Telecommunications and Energy Efficiency—A Profitable Combination

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With deregulation, we have witnessed a virtual halt in utility-sponsored DSM initiatives in many parts of the country. Utilities have correctly concluded that future rate increases to fund incentive-base, load-reducing programs is not sustainable in a competitive environment. New ways of achieving energy efficiency objectives and improved customer service are needed to fill the gap left from the reduction in traditional utility DSM programs. Puget Sound Power & Light Company has charted a new, innovative course to respond to the competitive, customer and societal needs of its service territory.

Puget Power's solution utilizes telecommunications technologies to provide new customer services, increase systemwide efficiencies and lower total operating costs. Puget views the information provided by these new technologies, both in terms of what information is available and the timeliness and frequency of that information, as critical to its future success.

To make this strategy a reality, Puget Power has been working with Iron, Inc., Metricom, Inc. and Washington Natural Gas Company to create a joint venture called ConnexT™. ConnexT™ will provide a broad portfolio of telecommunications-enhanced services too electric, gas and water utilities and their retail customers. These services fall into three categories: new electric, gas and water products; operational efficiency and non-utility revenues.

ConnexT™, through the implementation of fixed networks, will make it possible for utilities to offer *real-time* pricing, load control, distribution system automation and optimization, tamper detection and other services that will achieve significant energy efficiency savings benefiting both utilities and their customers. ConnexT™ provides a case study of how utilities can join together competitive realities and energy efficiency objectives.

INTRODUCTION

For the decade after the first least-cost plans in America were developed, energy efficiency within utilities struggled to gain the reputation and funding to realize its potential. Finally, by the late eighties, many had committed significant resources to the acquisition of energy efficiency and we were well on our way to transforming the electric system. But just like the old joke in Seattle, ''Like the weather, just wait fifteen minutes,'' this level of support by the early nineties was buried under the avalanche of impending global competition in the energy markets. While perhaps much of this was a premature panic attack, conservation budgets were slashed by up to 95% over two years. The move to once again promote sales reared up as Robert Smock points out in Electric Light & Power: ''Survivors of ruthless competition will not be doing much to reduce electricity sales. They'll be doing their best to sell more of their product.''

The consequences of this sea of change could be disastrous, robbing us of the real opportunity to make the electrical system one that is sustainable and affordable. Having entered the utility industry at the height of the nuclear binge in the seventies when energy efficiency was first seen as socialist at best and communist at worst, I believed the lessons we learned that decade could be used now. What environmentalists successfully did then was to infuse the debate with new intellectual capital—challenging conventional wisdom to understand that a soft energy path was cheaper, provided more jobs and stepped on the earth more lightly.

What was the new intellectual capital that we could inject into the marketplace given the tremendous and increasingly real challenges traditional energy providers were facing to retain customers? Could we broaden the conservation programs to capture more efficiencies at all levels of the power system? One of the major limiting factors had always been the lack of timely and specific information about usage not only at the end use level but also at the distribution level. With SCADA systems, most utilities had a pretty good handle on the current operation of their system. But because of the large communication costs, specific and real time information was usually not available to the power dispatcher which he or she could use to manage the overall

operations more efficiently or to the end use consumer, with the exception of large users. But maybe with the explosion in the telecommunications industry this was a place to look for that new intellectual capital, that new idea that will assist in creating a sustainable energy future.

GETTING OFF THE GROUND

In 1993, I approached McCaw Communications with the idea of starting a joint venture with an electric utility to develop a wireless information highway to the home and business. We would place on it, products and services for the utility to run its business more efficiently and for retail customers to have more pricing options and ways to use energy more efficiently and improve their lives. At first, they wondered why a fast moving entrepreneurial company like McCaw, who are singularly focused on the wireless business, would want to start a business with an electric utility. It did not appear the match was made in heaven much less on more solid ground. But after further discussion, they became intrigued and wanted to set up meetings with some innovative utilities to explore the idea. Puget Power was one and they were immediately struck by the creativity of the person who headed the conservation and customer service departments. We developed a memorandum of understanding and were set to proceed. But at the same time the AT&T investment in McCaw had grown to be a full acquisition and it did not appear to be the right time to proceed.

But by that time, Puget Power saw the power of the idea and we spent the next six months examining dozens of equipment vendors, telecommunication companies and technology companies with which to partner. They included Microsoft, Metricom, Itron, CellNet, the regional Bell operating companies, meter manufacturers, First Pacific Networks, OneComm (now part of Nextel) with Motorola, and others. In early 1995 Puget Power, Metricom and Itron signed a business agreement and announced an intent to form a company to put in place communication networks and provide services to utilities and their customers.

During 1995, meter communications equipment was installed in approximately 15,000 homes and businesses. Also, detailed market and customer research was conducted to more fully develop the types and prices of services that utilities and their customers wanted.

The aim of the new company ConnexT™, was to be technology independent using the best and most cost effective technology available. With technology partners, one of which had an expressed interest in competing with ConnexT™, it became obvious that having the technology companies as strategic alliances rather than partners would be more beneficial. Therefore, Puget Power became the major investor, but expects in 1996 to diversify the ownership by bringing in other strategic partners. They are expected to own up to 40% and active negotiations are taking place.

CONNEXT™

Building on a communications network, the utility had a host of options available to increase their services. They fall into three main categories:

New electric, gas, and water products. Today most utilities provide few, if any, pricing options to their customers. The hallmark of a competitive marketplace is the ability to offer new, innovative pricing and product differentiation to customers. MCI did this in telecommunications with its "Friends and Family'' offering. MFS did it by providing bulk long distance telephone service to large customers. Both of these offerings provided customers with a new pricing option and a product tailored to their specific needs. ConnexT™ will give utility providers tools to repackage and add value to their base commodity products. Examples include: time-of-use pricing, on-line billing information, outage notification, usage accounting, and consumption warning.

Operational efficiency. In addition to differentiating their product and repackaging it, utility service providers need to reduce costs. These ConnexT™ services help utilities reduce the costs of their back office and field operations. In addition, they help optimize distribution system utilization thereby deferring significant capital investments. One set of services is based on automating the meter reading function and includes: automated reads, on-request reads, outage reporting, tamper detection, logical disconnect, and load surveys. A second set combines field data, sophisticated software tools, and wireless communications to provide: outage management, load monitoring, advanced distribution planning, distribution optimization, and work force management. A third set of services provides utilities with sophisticated and flexible customer information capabilities on an outsourcing basis, including customer information systems, bill calculation, statement printing and mailing, and cash processing.

Non-utility revenues. The communications networks put in place to enable the other services provide the foundation for delivering services unrelated to the utility's base product. ConnexT™ can partner with a utility to sell services to residences and businesses, such as security and hazard monitoring and inventory monitoring. In addition, ConnexT™ will be a value-added reseller of leased communications networks.

NEW ELECTRIC, GAS, AND WATER PRODUCTS

These services give utility providers tools to repackage and add value to their base commodity products. Variable pricing strategies are often the key to product differentiation (again, note the telephone industry's MCI ''Friends & Family'' product), and these require detailed usage information. Time-of-Use Pricing responds to this need. The other services utilize previously unavailable data to create new value-added products that enhance the base offering (analogous to call waiting and call forwarding). These can then be sold to consumers on a subscription basis. Initial services include:

- Time-of-Use Pricing (TOU). Time-of-use (TOU) pricing allows the utility to charge customers differential rates based on the time of day the service is used. The metering system collects consumption data by prescribed time periods. Bills are then generated that reflect consumption at each rate level.

- On-Line Billing Information. Subscribers can call the utility and be told the previous day's meter reading and the amount of their monthly bill to-date. This service is targeted primarily at small- and medium-sized commercial companies.

- Consumption Warning. Subscribers are notified by mail, phone, or other pre-specified method if their utility consumption exceeds a specified level, based on meter information collected on a daily basis. This is particularly helpful to commercial customers trying to manage their demand charges and people worried about leaks.

- Outage Notification. Subscribers are personally notified by telephone or pager when a utility outage occurs at a place of business or residence. This is particularly attractive for people with second homes, elderly parents and commercial customers who may not be on the premises 24 hours a day. A future capability would notify the customer of the predicted time to restoration.

- Utility Usage Profiling and Accounting. Collection of meter reads at frequent intervals allows the development of detailed load profiles that can help customers understand and control their usage. Customers can be provided with the data for their own analysis or the analysis can be done for them. Large commercial customers can even be provided with real-time access to their own meters.

Other services under consideration include submetering for commercial customers, energy management systems for residential and commercial customers, and an electronic bulletin board for communicating utility information to customers.

OPERATIONAL EFFICIENCY

Beyond developing new products, utilities will need to squeeze more out of their systems in order to remain competitive. This will include increasing their system utilization—since most need more performance out of their supply systems as well as their transmission and distribution systems. ConnexT™'s products and services can result in millions of dollars of annual savings through higher system utilization without unreasonably jeopardizing system reliability.

In addition, successful utilities will be those that continue to reduce the costs of the back office and other internal operations. ConnexT™ has services to reduce these costs.

ConnexT™ will provide an array of services to utility providers to optimize their systems and operate more efficiently. Meter-Based Services provide lower cost and more flexibility to the utility. It offers the utility provider the opportunity to measure customer's usage much more often than they currently do and, therefore, provide new pricing options. Advanced Utility Services help utilities optimize their distribution system and field operations. CIS-Related Services allow utilities to take advantage of a new generation of computing capabilities to provide dramatically improved pricing, marketing, and customer relationships without the massive capital investment usually required.

Meter-Based Services

Traditionally, meter reading has involved a personal visit to each meter. Instead, these services center around advanced meter reading through advanced communications networks.

- Automated Meter Reading. This core application allows meters to be read remotely at whatever time, frequency, and grouping the utility chooses.

- On-Request Meter Reads. A major cost for utilities are the ''special reads'' required when a customer questions the accuracy of their bill, or discontinues service and asks for a closing bill. Since a service person has to make a special trip, these reads cost many times more than regular reads. Automated meter reading handles this task remotely.

- Outage Reporting. All meters in the system are monitored continuously to assure they are on line. The network identifies meters that have lost power and sends alarms to the utility operators. Once repair efforts are

underway, the network will notify operators when power to individual meters is restored.

- Tamper Detection. All utilities experience diversion (i.e., energy theft) to some extent. Tamper detection can help utilities reduce this loss. The system detects meter removal, tilt, reversal, and magnetic interference and sends alarms back to the utility operator. These meters can then be monitored closely, and appropriate action taken.

- Logical Disconnect. Logical disconnect allows the utility to monitor usage of its meters that are not supposed to be in service. An alarm is delivered to the utility operator when consumption exceeds a minimal level. The utility can then respond by sending a letter or a service person to the address to sign up the new occupant or physically disconnect the service.

- Load Survey. Collection of meter data at frequent intervals allows the utility to develop detailed load profiles of a building's consumption. By collecting this data from groups of properly selected buildings, the utility can gain an understanding of how its services are used by various customers and the nature of the demand on its delivery system.

The installation of communication networks also enables other services such as direct load control, physical disconnect, and real-time pricing. As the technology matures countless new services will be available.

Advanced Utility Services

Utilities need tools for optimizing the design and loading of their distribution systems. Raising the utilization rate of a mid-sized utility, such as Puget Power, by only 5% can save millions per year. However, the distribution automation (DA) solutions available thus far have been prohibitively expensive. ConnexT™ has been exploring new approaches that would deliver many of the benefits at a lower cost.

Utilities are also looking at ways to use mobile data communications and automation to streamline field operations. Of particular interest to ConnexT™ are those services enabled or enhanced by data provided through the ConnexT™ communications networks, such as:

- Outage Management

- Load Monitoring

- Advanced Distribution Planning

- Distribution Optimization

- Work Force Management

TELLUS™. Puget Power, through an unregulated subsidiary called TELLUS™, has developed a software package that performs much of the distribution system analysis necessary to perform these services. TELLUS™ software provides geographic database management and facilities tracking for the utility's transmission and distribution systems. By using load data provided by a fixed network, TELLUS™ can perform system modeling to a very high degree of accuracy. Once tied into the ConnexT™ metering network, TELLUS™ can also perform real-time outage management functions. Finally, using TELLUS™ as a tool, ConnexT™ can provide expert distribution system planning and optimization services.

Other Approaches. The ConnexT™ network can offer operational solutions independent of TELLUS™. Once advanced meter reading devices are in place, the utility can monitor load flows at the meter level and, by extrapolating from this data, can calculate the load flows on the rest of the system. This, in effect, provides the utility with much of the monitoring features of a full-scale DA system without having to install expensive high-voltage metering devices.

This approach represents a major technology innovation. Utilities, who have been clamoring for DA but are stifled by its traditional high cost, can now use ConnexT™'s services to gain these advantages. It will allow them to gain much more efficiency in their systems' operations.

ConnexT™ can also integrate various field support functions into a comprehensive service package. Areas could include work force planning, dispatch, work order tracking, and field access to customer and system data.

Customer Information System Services

Utilities want to change the way they package and sell their products. However, these changes require sophisticated and flexible billing systems, a feature that many customer information systems lack. In addition, many of these systems are antiquated by today's computing standards and are due for replacement. All across the country, utilities are ''hitting the wall'' with their CIS systems.

At the same time, new CIS systems are very expensive, easily costing $10 million to $30 million for the software development effort alone and substantially more for full implementation. (For example, PacifiCorp is asking regulators to a approve a $67 million expense for a new CIS system and Florida Power & Light Company has spent $100 million for its new system.) Building a system from scratch repre-

sents a huge technical and financial risk. Buying someone else's product involves serious compromises and can end up costing even more than a home-grown system after customization is completed. Industry horror stories abound, leaving utilities uncertain about how to proceed.

ConnexT™ will offer a number of CIS-related services to utilities on an outsourcing basis, thereby relieving them of the need to make massive capital investments in new or upgraded systems. Other vendors, by comparison, either sell software packages (typically customized) or want to take over the entire central computing function.

ConnexT™ begins by offering a set of services related to the billing function. These services will include, at a minimum, completion of the charge calculations necessary to create a bill. Additionally, ConnexT™ provides other billing-related services, including:

- Regular Statementing. This service involves the bill statementing, printing and mailing associated with energy and water bill calculations.

- Summary Statementing. Under this service, retail customers could have all of their meter accounts (or a subset of them) read on the same day, and summarized and totaled on one monthly bill. For example, a fast food restaurant chain could receive a single bill for all stores within the utility's service territory. This feature would lower the retail customer's check preparation and accounting costs.

- Multi-Company Statementing. With this service, a retail customer would receive one bill per month that would include charges for cooperating utilities, such as electricity, natural gas, and water. This can result in substantial cost savings for cooperating utilities.

- Cash Processing. A payment processing capability is the next level of service that ConnexT™ can offer utilities.

ConnexT™ combines meter reading information with other customer data and calculates charges for electric, gas, and water services.

The system is designed to operate in a regional data center environment and replaces the utility's billing subsystem environment, and integrates with the utility's other CIS functions which continue to be maintained by the utility. Over time, ConnexT™ moves from outsourcing of billing-related services to the outsourcing of a full set of CIS functions, and perhaps other utility information systems functions.

NON-UTILITY REVENUES

As pressures mount on the profitability of their core products, many utilities are seeking ways to leverage the excellent and long standing relationships they have with their customers. This can create whole new revenue streams for the utility or alternative service providers. The installation of communications networks provides the foundation from which ConnexT™ can partner with utilities to offer a number of subscription services for residential as well as commercial and industrial customers. Wireless radio network, where deployed, would be an excellent vehicle for the delivery of services requiring high volume data transmission.

- Security and Hazard Monitoring. Wireless networks provide a natural vehicle for the lucrative alarm monitoring aspect of the security business. ConnexT™, with its direct access to homes and businesses, will be in an excellent position to market and deliver security services.

- Inventory Monitoring. Opportunities exist for selling services to commercial enterprises which wish to remotely monitor inventory levels, either at their own or their customers' sites. Vending machines and storage tanks are just two possibilities.

- Communications Equipment and Services Resale. In areas where there is a wireless radio network installed, ConnexT™ may create a role as a value-added reseller of related products and services.

CONCLUSION

The energy behind the transformation of the utility industry into a sustainable and affordable system comes from the explosion in the telecommunications industry. It is this energy that ConnexT™ and its services will harness to bring two distinct and equally important benefits to the utilities. First, distribution systems are brought together making information more accessible to the power distributor. Second, the new services will allow the customer to manage his usage making information more accessible to the power consumer. For the power distributor, impediments brought along by large communication costs will not be an obstacle to accessing succinct real time information, because of the benefits of the bundle of services available. With a more technology-reliant distribution system, services like automated meter reading, distribution optimization tamper detection and outage reporting will help the utility to offer better service more efficiently. For the consumer, new services that are tailored specifically for him and her will offer up information that before was not easily accessible. It will

allow the end user to be much more efficient with their energy consumption.

As the telecommunications industry evolves through this time of change, so will the services that can be offered through ConnexT™ to the utility industry. It is in this characteristic that the services offered show their most potential benefits—in the ability to evolve and change with new technology.

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