Energy Management Systems (EMS)

Identifying and Maximizing your EMS Project

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This presentation should help you:

- Understand the basics of Energy Management Systems
- Recognize EMS project components
  - Custom vs Custom Express
- Utilize National Grid services and incentives
  - Tools and References Available
Overview of HVAC Controls
Why Control?

- Utilize automatic, non-manual control to:
  - Increase comfort (window controls)
  - Increase convenience
    - Chop wood and warm yourself twice
  - Run systems more effectively
    - Life expectancy of motor/fan/component
  - Run systems more efficiently
  - Both kinds of green
The Feedback Loop

- The backbone of modern controls

- Example: An employee is cold in a room at 55°F. They feel comfortable at 72°F. The desired reference (72°F) is input to a controller (wall Tstat), which translates an error signal to a controlled device (FCU) and its action (heating coil actuator). A reference sensor (built into Tstat) monitors the output of the device, and supplies a signal back to the controller to adjust the error signal (more/less heat).
Control Components

- Valves and Dampers
  - Control flow of liquid (water) or gas (air), respectively
- Sensors
  - Temperature, pressure, enthalpy, etc.
- Electronic Components
  - Motors, relays, VSDs, transformers, etc.
Modern Control Mechanisms

- Pneumatic Control
  - Control through the use of compressed air pressure to activate/deactivate end devices

- Direct Digital Control (DDC)
  - Control through pulse or constant electronic signals utilizing user input queues and/or software algorithms (packaged or PLC) National Grid incentivized
Poll Question # 1
Your EMS Project

Project Components and Involvement
Do I have a Project?


- Can you solve the problem or increase ease of use through automatic controls?

- From the view of National Grid, would you save energy by installing automatic controls on equipment that did not have it previously?
Poll Question #2
Project Development

- Building Equipment Audit – Identify and collect details of all components involved in “fixing the problem”

- Identify Pre and Post operating conditions – How does the equipment operate now, how do you want it to operate? Use metering liberally

- Equipment/Software requirements – What do you need to install to get the job done?

- Pro tip – Get your National Grid representative involved as soon as possible
Project Documents (Submittal)

- Equipment List
- Points List
- Sequence of Operations (SOO)
- Control Diagram (sometimes with SOO)
Project Documents (Final)

- Equipment List
- Points List – Final As-Built
- Sequence of Operations (SOO) – Contains final setpoints
- Control Diagram (sometimes with SOO) - Contains final control structure
Poll Question # 4
Applying for and Receiving an Incentive
Retrofit or New Construction?

- Retrofit is for adding points onto existing equipment that does not currently have control.
  - This includes either entire facilities or single pieces of equipment receiving only a few points.

- New Construction – National Grid will review opportunities on a case by case basis. The energy efficiency measures must go above and beyond code (RI uses IEEC 2012, MA will use IEEC 2012 very soon) *

*NE Only, No new construction for NYS
Prescriptive or Custom?

- Prescriptive incentives are provided for those projects that fall within the program range (building controlled square footage).
  - If you have a number of points above the prescriptive program allowance, you will receive diminishing savings after the main points are capitalized.
- Projects may go custom at the discretion of the program manager, but requires justification of special project and a significantly larger investment in savings calculations, bid documents, and potentially even pre-metering.
Poll Question # 6
Customer Information

Key points:

• Sq. Ft. (covered by this application)
  
  • Only the ft² touched by the equipment being controlled.

• Covered – facility wide heating points added to central boilers and all heating zones, use entire facility ft²

• Not Covered – DCV added to four out of eight AHUs, but entire facility ft² is used. SHOULD ONLY BE THE AREA COVERED BY THE AHUs

This number is the number used on page 3 to determine max # of points, not the total facility ft²
Point 1: What is “Control” – A point required in order to create automatic changes in the system.

Point 2: Operating EMS means anything providing control from automatic controls, including pneumatics. Time clock – control, OA setpoint – control, etc.

Point 3: Operator’s station shall be capable of monitoring all sensors and field devices IN REAL TIME.

Conditioned space controlled should match space on page 2

Manufacturers’ performance – model numbers and efficiency levels – necessary for post inspection and actual savings
Example Points List

Sample points list table showing type of point and description

https://ctrlspecbuilder.com

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Totals: 4 4 4 3 1 1 0 1 17 12 19

Total Hardware (15)    Total Software (32)
Example Sequence of Operation

Sample sequence showing operating conditions and any interactions between equipment.

https://ctrlspecbuilder.com
Each individual piece of equipment needs to be reflected – combining units makes post inspection extremely difficult

HP/kW/Tons/etc. needs to have all equipment associated. AHU with S/R fans, A/C, and heating coil should have HP info of fans, Tons of A/C, and MBH capacity of heating coil.

Control strategy should be a reflection of the sequence of operations from page 3.
Table 1E: Energy Management Summary

- This sheet is entirely for the prescriptive excel spreadsheet to calculate savings.
- If the vendor/customer has a more comprehensive savings calc, use that in lieu.
- Some control strategies should be greyed out on the form that are not (Cooling equipment will never have DCV or OA HW Reset directly associated to it)
Control Strategies

- 7 Day Scheduling – Ability to show and run equipment based on 7 day schedule (on/off).

- Optimal Start/Stop – typical SOO:
  - “The unit shall start prior to scheduled occupancy based on the time necessary for the zones to reach their occupied setpoints. The start time shall automatically adjust based on changes in outside air temperature and zone temperatures. The unit shall stop prior to scheduled unoccupancy based on the time required to allow the temperature to drift above the occupied setpoint a predetermined amount”

- Night Setback – Ability to set different setpoints for occupied and unoccupied periods.

- DDC Temp. Control – A direct-to-digital controller is used as the temperature sensor in the space. (as opposed to pneumatic)
Control Strategies (cont.)

- CHW Reset – chiller output temp. is increased during periods of low cooling load requirements.

- Enthalpy Economizer – Introduces OA into the air stream when the OA enthalpy is less than the return air enthalpy. (lower enthalpy=less moisture=less mechanical cooling required)

- Static Reset – Resetting supply air static pressure during partial load periods. (VAV systems)

- OA HW Reset – Boiler/furnace output temp. is dropped in response to increases in OA air.

- DCV – demand control ventilation bases air supplied to a space on occupancy, usually based on measuring CO₂.
Hotel Occupancy Sensors

Telkonet hotel controls and other technologies for in-room scheduling, occupied, unoccupied settings. Units must be existing, just like other equipment.
Incentive Project – Best Possible Case

- All equipment proposed for control is metered for a representative time period (heating equipment: Dec – Mar) and nameplate information is given.

- Calculations are provided based on metering data and control strategies, with thorough building load analysis (If whole building, metering on all equipment vs. OA conditions).

- All documentation for proposed system is supplied and matches (SOO does not list control strategies the points list is not capable of).

- Cost is broken out by labor and material for EACH CONTROLLABLE POINT (excluding alarms, software).
Incentive Project – Worst Possible Case

- Equipment nameplate data is missing, equipment that does not exist is claimed for points
- No savings calculations or even estimate of savings
- Proposed documentation is wrong, incomplete, does not match between points list/SOO/equipment
- No costs provided or single lump sum without labor/material broken out
Special Notes

- VFDs are not eligible for control points – If new VFDs, submit VFD application. Controls are included in the VFD incentive. If existing, tying into new EMS will not result in savings for that unit, and would not be incentivized. *

* NE Only, NY would cover the VFD points. VFDs are Custome EEM in NY

- Remove the cost associated with alarm/status points. These are not incentivized, and only the cost of control points should count. This will increase the benefit/cost ratio of your project*

* NE Only, NY would cover 1 Alarm Point per EEM
Getting Started or Next Step

- Contact your National Grid Commercial Sales Representative
- Call 800-787-1706
- Email: efficiency@nationalgrid.com
Today’s Presenters

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