#### WEBINAR SMART GRID AND SMART MANUFACTURING



Organized By
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**Note:** Today's presentation is being recorded and will be posted on Energy2030.org



#### A Partnership To Double U.S. Energy Productivity by 2030



# What Doubling EP Means for Our Country:









# 2X \$327

#### ECONOMIC OUTPUT

Getting twice as much economic output from each unit of energy <sup>[1]</sup>

#### BILLION

Saved annually in avoided energy costs <sup>[1]</sup>

# 1.3

MILLION

Jobs created<sup>[1]</sup>



IMPORTS

Reduced to represent a mere portion of overall energy consumption<sup>[1]</sup>

#### ENERGY ACCELERATE ENERGY 2030 PRODUCTIVITY 2030

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## 134 Endorsers To Date



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

Speaker 1: Smart Grid





Arun Vedhathiri, Manager, New York Energy Manager, New York Power Authority

#### **Speaker 2: Smart Manufacturing**





Spencer Lipp, Chief Engineer and Engineering Manager, Energy California Programs, Lockheed Martin

# One More Webmar Coming Up

Wednesday April 27th 2:00 pm ET Accelerating Energy Productivity in Transportation & Water Kathy Kinsey Senior Policy Advisor, Northeast States for Coordinated Air Use Management



**Mike McDonald** 

Senior Engineer, American Water American Water



# Accelerating Energy Productivity through Smart Grid and Smart Manufacturing NY Energy Manager

April 20, 2016

### **New York Energy Manager: Introduction**

 Support NYS Executive Order 88 – 20% <u>source energy</u> savings by FY-2020 compared to FY-2011 baseline

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- An innovative new program to support thousands of New York State facilities assist with real time energy management
- Big data, smart meters and real time data, modeling and visualization, energy efficiency and web based deployment
- Advanced analytics, BMS Data and Central Plant system integration at select sites
- Use data to target sites and systems for Grid Edge IoT devices

ACROSS

**Y SIALE** 

### NYEM Deployment ~ 3300 Buildings

- 44 College Campuses: SUNY & CUNY
- Offices
- Healthcare Facilities
- Correctional Facilities
- Transportation Hubs
- Armories
- K-12 Schools
- Research Laboratories
- Warehouses
- 2.5 Cents to 25.0 Cents per kWh in electricity costs





### **NYEM: Real Time Data**

- Connected to over 800 buildings sending real time data
- Supporting all utilities: Electricity, natural gas, steam, hot water, chilled water, space temperatures, humidity, CO<sub>2</sub>
- Weather data from 20 locations in NY
- NYISO Real-Time and Day-Ahead market pricing
- User customizable building operational schedules for people, equipment and temperature set points





#### NYEM:

- Web based (SaaS) needs any standard web browser
- Secure environment with varying privileges
- Customizable screens and analytics for each user



### NYEM: Network Operations Center (NOC)

- Establishment of a centralized NOC in Albany
- State of the art technology for real time monitoring and customer engagement
- Positioning customers for demand response, distributed energy resource asset management, time of use energy rates, Micro-grids and REV market place





### **NYEM: Customer Advisory Role for EO88**

- Opportunity identification for building tuning, retrocommissioning and capital improvement projects
- Document savings and track performance of capital investment projects (Measurement & Verification)
- Deploy Real Time Energy Management (RTEM)
  - Focus on low cost / no cost measures for quick results
  - Rapid scale up and standardization





NYEnergyManager

### **NYEM – Customer Adoption Milestones**

Infrastructure investment Sub-meters, sensors; energy data collection & aggregation

> Software tools Data visualization & analytics

Analysis → Action Drive O&M, capital decisions

Measurement & Verification

Monitor savings, track to goal Connect your existing meters and install new ones, and bring all the data to a secure energy data warehouse

View and analyze your data in new and useful ways, better understand your energy use, and focus your energy management efforts

Utilize virtual audits and other types of data analysis to more rapidly identify opportunities for O&M improvements and capital retrofits

Track your progress to goals and ensure that projects are delivering the savings anticipated



#### **Interval Meter Data Visualizations**



#### April 20, 2016

### Use Case 1: Portfolio Wide Schedule Optimization, SUNY Buildings > 100K Sf.



**NEW YORK** 

STATE OF OPPORTUNITY. NY Power

Authority

### **Schedule Optimization – Typical Week**

• Very good, tight schedules being maintained, optimum starts, Fridays and Weekend reduction.





### **Schedule Optimization – Vacation Period**



### Use Case 2: System Level Deep Sub-Metering & Optimization

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Building Total AHU-01 MTR AHU-02 MTR CH-5 Active Powe AHU-03 MTR  $\equiv$ = AHU-04 MTR AHU-05 MTR AHU-06 MTR Air Compressor Interval Data-Statistics Profile: Imported Imported PS180 Elec Mtrs C&S Lights Statistics 1 CH-5 = CH-6 200 Condensing Unit-5 100 Condensing Unit-6 Corridor Lights Exhaust Fans Panel 1 AHU-01 MTR AHU-05 MTR shts 1st Flr ... ghts Cellar A Exhaust Fans Panel 2 Glycol Pump D Lights 1st Flr A Interval Data-Profile Profile: Imported Imported CHW CH-5 CH-6 DLights 1st Flr B Graph Density Map Calendar View 23:20 22:30 21:40 20:50 20:50 20:50 19:10 18:20 17:30 16:40 15:50 15:50 14:10 13:20 12:30 12:30 10:50 09:10 08:20 09:10 08:20 07:30 09:50 05 D Lights 2nd Flr A Lights 2nd Flr B D Lights Cellar A Lights Cellar B Primary Chiller-Pumps Secondary Chiller Total MTR-WT

138,000 GSf., K-12 School @ NYC., Cooling w/ Chillers, No BMS 25 Wireless sub-meters, space sensors for 20% space, Waterside Loop Sensors

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Primary Chiller Pumps Acti.

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NY Power Authority

### 2- System Level Optimization

Optimized chiller staging, start and end times for all system. Lighting upgrades. Additional opportunities for fan and pump controls, outdoor air damper controls



### Use Case 3: ZEN (Zero Energy Nano) Bldg.



### **NYEM: Benefits**

- Align with emerging requirements in LEED, ASHRAE, Energy Codes.
- Continuously improve energy management and operations of state facilities
- Data driven for accuracy, feedback and transparency for all stake holders
- Single system for consistency and scaling up initiatives rapidly
- Facilitates cross platform and cross agency collaboration
- Drive down government operating expenses and save taxpayers money
- Track and reduce greenhouse gas emissions
- Create jobs in the emerging green economy



# Accelerating Energy Productivity through Smart Manufacturing

Spencer Lipp, PE Lockheed Martin Energy

#### Advancing Smart Manufacturing

- Cycle for Innovation
  - Early Adopters
  - Mainstream Implementers
  - Trailing Companies
- Initial Investment from Early Adopters
  - Traditional Leaders
  - Innovative Thinkers
  - Somewhat Less Risk Adverse
- How does Smart Manufacturing Solve the Industrial Customer's Problem
- Key is Flexibility in the Manufacturing Process
  - Quickly Change Product Types Based on Market Conditions



#### Smart Manufacturing Innovation Centers

- Outline the Benefits of Smart Manufacturing
  - Productivity
  - Product Quality
  - Operational
  - Financial
- Provide Medium for Testing Processes
- Proof of Concept to Mitigate the Risk
- Training Ground for Smart Manufacturing

#### Current Manufacturing Processes

- "Just in Time" Manufacturing
- Organizations Set Up in Silos
- Changing Products or Requirements Trickle Down to Production
- Retail Analogy
  - Silo Pricing, Sales, Store Ordering, and Supply Chain
  - Innovation to Computerized Prices and Registers
  - Automatically Update Prices and Custom Product Orde
  - Less Chance of Human Error
  - Resistance from Customers



#### Data Driven Metrics for Manufacturing



#### Utility Cost Advantages for Smart Manufacturing

- Varying Production Rates
  - Energy Intensive Processes Run Off-Peak
  - Less Intensive Processes Run On-Peak
  - Peak Demand Controls to Minimize the "Speeding Ticket"
- Demand Response Programs
  - Utilities Pay Customers to Shed Load when Grid is Impacted
  - AutoDR usually the Most Lucrative





#### Adoption of Advanced Manufacturing

- Easily Digestible Data and Metrics
- Smart Manufacturing Gives Knowledge to Leaders
  - Cost to Make a Unit of Production
  - Opportunity Cost of Downtime
- Allows for Further Improvement in Operations and Processes

# **Knowledge is Power**

#### Shift in Manufacturing Workforce



#### Imperative to Train Existing Workforce

#### Enabling Smart Manufacturing Growth

- Proof of Concept is Paramount
- Fully Invested from the Top Down
- Incentives Must be Provided to Justify the Risk
- Energy Efficiency and/or Renewable Experience
- Keep it Simple KISS Principle



#### Avenues for Deployment

#### DOE Superior Energy Performance

- Existing Energy Program
- Integrate Smart Manufacturing for Successful Companies
- Standard M&V Protocols Established

#### Utility DSM Programs

- Key Utilities to Run a Pilot
- DSM 1<sup>st</sup> in the Loading Order
- Utilities have Insight into Large Customers
- Energy Incentive Programs Provide Money and/or Services

#### Support from Local and State Governments

- Incorporate Advantages for Smart Manufacturing
  - Tax Breaks or Legislation
- Work with Air Quality Districts and Energy Code Compliance
- Tesla Gigafactory
- Five States (CA, NV, AZ, NM, TX) Vying
  - Nevada's Winning Offer
    - \$1.2B in tax breaks
    - Nevada Legislation Allowing Tesla Sold Directly to Customers
    - Discounted Electricity Rates
    - Expansion of Highways

#### Incremental Steps for Non-Leader Facilities

- Parallel Path with Early Adopters
- Jump from Antiquated Systems to Advanced is Difficult
- Improve to at least Achieve Industry Standard Practice
  - Ignored Currently in CA Energy Efficiency Programs



#### Align Manufacturing and Program Goals



#### Project Example of Aligning Goals

- Plastic Facility in CA Desert
- Summer Heat would Produce 50% Scrap
- Scrap and Salable Product Required Same Energy Input
- Process Cooling Redesign Allowed for Adequate Cooling
- Scrap was Reduced to 3-5% All Year Round
- Production Rate Increased
- Consumed a Little More Annual Energy
- Salable Production (kWh/lb) Metric Results in 8 Million kWh Saved

#### Training the Workforce – Existing Workforce

- Existing Workforce is Essential to Success
- Training Certification Model Programs
  - DOE Compressed Air Challenge Elevates Best Practices
  - CA Integrated Demand Side Management Certification
    - CSU East Bay Certificate Program
    - Four Courses Covering Two Years
    - Established an Advisory Board to Develop Curriculum
- Prerequisite for Participation in Pilot Programs
  - Superior Energy Performance Program Requires ISO 50000-1 Training

#### Training the Workforce – New Workforce

- Industrial Assessment Centers (IAC)
  - DOE Funded
  - Select Universities Across the Country
  - Provides Energy Audits to Small and Medium Industrial Facilities
- 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 Systems

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