BROADBAND SPECIALISTS, INC.

SMART GRID EXECUTIVE SUMMARY & PRESENTATION

PRESENTED AS A EMPLOYEE TRAINING PRESENTATION

- OR -

GENERAL USE EDUCATIONAL PRESENTATION

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MISSION STATEMENT

To provide an economical option in compliance with the American Recovery and Reinvestment Act of 2009 that integrates a last mile SMART Grid solution into rural broadband infrastructure deployed by BSI by utilizing dedicated fibers within the broadband network. The Smart Grid solution will improve the overall efficiency, reliability, and cost effectiveness of electrical system operations, including planning and maintenance, by way of convergence of information and operational technologies applied to the electrical grid.

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DEFINITION OF A SMART GRID

Smart Grid is the "convergence of information and operational technology applied to the electric grid allowing sustainable options to costumers and improved security, reliability, and efficiency to utilities".

BENEFITS OF A SMART GRID WITHIN THE ACT

On behalf of taxpayers and end users, this Smart Grid solution will provide synergies between, and substantial savings within the energy and the broadband initiatives, as called for within the Act, by incorporating this last mile Smart Grid solution into the rural broadband network as part of the comprehensive national Smart Grid infrastructure deployment strategy.

Smart Grid deployment will create thousands of sustainable manufacturing and service related jobs to support network systems and operations such as:

Distribution Automation (DA)

Intelligent Equipment Devices (IED)

Advanced Meter Infrastructure (AMI)

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WHY DEVELOP THE SMART GRID NOW

Worldwide demand for fossil energy resources, fuel transportation costs, climate change, renewable portfolio standards, and aging infrastructure: everyone agrees that retail electric rates and bills are going up. In fact, average electric rates nationwide are up more than 35 percent in the last six years. “The days of serial rate increases may soon be upon us. Electric utilities must be prepared to offer solutions to their customers or potentially face a firestorm of protest in years to come. The intelligent Smart Grid is one such solution.

APPLICATIONS

Smart Grid can be used in many applications:

Generation

Transmission

Distribution

Metering

Customer facilities/appliances

Transmission line loading

Substation equipment monitoring

Distribution power flows

Voltage measurement

Automated meter reads

Turn-on/turn-off services

Emergency grid management

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FACT CHECK

If we are to start developmental Smart Grid efforts now and achieve the best political results, all parties must consider focusing their combined efforts on distribution, metering. These efforts must also include customer solutions that quickly deliver quantifiable value to the customer. In the process, we must deliver a dynamic, highly trained, motivated workforce to develop, deploy, and maintain the solutions implemented.

SUSTAINABILITY

Applied to obtain the most immediate customer impact on the retail electric power delivery system, sustainability means an improved level of energy efficiency in the transformation, distribution, and use of electricity. This improved level of efficiency translates into such things as lower line and transformer losses for the utility asset owner and conservation and management opportunity for end-use commercial and residential customers.

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FACT CHECK

The most important part of the simple definition of the Smart Grid becomes “allowing sustainable options to customers.” Sustainability is defined as proactive stewardship of the environment providing for the long-term health and vitality of ecosystems.

HIGHER EFFICIENCY

There are two fundamental approaches to achieving higher efficiency in the transformation, distribution, and use of electricity.

Substation and Distribution Automation (DA)

Advanced Meter Infrastructure (AMI)

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DA SYSTEMS

Implementation of Substation and Distribution Automation (DA) systems will improve utility operational efficiency by the application of intelligent equipment devices (IEDs) to remotely monitor, measure, coordinate, and operate distribution capacitors, switches, transformers, and feeders over a secure, robust telecommunication network. An advanced DA system allows inter-device messaging between substations and the Supervisory Control and Data Acquisition (SCADA) system using the IEC61850 standard for equipment interoperability (among equipment made by different vendors).

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AUTOMATED METERING SYSTEMS (AMI)

Implementation of advanced meter infrastructure (AMI) will allow the electric utility to communicate directly with customers and create new opportunities for service. State regulators in many states across the country have embraced and authorized the implementation of AMI, and many utilities are purchasing and installing millions of new electronic, two-way meters and the required broadband communication system to support them. Two-way meters commonly utilized to support the FTTH or HFC rural broadband infrastructure BSI will deploy are referred to simply as "hardened modems", and are economical and proven technology.

FACT CHECK

The ability of various new and legacy components of the electric distribution system to communicate with one another is expected to lead to better operational efficiency and reliability.

LOAD SHIFTING AND LOAD REDUCTION

There are many tangible and intangible benefits of an advanced DA system or an AMI-enabled Smart Grid, but the regulatory driver for this massive effort is sustainability. Regulators will require quantifiable system efficiency improvements or progressive demand response and demand side management programs that provide load shifting and load reduction leading to a more sustainable use of electric power.

FACT CHECK

States such as California have passed bills that require independent utility operators (IUO) and legislators to work together to create a plan that will improve “overall efficiency, reliability, and cost-effectiveness of electrical system operations, planning, and maintenance” of the electrical grid.

FUNDAMENTAL CHALLENGES

There are many fundamental challenges to meeting the sustainability goals of regulators, challenges that must be met with a practical deployment strategy that is achievable.

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FUNDAMENTAL CHALLENGE #1

The DA or AMI build-out requires a secure and highly robust telecommunication network for mission critical and non-mission critical data transport. The Fiber to the Home (FTTH) and Hybrid Fiber to Coaxial (HFC) fiber-based networks BSI will deploy provide the most secure and robust of all network options available today.

FUNDAMENTAL CHALLENGE #2

Meter data integration and management for billions of meter readings turning data into information and, ultimately, action will be culturally disruptive for utilities. Privacy and security of data issues must be addressed and participation by the end-user beyond the meter may need to be offered on a voluntary, "opt-out" basis.

FUNDAMENTAL CHALLENGE #3

Demand response and demand side management programs allowing for “prices to devices” for residential and small commercial customers must be part of an ultra-simple, readily accepted rate structure. Economic benefits derived can be substantial. For example, peak usage pricing curves would allow consumers to actively limit their peak time usage remotely by diverting some usage to off-peak hours in order to maximize lower rates. In another example, end users can manage usage of air conditioners, pumps, lighting, and other appliances remotely according to needs and conditions, maximizing energy efficiency, therefore reducing energy consumption, increasing discretionary spending otherwise for goods and services elsewhere.

FACT CHECK

If the Smart Grid is to be a solution for offsetting the negative impact of rising rates and bills, it must be deployed in a manner that specifically addresses these rate/bill impacts.

HOME AREA NETWORKS (HAN)

The future of electricity begins with the customer. Integration and management of system and customer data can lead to the ability to analyze warehoused information in manner that improves operational efficiency and reliability but, most importantly, provides sustainable options for customers.

Sustainable options will include demand-response and demand-side management programs for all customer classes that include a Home Area Network (HAN) plan for residential customers allowing "prices to devices" supported by ultra-simple rate plans. Data will become information used for action.

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The HAN is a computer automation system for the home (or small commercial business) that integrates devices through the Internet and with the electric utility to allow the user to be proactive in the use of generation of energy. The HAN will play a major role in making the grid more efficient and in moderating rate impact for the customer.

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The HAN begins on the “customer side” of the meter and will be made up of plug-in hybrid electric vehicles (PHEV), renewable and/or distributed generations, HVAC systems, pool pumps, intelligent appliances, and “plug load” consumer devise like MP3 players, cell phones, and I-Pods authenticated to the electric utility on a secure network owned by the home/business owner.

The home/business owner will have the ability to control the operation of the devices on the HAN from a computer (with manual override features) to maximize the advantages for demand response (DR) or demand side management (DSM) rate structures offered by the electric utility.

FTTH|HFC |Wireless PROVIDES THE SCALABILITY NEEDED

The proliferation of information technology utilizing Internet Protocol (IP) transport over Ethernet has made IP the de-facto standard for data transport. What is needed is IP transport network operating at bandwidths robust enough to handle traditional utility power delivery applications along with vast amounts of new data from the Smart Grid. These networks must be scalable enough to handle future applications as they come.

TIME DIVISION MULTIPLEXING (TDM) VS. ETHERNET

Communications for Smart Grid data transport requires that utilities address both the backbone and the spur segment. Most electric utility communication s backbones are based largely on traditional time division multiplexing (TDM) digital architectures.

TDM technology, while highly reliable, was originally developed for the transport of point-to-point constant-bit-rate voice communications and is not necessarily well suited to cost-effective transport of point-to-multipoint “bursty” data traffic required in an IP environment.

The Smart Grid will require that these backbones be upgraded to backhaul Ethernet/IP data traffic at speeds raging from 1 to 10 Gigabits/second in a highly reliable manner. Rather than replacing their legacy TDM networks, many utilities will opt initially to “overlay” these existing networks by overbuilding Gigabit Ethernets on unused fiber and licensed or unlicensed broadband wireless networks over existing microwave paths.

FTTH/HFC FOR LAST MILE

Until now, the deployment of spur or last-mile communications for the Smart Grid (typically from a backbone node to the customer premise) has offered additional challenges because the network must cover a very large area to reach every resident, and the economics simply where not there.

The logistics and poor economics prompted some utilities to take a phased approach, deploying the Smart Grid to large-load industrial and commercial customers initially because the bulk of Smart Grid benefits follow the bulk of the electrical load while residential applications remained on the back burner waiting for a clearer quantification of benefits.

This balanced approach has left the vast majority of last mile Smart Grid still not deployed. This will have broad ramifications politically as rates rise and residential customers demand relief. This can be overcome simply by utilizing space on the broadband network. In rural areas where the deployment economics are least attractive, combining rural broadband with Smart Grid deployment makes the most economic sense.

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LAST MILE TECHNOLOGIES

Meshed WiFi

FTTP

Packet-based store and public carrier

Forward radio networks

Broadband-over-power lines (BPL)

FACT CHECK

Other services, such as:

Community Antenna Television (CATV)

DSL

Cellular-based wireless data networks

… may also make sense where utilities can negotiate bulk service rates.

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UTILITIES MUST FOCUS ON THESE TEN (10) STRATEGIES TO SUCCEED

1. DISTRIBUTED GENERATION

Engineer the connection, dispatch and/or storage of renewable and micro-scale renewable and micro-scale generation resources to the customer /owner and electrical equipment provider.

2. REMOTE EQUIPMENT MONITORING

Design and manage the installation of intelligent equipment devices on major substation equipment and critical transmission spans to remotely monitor asset and environmental condition on a quasi-real time basis.

3. DATA ACQUISITION TECHNOLOGIES

Specify a vendor neutral Advanced Meter Infrastructure (AMI) system or Substation/Distribution Automation (DA) program that acquires real time data to support improved security, reliability, and operational efficiency of the operational system.

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4. TELECOMMUNICATIONS

Study and develop a robust telecommunications system for rural, suburban, and urban applications to transfer mission critical and non-critical data from the customer, distribution feeder, or substation to system operations centers.

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5. NERC COMPLIANCE

Evaluate the physical and cyber security requirements of the distribution system to include substations and system operations centers and develop a plan for compliance with existing mandatory NERC standards and for future cyber security challenges related to AMI.

6. DATA INTEGRATION MANAGEMENT

Coordinate the integration and long-term management and warehousing of operational and/or customer data from new and legacy systems onto a secure platform that allows data analysis, visualization, and reporting by various user groups.

7. DATA ANYLYTICS AND EVALUATION

Analyze real-time and archived data to develop a better understanding of load factors, energy usage patterns, equipment condition, voltage levels, etc., and integrate the data into usable customer programs and/or operation and maintenance algorithms that identify, trend, and alert operators to incipient failure.

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8. DEMAND SIDE MANAGEMENT

Study the rate impacts of conservation and load management programs, to include demand response programs and the use of dispatch able or stored renewables, using AMI data for various customer classifications. Obtain regulatory approval to test the marketing, performance, and acceptance of the programs though pilot projects for customers.

9. ENERGY SERVICES

Provide design only or turnkey (EPC) services for commercial and industrial customers that implement energy efficiency or load shifting projects at their facilities.

10. HOME AREA NETWORK

Identify, test, and analyze the response of new electric household appliances and consumer devices to market price signals from the utility via AMI in the context of existing or pilot rate structures.

BSI is a consulting firm, project management firm, and full service turnkey design/build network construction firm specializing since 1992 in taking the broadband network deployment process from inception to certification. Whatever your project requirements are, please contact BSI, your “deployment destination” firm.

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