same time. Of course, 95% of the time this does not affect call availability or quality. It is only in unusual circumstances, such as when a very large number of people gather in one place for a holiday or religious festival, or in a large scale emergency, that service availability suffers. Unfortunately, this is often at exactly the same time that monitoring and control of critical national infrastructure such as the electrical grid is essential.

Managing the grid requires uncompromising service coverage, quality and resiliency. Applications such as SCADA substation control have to be delivered to a specific Service Level Agreement (SLA), which typically includes 100% connectivity of every substation, guaranteed service availability 99.999% of the time, sub-cycle network latency (<17ms), and the highest level of data security. Telecommunications companies are not geared to offer this level of SLA. In fact, there is not a telco in the world that will guarantee a Service Level Agreement for a specific application such as this.

The Utility-Owned Alternative

Utilities can, however, leverage the experience gained in building these complex, very large scale networks. ICT integrators like Technology Partners routinely build service area-wide broadband infrastructure for telcos, Internet Service Providers, government entities and others using basically the same technologies. The difference is that we can also build infrastructure for specific Smart Grid applications and to specific Smart Grid operational and security requirements. Such infrastructure is inherently multi-use, allowing multiple virtual networks (VLANs) to operate separately, each with pre-defined Quality of Service (QoS) and bandwidth parameters, and application-specific security up to the highest military-grade security levels, when required.

The prevalence of industry communications standards, and the availability of robust, Commercial Off The Shelf (COTS) components now makes this infrastructure surprisingly affordable, especially when key utility assets such as substation buildings and existing fibre can be utilised. The business case for a utility to build its own infrastructure instead of leasing service from a telco is often unassailable, with the network capital expenditure frequently comprising only a fraction of the cost of upgrading to smart utility meters. The utility also ends up with a high value, multi-use communications asset that may also be used to generate revenue from other municipal and commercial users – even by leasing capacity to the telcos themselves.

The Foundation for Demand Response Management

Every major utility is facing the challenge of keeping up with demand, especially in the Middle East where additional challenges include the highest per capita consumption in the world, often coupled with heavily subsidised utility bills. Many utilities find they have around 5% of their generation capacity sitting idle for up to 360 days a year, just to maintain service levels during peak demand.

The ability to “shave” demand at critical annual peak periods and even during daily usage cycles is the aim of all demand management programmes, but it can only be achieved by changing the socio-economic behavior of consumer and commercial users. It is generally accepted that this requires a “stick and carrot” approach – a combination of Time Of Use (TOU) billing that encourages off-peak (and discourages on-peak) usage with an increase in social awareness of the benefits of conservation. In the Middle East Region in particular this will be an evolutionary process, requiring the social and economic will of government to succeed. Before any of this is possible, though, it is essential to understand the parameters of the problem. Near real-time monitoring and management of the grid infrastructure – a Smart Grid – is the foundation of any demand response programme.

Getting it Right First Time

A reliable, secure and high performing data communications infrastructure is the key to Smart Grid implementation. The technology is now economical, available, and proven. Building such infrastructure is an intricate and critical part of modern grid engineering and should be built to the same standards as other grid components. As with all critical infrastructure, there is a strong business case for getting it right first time.

About Technology Partners

Technology Partners FZ, LLC is a full service communications and information technology (ICT) integration and solutions company. Technology Partners focuses on very large scale telecommunications and network infrastructure, applications and services which are designed, deployed and supported by our highly skilled technical and management team. These solutions are created from best-of-breed, industry-standard components, acquired through international partnerships with the world’s leading technology vendors. The company delivers complete solutions from requirements analysis through design, procurement, development, integration, testing, and end-user training which is offered both in Iraq and out of country, if required. *The Corporate Head Office* of Technology Partners is in Dubai, United Arab Emirates in the Dubai Media City Free Zone. TP also operates from branch offices in Baghdad, Erbil and Basra in Iraq.