

DEMAND ENERGY NETWORKS

Energy Highway RFI

May 30, 2012



Contents

Executive Overview/Cover Letter 3

Respondent Information..... 4

Project Description..... 5

 Problem Statement..... 5

 Solution Overview..... 5

 Demand Energy Networks Solution 8

 Solution Platform Overview 8

 Demand Shifter 8

 Distributed Energy Management System (DEMS) 9

 Solution Services 9

 Key Technical Differentiators:..... 10

 Lifecycle..... 10

Project Justification..... 10

Financial 10

Permit and Approval Process..... 12

Appendix A

 Leadership Team.....13

Executive Overview/Cover Letter

Demand Energy Networks, Inc. is pleased to respond to the NY Energy Highway RFI. Demand Energy Networks is encouraging NY to “think differently” about its approach to its energy challenges (opportunities) and consider the unique solution presented.

Relief for New York’s congested transmission system can be achieved by storing off peak energy – to a large extent generated by upstate renewables – at the load point and reinserting that energy at downstate load points during peak periods. Energy storage offers a new Smart Grid “tool” to balance the complete supply chain and enable NY to rapidly move towards alignment and obtainment of its energy and environmental goals. Only by placing storage into the resource mix, effectively creating a Dispatchable Loadtm, can NY build a complete renewable, sustainable future. Additionally, there is no other technology that can be applied as rapidly with as many system benefits as Distributed Energy Storage. Immediate deployments can be efficiently achieved. Furthermore, distributed storage, offers a unique Public/Private partnership approach that provides mutual benefits and makes best use of public funds. It can contribute to creating a vibrant, sustainable energy economy for NY.

Future systems must be balanced, not designed to meet peak load conditions. A great opportunity exists to take a different approach to NY’s future energy highway and engage in new system architecture and a new operational model. We sincerely encourage NY to carefully consider this proposal to create a better energy future for NY.

Thank you for your consideration.



Dave Curry

President and CEO

Respondent Information

CONTACT INFORMATION

Demand Energy Networks, Inc. (“DEN”)

2100 N. Molter Rd. Ste 102

Liberty Lake, WA 99019

Primary contact: Shane Johnson, Vice President of Sales and Product Management

Phone: (509) 270-1227

SUMMARY OF RESPONDENT’S BACKGROUND AND EXPERIENCE

After 3+ years in stealth mode, DEN launched two projects in New York in 2012, with the goal of becoming the world’s leading complete distributed energy storage solution based on reliability, fully integrated feature set, and lowest total cost of ownership. System deployments date back to 2009 with a total of 9 systems deployed in the Pacific Northwest, New York City and China, supporting a variety of applications ranging from solar, wind, electric vehicle (“EV”) integration and Demand Response.

A significant IP footprint has been established with 7 patents filed and a rich pipeline of IP opportunities including our novel Induction Generation technology that eliminates scale grid connectivity concerns. The company has raised in excess of \$12M from private investors and grants.

Demand Energy Networks provides a complete distributed energy storage solution, which can substantially relieve congestion on NY’s transmission system. This solution includes a suite of energy storage modules distributed within load centers, integrated with distributed renewables (where applicable) and networked through intelligent system management software. DEN’s breakthrough distributed edge storage solution caches electricity at end points of consumption by storing energy during off-peak hours or at times of renewable energy production, and then generating the stored energy back to the grid during peak demand periods. The DEN solution is comprised of two core components: The Demand Shifter (the physical storage modules) and the Distributed Energy Management Software (DEMS).

The Demand Shifter represents the physical units supporting the distributed energy storage architecture, providing 1-8 hours of storage. Individual sites can parallel aggregate multiple systems to provide scalable solutions exceeding 1MW at a single location. System connect to the secondary side of a distribution transformer (208-480V 3 phase).

Demand Energy’s DEMS is a highly scalable, platform independent management system with real-time reporting and service assurance capabilities. DEMS is generally delivered as a managed service and integrates with legacy front/back office systems such as SCADA, CRM, Billing and Outage Management, in addition to various reporting systems. However, if preferred by a local utility or the NYISO, dispatch of the stored energy can be done by those entities. Various distributed resources such as smart meters,

relays, and other intelligent devices are also easily integrated into the system. DEMS user interface provides a full, feature rich browser-based graphical user interface (“GUI”) requiring no special plug-ins.

DEN is led by an executive team with outstanding experience in building and growing companies in the utility and telecommunications industries, including World Wide Packets, Itron and Architel. The team has grown mature companies to great success and brought start-ups to fast growth and beyond. The Company’s leadership possesses extensive experience and expertise, with core competencies in the following areas: power/energy conversion, power switching, batteries, battery management and network management. Please see executives’ bios as provided in Appendix A for more detail.

Project Description

DEN’s proposed energy storage project provides a solution to transmission congestion that will transform the traditional energy system architecture, enabling power systems engineers to think differently about the energy supply and transmission system. This solution will not only enable NY to maximize the investment of its existing supply chain and minimize the amount of capital spent on upgrading aging infrastructure, but will also enable the State to exceed its environmental and sustainable supply objectives.

Problem Statement

Traditional energy system architecture involves, in its simplest form: generation, transmission and distribution infrastructure design and construction to meet peak forecasted demand. New York’s objective to create a more sustainable renewable energy supply mix is creating reliability and integration challenges, forcing system wide rethinking of energy architectures. Until recently, energy systems have been simply operated to match supply with load across available constrained resources. Traditional peaking solutions do not provide adequate support for renewable integration, as well as not matching environmental objectives. As a result, the future Energy Highway requires a new resource tool that enables an operator to manage not only supply, but create a Dispatchable Loadtm in order to balance the entire system supply chain. Additionally, low cost penetration of customer distributed renewable generation is changing the landscape for traditional utilities and new architectures, operating models, and customer engagement must be sought to adapt to this rapidly evolving industry.

Solution Overview

Demand Energy Networks believes a key tenet for solving this problem lies in developing a meshed network of distributed energy storage systems. DEN’s software technology provides the ability to remotely control a very large number of distributed electricity storage units so that they can be dispatched as a single supply whenever a utility or the NYISO so requires. Individual storage units can be widely dispersed or placed in a targeted way to address specific, localized distribution system constraints. If the storage units are located on the customer side of the meter, the end customers can also benefit from reduced peak demand charges. Through the use of patented induction generator technology, DEN’s Demand Shifters can be seamlessly integrated into utilities’ networks, thereby

eliminating utilities' justifiable concerns with the interconnection of distributed supply. Demand Energy's solution allows utilities and/or the NYISO, as well as building owners, to think differently and take a different approach to bringing sustainability and balance to our future Energy Highway. System benefits include:

- **Balanced Transmission and Distribution** – By storing energy at off peak times when transmission and distribution systems are lightly loaded and generating against peak times, the system load curve can be balanced. This provides overall system-wide efficiency improvements through better utilization of efficient base load facilities and less line losses; relief of capacity constrained infrastructure; and deferral of costly and time consuming system capacity upgrades. Essentially this is putting the existing infrastructure to better use. Operational challenges of overall balancing, ramping, and system reliability can be optimized by leveraging this new operating tool that has not previously been available.

Deep Penetration of Renewables – Upstate NY wind generation is creating system integration challenges. Intermittency and variability of the supply, as well as wind profiles that are generally non-coincident with peak needs (wind generally blows at night), create circumstances where the wind supply is either not usable or undervalued. Furthermore, additional resource development is limited without a new integration approach. Distributed storage at the load edge allows the energy system to maximize economic and environmental benefits of this valuable renewable resource. When wind blows at night, energy storage can create a Dispatchable Loadtm to store wind at the load sites (e.g., NYC) and move the energy across the transmission system at night when it is lightly loaded. Then this energy can be generated into the grid at local system load peaks, eliminating T&D congestion, improving system efficiency and leveraging the renewable energy at its peak economic and operational value. Furthermore, continued penetration of distributed renewable generation (e.g., solar) creates significant grid challenges and the amount of supply is limited without a new approach. Distributed energy storage, coupled with directly integrated solar systems change the entire equation and allow for deep penetration of distributed solar generation. Directly integrated storage/solar enables a utility to take intermittent, non-firm solar and turn it into a reliable, firm resource that the system can rely on as part of its supply. This solution enables operators to obtain maximum solar penetration on the system while improving system reliability standards. Without this game changing solution, expensive and inefficient gas peaking technology and/or very expensive and hard to site transmission will have to be used, which likely will cause long-term, continued limitations on the penetration of renewables both upstate and locally at load centers. All of which caps the potential of the State to reach its environmental and climate goals in conjunction with the Energy Highway initiatives.

SIZE, LOCATION AND DATE OF OPERATION

A substantial benefit of distributed generation is that it is constructed in modules and can be sized as needs are identified. For this proposal, DEN anticipates that thousands of distributed storage units will be aggregated as a massive distributed resource enabling 100's of megawatts of resources.

One thousand 100kW systems with four hours of storage equates to 100MW of power and 400MWh of Dispatchable Load for excess renewable generation.

- Ease of Deployment & Immediate Benefits – Distributed storage planning, siting and permitting challenges are very simple in comparison to the challenges of large scale generation, transmission and even distribution construction in some areas. Distributed energy storage can reduce transmission system bottlenecks but avoids transmission siting problems. Rather, energy storage units can sit adjacent to existing distribution transformers at the edge of the grid. The solution is deployed like a piece of pad mount distribution equipment and can be operated as part of the Utility smart grid infrastructure. Systems will be deployed in targeted locations (hot spots) maximizing the complete supply system benefits. This system can be rapidly deployed and provide immediate significant benefits to the utility supply system. Uncertainty with future generation supply (relicensing, environmental requirements, etc.) and fuel supply/costs (natural gas, oil, coal), combined with the potential for rebounding economic growth and new system demands from Electric Vehicle charging are a real concern, requiring access to a solution that provide rapid response and relief to an already strained infrastructure. Systems can be deployed incrementally in a “pay as you grow” model to maximize available capital and benefits. Once hosts are identified, installations can begin in as little as 90 days. For example, DEN is currently in negotiations with a major New York City real estate owner to provide a total of approximately 7.5 MW of storage, housed in as many as thirty buildings, achieving about 30 MWh of energy for peak periods. The installation of this network is estimated to be 18 months. An important factor is that very few permits are required for battery storage, which at heart is a well understood and proven technology. The innovative aspect of DEN’s product is its networking capability, which is cloud-based and, therefore, avoids complicated and lengthy regulatory involvement.

Because DEN’s project proposes “distributed” storage, the location of the potentially thousands of units is dispersed across a wide, disparate region. Generally, though, the storage units would be placed in load centers, primarily in NYISO Zones I, J and K, although DEN is open to discussions of locating its energy storage facilities in other areas of New York State if that is advantageous to the statewide T&D system.

BATTERY TECHNOLOGY

DEN can use multiple battery technologies, including VRLA, Advanced LA and Lion. DEN’s philosophy is to take a solutions approach rather than being battery technology-centric. At the same time, DEN has a patent pending on a new, copper/carbon battery technology that will provide more uniform current distribution and improve battery lifecycle. DEN is partnering with a leading battery manufacturer to create a new battery class with the lowest cost per kWh.

EXPERIENCE, MARKET AVAILABILITY AND SUITABILITY OF PROJECT TECHNOLOGY

DEN is already operating its energy storage units in numerous locations, including New York City. Although the sizes of the current installations are relatively small, by networking installations grid-level storage can be achieved simply by networking multiple installations, which can be significantly larger.

Demand Energy Networks Solution

Demand Energy Networks provides a complete distributed energy storage solution. This solution includes a suite of energy storage modules distributed at the edge throughout the system, integrated with distributed renewables (where applicable) and networked through intelligent system management software.



Solution Platform Overview

Our breakthrough distributed edge storage solution caches electricity at end points of consumption by storing energy during off-peak hours or at times of renewable energy production, and then generating the stored energy back to the grid during peak demand periods. The DEN solution is comprised of two core components: The Demand Shifter (the physical storage modules) and the Distributed Energy Management Software (DEMS).

Demand Shifter

The Demand Shifter represents the physical units supporting the distributed energy storage architecture. System sizes range from 10kW-100kW, providing 1-8 hours of storage. Individual sites can parallel aggregate multiple systems to provide scalable solutions exceeding 1MW at a single



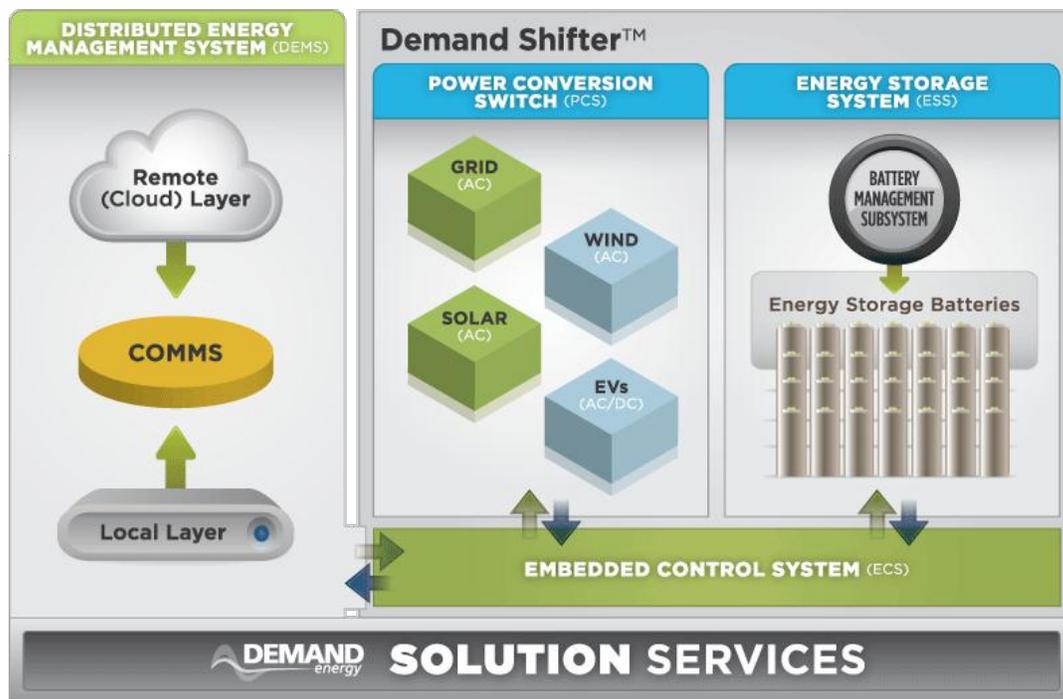
location. System connect to the secondary side of a distribution transformer (208-480V 3 phase).

Key subsystems are noted below:

- **Power Conversion System (PCS):** Provides grid interconnection and AC/DC power conversion
 - Includes direct connect, power conversion for renewables/EV integration and patented induction generation design for safe grid integration, self-synchronization
- **Energy Storage System (ESS):** Energy storage batteries and battery management system
 - Supports multiple battery chemistries, battery agnostic, integrated intelligent BMS
- **Energy Control System (ECS):** Embedded distributed energy control system which provides the interface to the Distributed Energy Management System.

Distributed Energy Management System (DEMS)

Demand Energy's DEMS is a highly scalable, platform independent management system with real-time reporting and service assurance capabilities. DEMS is delivered as a managed service and integrates with legacy front/back office systems such as SCADA, CRM, Billing and Outage Management, in addition to various reporting systems. Various distributed resources such as smart meters, relays, and other intelligent devices are also easily integrated into the system. DEMS user interface provides a full, feature rich browser based GUI requiring no special plug-ins.



Solution Services

Demand Energy's industry expertise can be leveraged to provide a turnkey solution. Design, project management, implementation and integration consulting; systems operations and optimization; and

solution support (remote and in the field) and are available to enable Utilities to maximize their benefits of Demand Energy solutions.

Key Technical Differentiators:

- **Direct Solar integration** – Direct, high voltage DC connection of solar array (no grid tie inverter) utilizes integrated DC/DC power conversion switching and leverages battery storage as elastic medium to provide firm, constant output regardless of PV production.
- **Direct EV integration** – Direct DC to AC power conversion switching for EV charging stations isolates EV charging demand from the Grid and optimizes charging with renewable solar energy.
- **Patented Induction Generation Design** – Inherently synchronizes with the grid with pure AC sine wave output, spinning mass naturally accommodates grid transients and surges, provides minimal harmonic distortion, field proven 20 year life, inherently safe as it cannot generate if no grid voltage is present.
- **DEMS Network Software:** Purpose built, “Big Data”, cloud based managed service for the aggregation of 1,000’s of distributed elements
- **Advanced Copper/Carbon Battery technology** – Proto stage development with capability of significantly reducing the performance/price gap of lithium vs. lead acid batteries, patented DEN technology

Lifecycle

Demand Energy solutions are architected for a 15-20 year lifecycle. Our modeling shows a typical operation of 120-150 cycles per year. As a result, with DEN’s copper-carbon battery that supports 2500 cycles, we would typically support a lifecycle of ~15 years before a battery change out is required.

Project Justification

Demand Energy proposes a first project to install storage units in a large number of NYC and downstate NY State government buildings that will be identified as having appropriate peaking profiles. Such buildings are expected to include many NYCHA facilities. These natural locations would support low cost placement and leverage government assets. By leveraging these sites, the government would receive a combined system-wide benefit, but also see a reduction in governmental facility electrical bills.

Demand Energy would propose to immediately engage with NYPA and its energy customers (including NYCHA) to engage in a preliminary discovery and design process to scope this project.

Financial

As with many emerging technologies, the business opportunity has many options and many variables to consider. This is particularly unique with distributed energy storage as the benefits and resulting “value” crosses many functional organizations and operational boundaries. As an example, applying distributed storage in the NYC metropolitan area to support upstate wind integration and to relieve transmission capacity constraints provides the following benefits:

- Higher market value and more efficient use of wind generated by the wind producers;

- Enables construction of more wind capacity as part of the supply mix;
- Fills underutilized transmission capacity during off peak times when the system is lightly loaded;
- Improves I²R losses of transmission system ;
- Improves operational wind integration challenges during ramping periods;
- Relieves system peak by generating locally at the load point;
- Increases total MWh of energy delivered to load centers;
- Minimizes cycling of existing generation assets caused by wind integration challenges and improves system reliability and reduces maintenance issues caused by these unexpected operational cycles;
- Provides relief to heavily loaded transmission, substation transformers and distribution feeders, deferring costly upgrades with lengthy permitting processes;

As one can see, these benefits cross the boundaries of the Generating companies, Transmission companies, NYISO and the distribution companies.

Numerous studies have been completed showing system benefits ranging in value up to and in some cases exceeding \$5,000/kW (well exceeding the cost of deployed distributed storage). In addition to the system technical benefits, the public benefits are significant. Deferring transmission ROW procurement, encouraging deep penetration of sustainable renewables (wind and solar), minimizing environmental impacts of new projects, reducing greenhouse gas emissions and system-wide carbon footprint and better utilization of public infrastructure/money are all benefits received through the proposed solution.

Systems are readily available and rapidly deployed in a “pay as you grow” methodology, applied strategically to maximize system operational and economic benefits. As a result, the solution can be deployed with minimal capital investment demonstrating real and significant benefits.

We view a model where all benefitting entities share in the funding of the systems, which are located within and maintained by the Distribution Companies. System operation could be performed by either the NYISO or the Distribution entities working together with the Generation Entities to maximize the system wide benefits.

An additional, supporting model would be to also partner with the private sector and develop a program/structure of incentives for the end commercial customers to purchase, deploy and operate the systems. The incentives would come in the form of:

- 1) Rate structures which encourage the use of the systems to maximize the benefits;
- 2) Implementation of cost sharing programs that recognize the benefits received by the Generation, Transmission and Distribution companies;
 - a. Rebate (i.e., direct cash incentives) upon project completion;
 - b. Tax Benefits;
 - c. Other similar existing models used in DR/Efficiency programs;

Our analysis is showing that in some markets, rates structures exist that provide <7 year payback with DEN equipment. If rebate and tax benefit programs could be structured to decrease the payback to <3 years, the commercial adoption of these solutions would easily meet the system wide technical benefits and the cost share is significant, fair and represents a value model that provides potentially the best use of public funds.

As an example, with the proper incentives, it is easily possible that 1000 businesses in NYC could install an average of 250kW/1MWh of distributed storage each. This would represent 250 MW, 1GWh of system balancing capability to meet the State's targeted objectives.

Additionally, the incentive structures could be developed in a way to encourage the procurement of systems manufactured in NY. This would further enhance the State's objectives towards creating a vibrant energy business sector and drive the creation of many jobs. The private sector would lead the initiative, creating significant economic activity and work in partnership with the State of New York to meet its Energy Highway objectives.

The socio-economic benefits of this type of a structure are significant. This solution would be a low impact solution aesthetically and would have no negative impact to safety, the environment or tourism. The solution would create jobs through the project deployment and ongoing operational phases. Reduced energy costs ultimately will help drive economic development as NY competes in the global market. The lowest cost blend of sustainable energy can drive the location of like-minded organizations into the NY economic base.

Permit and Approval Process

Permitting processes would be based upon existing local authorities having jurisdiction. These structures are in place today. Local electrical, building and fire permits generally would be required. Indoor and outdoor applications are available. If owned and operated on the utility side of the meter, existing ROW and easements will be used to locate the equipment adjacent to existing pad mount transformer equipment. Local Distribution interconnection agreement structures already exist within the Distribution Utility procedures. Public Safety policies and processes are already defined and in place.

In summary, there are no barriers to entry for the deployment of these systems. Immediate implementation and benefits can be achieved. The scale of deployment is limited to the scale of manufacturing and resources to design and implement systems, which is easily solved. DEN is prepared to locate a manufacturing and/or assembly facility in NY if it obtains sufficient orders for its products in the Northeast.

Appendix A

DEN Leadership Team

Dave Curry, Co-founder, President & CEO

Former President & CEO of World Wide Packets (WWP), a layer2, point to point Carrier Ethernet switch company that was sold to Ciena for \$325 M in March 2008. Prior to WWP, Dave founded Architel, a telecom OSS company that went public in 1998 and was sold to Nortel in 2000 for \$500M. In 1996, Dave was selected Canadian Entrepreneur of the Year for his leadership at Architel. These successful endeavors included the delivery of hundreds of solutions to the largest carriers worldwide. Dave will provide overall team leadership and ensure project success.

Brett Turner, Co-founder, CFO

Former VP of Finance of WWP with over 15 years of experience in senior finance positions in both public and private high-growth technology companies. Responsible for raising \$70M in equity and debt financing and the financial support leader for a \$500M AT&T award and sale of the company to Ciena. Prior to WWP, Brett was with Amazon.com, Teledesic, and theglobe.com, after becoming a CPA while at Deloitte & Touche. Brett will engage in the commercial aspects of the project.

Doug Staker, VP Business Development

Former VP and GM International Sales and Marketing for Itron, a leading provider of technology to automate the electric, gas and water utility industry. While at Itron, Doug was specifically responsible for developing emerging markets in Asia and for all aspects of product line management and product development of fixed network and electric meter modules, which generated over \$1 billion of revenue for the company. Previous positions include business development, product line management and product development. Doug was specifically involved in the design, operation, and support of several large fixed network deployments Duquesne Light, Virginia Power, Trinidad and Tobago Electricity. These were multi-year projects that required customer-vendor partnerships in order to become successful deployments. Doug understands utility challenges and how to help our customers achieve success.

Shane Johnson, VP Sales and Product Management

Former VP Global Professional Services for Ciena, a \$2B optical transport & carrier Ethernet switching company, with over 17 years of experience in both the telecom and utility industries. Prior to Ciena, Shane was VP Customer Service & Support for World Wide Packets where he led the transformation of its services business. During his tenure at WWP, Shane carried sales responsibilities in APAC and Global

Sales Engineering. Prior to WWP, he was Systems Engineer for Douglas County PUD and a key contributor to the design and implementation of its fiber-based control, automation, and communication infrastructure. Shane's project lists range from SCADA system replacements, generation plant controls and instrumentation modernization, protective relaying, distribution automation and integration, regional and community fiber optic network infrastructures. During Shane's tenure at World Wide Packets he was a key contributor to Ethernet network solutions worldwide with Utilities such as Grant PUD, Clarksville Department of Electric and Counties Power; to large global carriers such as AT&T, CenturyLink and ClearWire. Shane provides leadership for the Demand Energy Sales activities which including all post sales customer facing services.

Ted Volberding, VP of Operations and Product Development

Responsible for Design Engineering, Supply Chain, Quality Management Systems, Production and Logistics with over 30 years of experience. A proven global sourcing specialist. Instituted world class quality management systems (ISO 9001:2004) in the industrial, telecom, networking, and medical device industries. Ted will provide leadership and direction in supplying product realization and customer satisfaction. Ted will provide product development support and will be responsible for product delivery through customer lab acceptance to the field location(s).

Rob Neilson, Director / Advisor, Sales & Strategy- former Itron President and COO

Responsible for creating, leading and implementing the vision that resulted in market cap growth from \$85 million to \$1.5 billion from 2000 to 2006. Transformed Itron to a full solution company incorporating hardware, software and services. Orchestrated and managed the integration of 5 acquisitions from 2002 – 2005. 23 years at Itron included previous positions of VP Strategy and Business Development and VP Marketing.

Randi Neilson, Advisor, Marketing- former Itron VP of Marketing

Responsible for increasing brand equity, alliance partners and pioneering regulatory and legislative support for smart metering technology. Developed and led Itron's re-branding efforts, raising Itron's relevance to the highest executive level in the utility industry. Received the 2004 Key Women in Global Energy Award for vision and leadership. Previous positions include Director Product Line Management and Solutions Marketing.