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UTILITIES

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The Benefits of Smart Grid Business Software

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Introduction

Smart Grids help electric utilities respond to a variety of emerging customer and community needs. Utilities that implement them can:

- Defer major capital infrastructure requirements by influencing customers to shift peak demand consumption.
- Improve utility asset management by providing real-time grid monitoring and control.
- Ensure utility and customer compliance with environmental and security regulations.
- Improve customer service.
- Facilitate new consumer-facing business opportunities.
- Improve the environmental profile of their own operations and help their customers do the same.

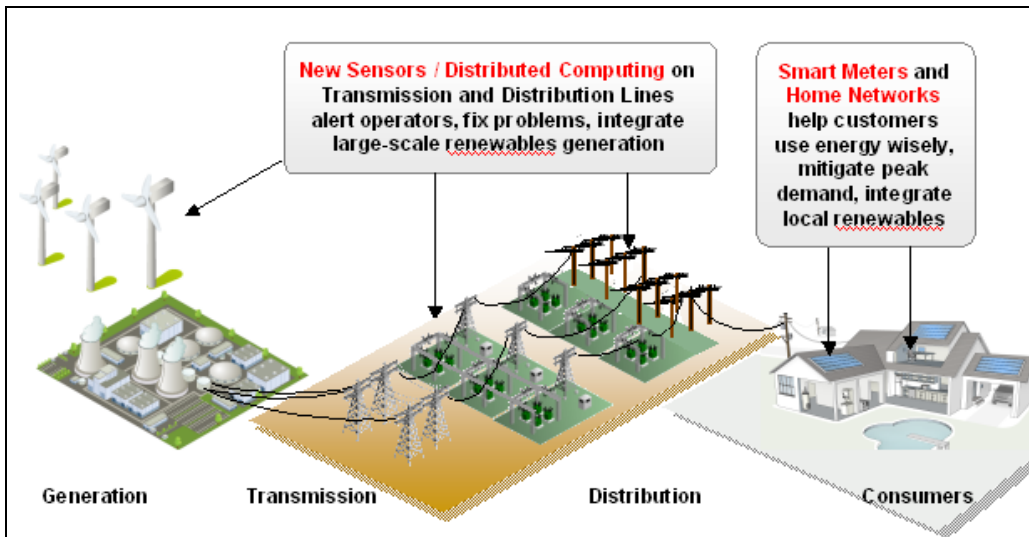
This paper explains the role utility business software plays in maximizing these benefits while minimizing overall costs.

Smart Grid Background

What Are Smart Grids?

Smart Grids use computer hardware and software, sensors, controls, and telecommunications equipment and services to:

- Link customers to information that helps them manage consumption and use electricity wisely.
- Enable customers to respond to utility notices in ways that help minimize the duration of overloads, bottlenecks, and outages.
- Provide utilities with information that helps them improve performance and control costs.



A Smart Grid links customers to electricity via an information-rich network. It also provides utilities with valuable operational information that helps improve efficiency.

What Is Driving Smart Grid Development?

Environmental Impact

Smart Grid development is picking up speed because of the widespread interest in reducing the negative impact that energy use has on the environment. Smart Grids use technology to drive efficiencies in transmission, distribution, and consumption. As a result, utilities can serve customers' power needs with fewer generating plants, fewer transmission and distribution assets,

and lower overall generation. With the possible exception of wind farm sprawl, landscape preservation is one obvious benefit. And because most generation today results in greenhouse gas emissions, Smart Grids reduce air pollution and the potential for global climate change.

Smart Grids also more easily accommodate the technical difficulties of integrating intermittent renewable resources like wind and solar into the grid, providing further greenhouse gas reductions.

Costs

The ability to defer the cost of plant and grid expansion is a major benefit to both utilities and customers. Utilities do not need to use as many internal resources for traditional infrastructure project planning and management. Large T&D infrastructure expansion costs are not passed on to customers.

Smart Grids will not eliminate capital expansion, of course. Transmission corridors to connect renewable generation with customers will require major near-term expenditures. Additionally, in the future, electricity to satisfy the needs of population growth and additional applications will exceed the capacity reductions available through the Smart Grid. At that point, expansion will resume—but with greater overall T&D efficiency based on demand response, load control, and many other Smart Grid technologies and business processes.

Energy efficiency is a second area of Smart Grid cost saving of particular relevance to customers. The timely and detailed information Smart Grids provide encourages customers to limit waste, adopt energy-efficient building codes and standards, and invest in energy efficient appliances. Efficiency may or may not lower customer bills because customer efficiency savings may be offset by higher costs in generation fuels or carbon taxes. It is clear, however, that bills will be lower with efficiency than without it.

Utility Operations

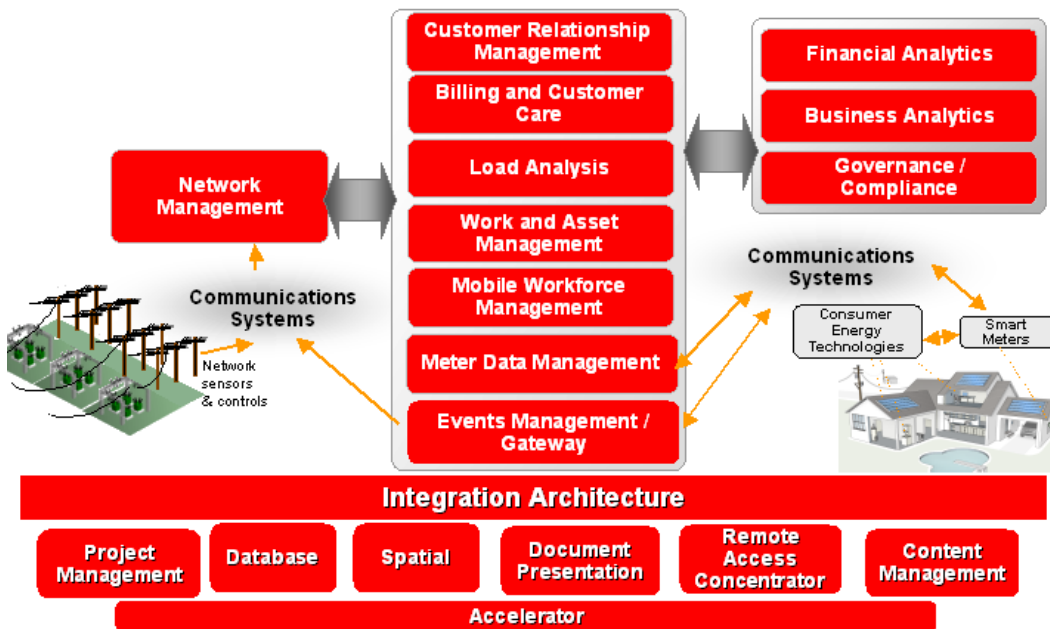
Smart Grids can serve as the central focus of utility initiatives to improve business processes. Many utilities have long “wish lists” of projects and applications they would like to fund in order to improve customer service or ease staff’s burden of repetitious work, but they have difficulty cost-justifying the changes, especially in the short term. Adding Smart Grid benefits to the cost/benefit analysis frequently tips the scales in favor of the change and can also significantly reduce payback periods.

Mobile workforce applications and asset management applications work together to deploy assets and then to maintain, repair, and replace them. Many additional benefits result—for instance, increased productivity and fuel savings from better routing.

Similarly, customer portals that provide customers with near-real-time information can also encourage online payments, thus lowering billing costs. Utilities can and should include these cost and service improvements in the list of Smart Grid benefits.

What Is Smart Grid Business Software?

Smart Grid business software gathers data from a Smart Grid and uses it improve a utility's business processes, as shown in the chart below:



A Smart Grid business software solution encompasses a wide variety of applications that work together to revolutionize business processes.

Smart Grid business software also helps utilities provide relevant information to customers who can then use it to reduce their own consumption and improve their environmental profiles.

Smart Grid Business Software Minimizes the Impact of Peak Demand

Utilities must size their assets to accommodate their highest peak demand. The higher the peak rises above base demand:

- The more assets a utility must build that are used only for brief periods—an inefficient use of capital.
- The higher the utility’s risk profile rises given the uncertainties surrounding the time needed for permitting, building, and recouping costs.
- The higher the costs for utilities to purchase supply, because generators can charge more for contracts and spot supply during high-demand periods.

Smart Grids enable a variety of programs that reduce peak demand, including:

- Time-of-use pricing and critical peak pricing—programs that charge customers more when they consume electricity during peak periods. Pilot projects indicate that these programs are successful in flattening peaks, thus ensuring better use of existing T&D and generation assets.
- Direct load control, which lets utilities reduce or eliminate electricity flow to customer equipment (such as air conditioners). Contracts govern the terms and conditions of these turn-offs.
- Indirect load control, which signals customers to reduce the use of on-premises equipment for contractually agreed-on time periods. Smart Grid business software enables utilities to impose penalties on customers who do not comply with their contracts.

Smart Grids also help utilities manage peaks with existing assets by enabling:

- Real-time asset monitoring and control. In this application, advanced sensors safely enable dynamic capacity load limits, ensuring that all grid assets can be used to their maximum capacity during peak demand periods. Real-time asset monitoring and control applications also detect the location of excessive losses and pinpoint need for mitigation and asset replacements. As a result, utilities reduce outage risk and guard against excess capacity or “over-build”.
- Better peak demand analysis. As a result:
 - Distribution planners can better size equipment (e.g. transformers) to avoid over-building.
 - Operations engineers can identify and resolve bottlenecks and other inefficiencies that may cause or exacerbate peaks. As above, the result is a reduction in the tendency to over-build.
 - Supply managers can more closely match procurement with delivery. As a result, they can fine-tune supply portfolios, reducing the tendency to over-contract for peak supply and reducing the need to resort to spot market purchases during high peaks.

Smart Grids can help lower the cost of remaining peaks by:

- Standardizing interconnections for new distributed resources (such as electricity storage devices).
- Placing the interconnections where needed to support anticipated grid congestion.

Smart Grid Business Software Lowers the Cost of Field Services

By processing Smart Grid data through their business software, utilities can reduce such field costs as:

- Vegetation management. Smart Grids can pinpoint momentary interruptions and tree-caused outages. Spatial mash-up tools leverage GIS models of tree growth for targeted vegetation management. This reduces the cost of unnecessary tree trimming.
- Service vehicle fuel. Many utility service calls are “false alarms.” Checking meter status before dispatching crews prevents many unnecessary “truck rolls.” Similarly, crews use far less fuel when Smart Grid sensors can pinpoint a problem and mobile workforce applications can then route them directly to it.

Smart Grid Business Software Ensures Regulatory Compliance

Smart Grids can ensure compliance with private contracts and with regional, national, or international requirements by:

- Monitoring fulfillment of contract terms. Utilities can use one-hour interval meters to ensure that interruptible (“non-core”) customers actually reduce or eliminate deliveries as required. They can use the information to levy fines against contract violators.
- Monitoring regulations imposed on customers, such as maximum use during specific time periods.
- Using accurate time-stamped event history derived from intelligent devices distributed throughout the smart grid to monitor and report reliability statistics and risk compliance.
- Automating business processes and activities that ensure compliance with security and reliability measures (e.g. NERC-CIP 2-9).

Grid Business Software Strengthens Utilities' Connection to Customers While Reducing Customer Service Costs

During outages, Smart Grid business software can:

- Identify outages more quickly. Software uses sensors to pinpoint outages and nested outage locations. They also permit utilities to ensure outage resolution at every meter location.
- Size outages more accurately, permitting utilities to dispatch crews that have the skills needed, in appropriate numbers.
- Provide updates on outage location and expected duration. This information helps call centers inform customers about the timing of service restoration. Smart Grids also facilitates display of outage maps for customer and public-service use.

Smart Grids can significantly reduce the cost to:

- Connect and disconnect customers. Meters capable of remote disconnect can virtually eliminate the costs of field crews and vehicles previously required to change service from the old to the new residents of a metered property or disconnect customers for nonpayment.
- Resolve reports of voltage fluctuation. Smart Grids gather and report voltage and power quality data from meters and grid sensors, enabling utilities to pinpoint reported problems or resolve them before customers complain.
- Detect and resolve non-technical losses (e.g. theft). Smart Grids can identify illegal attempts to reconnect meters or to use electricity in supposedly vacant premises. They can also detect theft by comparing flows through delivery assets with billed consumption.

Smart Grids also facilitate outreach to customers. By monitoring and analyzing consumption over time, utilities can:

- Identify customers with unusually high usage and contact them before they receive a bill. They can also suggest conservation techniques that might help to limit consumption. This can head off “high bill” complaints to the contact center. Note that such “high usage” or “additional charges apply because you are out of range” notices—frequently via text messaging—are already common among mobile phone providers.
- Help customers identify appropriate bill payment alternatives (budget billing, prepayment, etc.).
- Help customers find and reduce causes of over-consumption. There’s no waiting for bills in the mail before they even understand there is a problem. Utilities benefit not just through improved customer relations but also through limiting the size of bills from customers who might struggle to pay them.

Where permitted, Smart Grids can open the doors to such new utility service offerings as:

- Monitoring properties. Landlords reduce costs of vacant properties when utilities notify them of unexpected energy or water consumption. Utilities can perform similar services for owners of vacation properties or the adult children of aging parents.
- Monitoring equipment. Power-use patterns can reveal a need for equipment maintenance. Smart Grids permit utilities to alert owners or managers to a need for maintenance or replacement.
- Facilitating home and small-business networks. Smart Grids can provide a gateway to equipment networks that automate control or let owners access equipment remotely. They also facilitate net metering, offering some utilities a path toward involvement in small-scale solar or wind generation.
- Prepayment plans that do not need special meters.¹

Smart Grid Business Software Helps Customers Control Energy Costs

There is no end to the ways Smart Grids help both small and large customers control energy costs. For instance:

- Multi-premises customers appreciate having all meters read on the same day so that they can more easily compare consumption at various sites.
- Customers in competitive regions can match their consumption profile (detailed via Smart Grid data) with specific offerings from competitive suppliers.
- Customers seeing inexplicable consumption patterns and power quality problems may investigate further. The result can be discovery of electrical problems that can be resolved through rewiring or maintenance—before more serious fires or accidents happen.

Smart Grid Business Software Facilitates Use of Renewables

Generation from wind and solar resources is a popular alternative to fossil fuel generation, which emits greenhouse gases. Wind and solar generation may also increase energy security in regions that currently import fossil fuel for use in generation.

¹ See the Oracle Utilities white paper *Serve Prepaid Customers Without Prepayment Meters*.

Utilities face many technical issues as they attempt to integrate intermittent resource generation into traditional grids, which traditionally handle only fully dispatchable generation. Smart Grid business software helps solve many of these issues by:

- Detecting sudden drops in production from renewables-generated electricity (wind and solar) and automatically triggering electricity storage and smart appliance response to compensate as needed.
- Supporting industry-standard distributed generation interconnection processes to reduce interconnection costs and avoid adding renewable supplies to locations already subject to grid congestion.
- Facilitating modeling and monitoring of locally generated supply from renewables and thus helping to maximize their use.
- Increasing the efficiency of “net metering” (through which utilities can use electricity generated by customers) by:
 - Providing data for analysis.
 - Integrating the production and consumption aspects of customer accounts.

During non-peak periods, such techniques enable utilities to increase the percent of renewable generation in their supply mix. During peak periods, Smart Grid business software controls circuit reconfiguration to maximize available capacity.

Conclusion

Utility missions are changing. Yesterday, they focused on delivery of reasonably priced energy and water. Tomorrow, their missions will expand to encompass sustainable use and environmental improvement.

Smart Grids are key to helping utilities achieve this expanded mission. But they come at a relatively high price. Utilities will need to invest heavily in new hardware, software, business process development, and staff training. Customer investments in home area networks and smart appliances will be large. Learning to change the energy and water consumption habits of a lifetime could ultimately prove even more formidable tasks.

Smart Grid business software can ease the cost and difficulties inherent in a needed transition to a more flexible, reliable, responsive electricity grid. Justifying its implementation, however, requires a full understanding of the benefits it brings—benefits that can ultimately help customers, utilities, communities, and the world address global issues like energy security and climate change while minimizing costs and maximizing customer convenience.



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