ACCELERATE ENERGY PRODUCTIVITY 2030

Webinar 2: Accelerating Energy Productivity through Smart Grid and Smart Manufacturing

Wednesday, April 20, 2016

https://www.youtube.com/watch?v=bkT6nngr_2c

Welcome & Opening Remarks

- **Karen Wayland**, Deputy Director, Energy Policy and Systems Analysis, U.S. Department of Energy
- **Kevin Lucas**, Director of Research, Alliance to Save Energy
- **Deborah Wince-Smith**, President and CEO, Council on Competitiveness

Smart Grid Presentation: **Arun Vedhathiri**, Manager, New York Energy Manager (NYEM), New York Power Authority (NYPA)

- NYS Executive Order 88: mandates State buildings to save 20% of their overall source energy use by 2020 compared to 2011 baseline energy use.
    - New York has an aging infrastructure, and one strategy NYPA used was to take advantage of the smart technology and smart sensors - data driven approach. We wanted to capture data, manage data, and share that data with stakeholders.
    - Overall goal: bring big data from smart meters and real time meters, use this data to do modeling/visualizing, find trends and use the power of the internet to bridge to the internet of things. Provide building managers and customers with this knowledge so they can better manage their buildings and save energy.
    - Notion of the "semantic grid": give meaning to all the different types of the collected building data, hoping to make a standardized protocol for naming and categorizing the data.
    - NYEM government building portfolio: Over 3,300 buildings with a variety of types, building purposes, and electricity costs which makes it difficult to approach each with the same prescriptive solution to energy savings.
    - Putting sensors in all of the state facilities, connecting over 800 buildings with real-time data. Getting data in 15 minute intervals, soon we will receive data minute-to-minute.
    - Collecting information on electricity, natural gas, steam, hot water, chilled water, space temperatures, humidity, and CO_2 from the buildings.
- Also collecting information from weather stations and the grid to help better predict energy use in buildings and the cost of that energy so customers and building managers can better manage their environments. NYEM: Network Operations Center (NOC): we are creating a centralized headquarters in Albany, NY for state of the art real-time monitoring of energy use and the grid to forecast demand, time of use energy rates, control the smart grid, save energy and better serve customers.
    - This will also be used as an education center for building managers to help them reduce energy use and understand the grid in relation to their building.

- Customer advisory role for Executive Order 88.
    - Education - the market demands education for these new technologies to be properly utilized. The advisory role will help building managers and customers understand the data that is coming to them.
    - Deploy Real Time Energy Management (RTEM): low cost no cost measures that are prevalent in buildings. Standardization and rapid scale-up, market adoption.
- Customer adoption milestones – deployment.
    1. Infrastructure investment: connection of existing meters, install new ones, and bring data to a secure data warehouse.
    2. Software tools: make data into a uniform format, view and analyze this data in ways that are useful to the customer which will help them manage their energy better.
    3. Analysis → action: data needs to be formatted to be able to communicate with other machines so it can drive operations and management projects and investments.
    4. Measurement & verification: monitor savings and track goals. Keep the savings persistent. If you do not monitor buildings within the first five years you can lose 30% of the savings.
- Case study: SUNY University System.
    - Driving energy use by occupancy – university buildings have such a varying occupancy throughout the seasons, and without the ability to track the occupancy data, it is hard to manage data according to the building's actual use.
    - Without having a system to view patterns with regards to occupancy and energy use, it becomes impossible to manage energy waste. By scaling back energy use through schedule optimization, one campus saved a quarter million dollars in energy during a three week vacation period.
- Case Study: Zero Energy Nano (ZEN) Building.
    - The building features a building management system combined with system level smart meters & sensors, solar PV & fuel cell technology, and smart edge devices (e.g. blinds). Also contains a real time energy management system.
    - Smart technology has become more affordable in the last twenty years, so more systems within a building can be "smart." Blinds that are automatically controlled with the lighting sensor that changes due to amount of light as well as what individual is in the room (each person has a card that knows what amount of sunlight they prefer).
    - Building will soon communicate with the grid which is where the smart grid comes into effect.
    - Biggest take away from using one system is that once you are streamlined to using only one system, it is easy to scale up new technologies within that system and scaling up initiatives rapidly.
    - Biggest goal in this project: reduce energy costs within NYS buildings and therefore reduce tax payer money and reduce GHG emissions.

<u>Q & A:</u>

- **Kevin Lucas**: Regarding visual presentation of data – as you move from 15 minute resolution time frames to 1 minute resolutions, which will increase the amount of data coming into the network and sensors needed to capture the data, how will the software automate this information and present it in a visual way where users may have increasingly more screens or more data to dig through – how will the major issues surface and be seen by the consumer?
    - **Arun**: As we are scaling up our data resolution time frames, our data capturing is increasing by leaps and bounds. Our current expansion is about 150 times greater than the last generation and the next generation will be 100 times on top of that. We are expanding and changing our software to something similar to what Netflix uses. The front data software, which is what interfaces with the customer, is also updating and will be able to easily process this increased inflow of data and easily present it to the consumer.

Smart Manufacturing Presentation: **Spencer Lipp**, Chief Engineer and Engineering Manager, Energy California Programs, Lockheed Martin

- Cycle for innovation:
    - Early adopters – important key target. Leadership, innovative thinking, handle more risk, ability to pivot.
    - Mainstream implementers.
    - Trailing companies.
- Flexibility: commercial facilities need to be able to change rapidly to meet customer demand; industrial facilities also need to be flexible but it is harder for them.
    - Assembly lines could switch to meet market demand quicker so as to decrease down time.
- Current manufacturing processes:
    - Just in time manufacturing – a reactionary means of doing business.
    - Organizations are very siloed: sales, production, shipping, and receiving all work outside of one another so any change in the market will take that much longer to trickle down.
- Data driven metrics for manufacturing:
    - Data from sensors and advanced computer simulation and modeling are key.
    - Manufacturing intelligence – drive flexible manufacturing to increase production, inventory controls, efficiency which increases cost benefit ratio.
- Utility cost advantages of smart manufacturing:
    - Smart factories can respond to peak energy demands at the plant and minimize the monthly “speeding ticket” for the demand charge.
    - Solar PV generation/battery storage: system can respond in different ways.
    - Demand response programs: Utilities pay customers to shed load when grid is impacted.
- Adoption of advanced manufacturing:
    - Crucial to provide easily digestible data and metrics to the consumer. Data analytics that are produced from smart manufacturing allow business leaders to quickly grasp the benefits of energy reduction, the real cost to make a unit of production, and the opportunity cost of downtime.
- Smart manufacturing workforce - the implementation of smart manufacturing will require operational and financial workers to train in new technologies and new roles.

        - 12-24 months to train workforce.
        - This will impede early adopters.
- To enable smart manufacturing growth, there needs to be:
    - Proof of concept - industrial customers are risk adverse.
    - Full investment from the top down.
    - Incentives to justify the risk.
    - Energy efficiency and/or renewable experience.
    - Keep it simple.
- Avenues for deployment:
    - DOE Superior Energy Performance – integrating smart manufacturing into this program could be a possibility.
        - Existing energy program.
        - Integrate smart manufacturing for successful companies.
        - Standard measurement and verification (M&V) protocols established to show results, they will be well versed in M&V already.
    - Utility Demand Side Management (DSM) Programs
        - Key utilities to run a pilot and accelerate growth.
        - DSM 1st in the loading order.
        - Utilities have insight into large customers.
        - Energy incentive programs provide money and/or services.
- Keep it simple:
    - If policies become too difficult, companies will not participate.
    - Starting to see this in California, in the energy efficiency arena.
- Support from local and state governments:
    - Incorporate advantages for smart manufacturing through tax breaks or legislation.
    - Work with Air Quality Districts and Energy Code Compliance - need to require net environmental impact to be zero, but can allow for an increase in emissions to encourage participation.
        - Quicken permitting process and approval codes for compliance.
        - Need to allow for tradeoffs to invigorate the smart manufacturing process.
    - Tesla gigafactory example:
        - Five States (CA, NV, AZ, NM, TX) were vying to host the Tesla manufacturing plant.
        - Nevada's winning offer/why the won the manufacturing plant:
            - $1.2B in tax breaks.
            - Nevada legislation allowing Tesla to be sold directly to customers.
            - Discounted electricity rates.
            - Expansion of highways.
    - Takeaway: creating these incentives help advance the development and presence of smart manufacturing facilities, which provide jobs.
- Workforce training: a crucial component that will determine the success of smart manufacturing implementation.
        - Industrial Assessment Centers (IAC) - DOE funded; provides energy audits to small and medium industrial factories.

- Smart manufacturing could be the next IAC
  - Integrate industrial or mechanical engineering with smart manufacturing concepts.
  - Graduate level course.
  - Assist companies to set up smart manufacturing.

<u>Q & A:</u>

- **Kevin Lucas**: Are the utilities themselves involved in the training program? Is there any funding of the training programs from the utilities demand side management programs?
  - **Spencer**: The utilities have robust training seminars so that can be a part of the training. There are also programs that we (Lockheed Martin) administer throughout the nation that are not as extensive. That can be another avenue to work with the key utilities.
- **Kevin Lucas**: As you move to the next phase of the innovative thinkers, what differences and motivations do you use to target the second group of people who do not fall under the innovative thinkers who want to implement smart manufacturing?
  - **Spencer:** They are almost there, they just need a little push. They know it’s important, but they are so bogged down in the daily issues of manufacturing, that they need the labor assistance to develop the programs and vision. They also need that it is not going to negatively impact them.