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The Role of the Owners Rep for Energy Performance and Control

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Mr. Bernstein is President of RBCG, LLC providing consulting services to organizations needing help navigating their energy and automation strategy. He has over 30 years experience in industrial, commercial and residential automation and controls technologies. RBCG provides building automation standards, specification development support, educational program development, and facility master planning.

Key areas of focus include energy management and open solutions for energy efficient control networking. He helps organizations evaluate and implement technologies and solutions based upon open interoperable system architectures. He is an active member of several standards bodies including ASHRAE, ANSI/CEA, CEN, LonMark, OASIS and ISO.

Ron holds the position of LonMark International Chief Ambassador, is a Director of the Smart Buildings Institute, curriculum advisor to Mt. San Antonio College, frequent lecturer, published author, and educator.

He holds a BS in Mechanical Engineering from Carnegie Mellon University, a Masters in Psychology from The University of Santa Monica, and a Masters in Philosophy from PTS College of Philosophy.
Learning Objectives:

• Understanding the inter-relation of energy and control
• Navigating the project elements of energy and control systems
• A holistic model of building environments
• The value of an open, integrated control system architecture
• How to get from vision to specification
• Developing a team plan and core objectives
• Education and subject matter expertise
• The Owner’s Representative value
The Scope: Energy and Control
A Holistic Approach

GUI - USER APPS
- Alarms, Reports, Control, Monitoring, Load Shed, Demand Limiting, Financial Performance

Enterprise

Campus
- Utility
- Indoor Facility
- Outdoor Facility
- Energy

Building
- Demand Response
- HVAC
- Lights
- Parking
- Irrigation
- Street Lighting
- Metering
- Sub Billing

Energy and Control

• Direct correlation of energy usage and control systems
• Can’t control what you can’t see
• HVAC, Lighting, Electric SubMetering, Occupancy, Plug Load, Elevators, and more
• All use energy, all need optimization through control environment
• Integration of sub-systems into common “view” improves efficiency
System Integration

FIRE
Functionality checks
Detector service
Valve Pressure
Fire, Life, Safety

SECURITY
Doors
PIR
Integration

ACCESS
Doors
Buildings
Occupancy
Feed Forward

ENERGY
Appliances
Electronics
Utility Monitoring
(Elec/Water/Gas/Oil)
Load Shedding
Air/Water
Heat
Lighting
Solar Generation

Home Electronics
Audio
Video
Computers

24/7 Monitoring
Service/Maintenance
Demand Response
Conditioned Monitoring
Vehicle Charging

HVAC
Air-Handling Unit
Boilers
Pumps
Fans
Energy Control
Hot Water Heaters
Air Quality

Remote Monitoring and Control

Lighting
Appliances
Indoor/Outdoor: Schedules
Occupancy Sensing

SECURITY
Doors
PIR
Integration

ACCESS
Doors
Buildings
Occupancy
Feed Forward

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24/7 Monitoring
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HVAC
Air-Handling Unit
Boilers
Pumps
Fans
Energy Control
Hot Water Heaters
Air Quality

### Process vs. Technical

<table>
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<th>Process</th>
<th>Technical</th>
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<td>Project Ownership</td>
<td>System architecture</td>
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<td>Management requirements</td>
<td>IT and BAS involved</td>
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<td>Teaming, SMEs</td>
<td>Open systems and standards</td>
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<td>Knowledge and education</td>
<td>Scope and spec</td>
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<td>Consensus building</td>
<td>Compliance verification</td>
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<td>Engagement</td>
<td>Integration and Interoperability</td>
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<td>Enforcement</td>
<td>Communication protocols</td>
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<td>Validation, revision</td>
<td>Hardware and software</td>
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Project Progression

Vision
- Go Green, Improve Our Carbon Footprint, Be Better Environmental Stewards

Objective
- Implement strategies in alignment with our corporate green, energy conservation, and operational efficiency objectives

Scope
- Evaluate our processes and procedures and recommend projects to implement our key objectives

Specification
- Create corporate standards and guide specifications as a model for all projects

Adoption
- Work with our vendors, contractors, integrators, and engineers to ensure success

Enforcement
- Enforce all standards through the submittal process, require revision to meet specs

Validation
- Ensure validation process is in place, revise scope, specs and procedures as needed
Project Example

- **Vision**
  - Go Green, Improve Our Carbon Footprint, Improve our Work Environment

- **Objective**
  - Evaluate and improve our facility energy and operational procedures

- **Scope**
  - Update our building operational systems standards to meet industry best practices

- **Specification**
  - Define our corporate standards for energy and environmental comfort and safety

- **Adoption**
  - Interview our vendors, contractors, integrators, and engineers to ensure compliance

- **Enforcement**
  - Create submittal compliance check list for HVAC, Lighting, IAQ, Life Safety

- **Validation**
  - How much energy saved? Better operations – fewer complaints, better staff efficiency
The Teams – Subject Matter Experts

**Internal**
- Facility Management and Engineering
- Energy Engineering
- Construction
- Operation and Maintenance Departments including Electrical and Mechanical
- Information and Data Management - IT
- Security (life safety)
- Corporate or Institutional Management
- Contracting, Budgeting, and Finance Departments

**External**
- Mechanical, Electrical and Controls Contractors
- Master System Integrator
- Project Manager
- Architect
- Consulting Engineer
- Product and System Vendors,
- Commissioning Agent
- Energy Auditor
Energy and Control Effected System

- HVAC – chillers, air handlers, VAV systems, economizers, cooling towers
- Lighting - indoor, high-bay, emergency, facade, walkway, parking lot, and roadway lighting
- Energy Management - metering, sub-metering, and load management
- Power Systems - generation, cogeneration, and renewables
- Life Safety Systems - laboratory fume hood, smoke evac systems, fire detection, suppression, toxic gas monitoring, CO2 monitoring
- Elevator/escalators
- Process Control Systems
- Security and Access Control Systems
- Audio/Visual Systems
- Water Systems - irrigation, hot water/cold water, waste water
- Alarming and Annunciation Systems
- Occupancy and Vacancy Systems
- Monitoring, Control and Reporting - user interfaces, alarming and alerting, trending, scheduling, data analysis
- IT and Data Systems, LAN, WAN, VPN and related systems
3-Tier Architecture

- Tier 1: Enterprise/Campus Connectivity
- Tier 2: Building Infrastructure Connectivity
- Tier 3: Device Level: Sensors, Actuators, Controllers
3-Tier Architecture

Building Data Abstraction

Tier 1
Multiple Buildings
- Campus/Enterprise
  - Multi-Data Construct
  - Demand Response, Load Shed

Tier 2
Single Building
- Multiple Sub-System Integration
  - HVAC, Lighting, Shading

Tier 3
Single Sub System
- HVAC
Tier 3 - DDC Devices
Tier 2 - Infrastructure

Tier 1
- Enterprise Connectivity

Tier 2
- Building Infrastructure
- System Integrator
- Controls Contractor

Tier 3
- DDC Devices

- Communications
- Control Network
- User Interfaces
- BMS/BAS Control
- Controllers
- Routers/Gateways
- Media (wired, wireless, PLC, Fiber)

Building Data Abstraction
## Total Facility Control
### Access to Data

<table>
<thead>
<tr>
<th>Layer</th>
<th>Stakeholder</th>
<th>Data level</th>
<th>Data Types Examples</th>
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<tbody>
<tr>
<td><strong>Enterprise</strong></td>
<td>Owner/Master integrator/Facility Staff/Application Developer/Aggregator</td>
<td>5, 6 - Aggregate, Monitor, Report</td>
<td>Energy savings, pricing, reporting/monitoring, scheduling</td>
</tr>
<tr>
<td><strong>Campus/District</strong></td>
<td>Owner/Master integrator/Facility Staff/Application Developer/Aggregator</td>
<td>4, 5 - Schedule, Report, Monitor</td>
<td>Alarms, Monitoring, Scheduling, Energy Data,</td>
</tr>
<tr>
<td><strong>Premises/System</strong></td>
<td>Owner/Integrator/Facility Staff/Application Developer</td>
<td>3, 4 - DR, Load shed, control, monitor, schedule</td>
<td>Energy mode, ADR Signals, Alarming, Scheduling</td>
</tr>
<tr>
<td><strong>Zone</strong></td>
<td>User/Occupant/Manufacturer/Vendors/Integrators</td>
<td>2, 3 - Status/Mode/Scene, schedule</td>
<td>Occupied mode, Load Shed mode, Lighting scene</td>
</tr>
<tr>
<td><strong>Room</strong></td>
<td>User/Occupant/Manufacturer/Vendors/Integrators</td>
<td>2 – Status Mode Scene</td>
<td>Occupied mode, Load Shed mode, Lighting scene</td>
</tr>
<tr>
<td><strong>Device</strong></td>
<td>Manufacturer/Vendors Integrators</td>
<td>1 - on/off/control, low level data</td>
<td>Temp, pressure, status, set points, mode, scene</td>
</tr>
</tbody>
</table>
Information Access – The Key

- Alarming
- Control
- Monitoring
- Setpoint changes
- Overrides
- Schedule changes
- Maintenance scheduling
- Event reporting
- Quality control
- Energy Management
- Enterprise wide consistency
Information Access – The Key

- And I want it from my browser
- From any computer on my network
- Or from home
- With different access levels for different personnel needs
- With my full campus integrated into one system
- And all of my subsystems working together
- To simplify my facility management
- And reduce my operating costs!

- Alarming
- Control
- Monitoring
- Setpoint changes
- Overrides
- Schedule changes
- Maintenance scheduling
- Event reporting
- Quality control
- Energy Management
- Enterprise wide consistency
Success Concepts

- Embrace Open Systems
- Interoperable Communications
- Common device and sub-system profiles
- No Closed or Locked-In vendor solutions or systems
- Manage from data monitoring and control, not bells and whistles
- Define Scope, Standards, Specifications
- Top Down Design, Bottom Up Implementation
Integration Examples

• Sharing data from sensors
  – Occupancy sensor data used by HVAC, Lighting, and Security

• Energy consumption data
  – Used by demand limiting control strategy
  – Real time adjustments via control system – load shed

• Scheduling by office workers
  – Direct control over environment
  – Lighting, HVAC, Security

• Alarm and equipment management
  – Single alarm, multiple recipients
  – Remote acknowledgement and response
  – Preventative maintenance based upon actual usage
Convergence
Of Two Separate Worlds
With it you have –

One Complete System

Control

Interoperability Standards

Data

Control Networks
- LON
- BACnet
- Zigbee
- Modbus
- DALI
- Etc.

Ethernet
- TCP/IP
- UDP
- FTP
- SOAP/XML

Qualifications of the Owner’s Rep

• Independent – not tied to a particular vendor, product, or system approach
• Experienced – background in control, networking, facility systems, market and technology, able to advise on all aspects of the master planning process
• Professional – providing team leadership, quality reporting, objective setting, facilitation through the process
• Supportive – able to listen, digest, and assimilate the high level master plan objectives and also be able to deal with low level issues
• Networked – able to bring in Subject Matter Experts (SME) as needed into the process should the need arise
Responsibilities of the Owner’s Rep

- Scope, standards, and guide spec support and development
- Training program needs identification and development
- Working with vendors and industry to ensure compliance
- Evaluating open systems technology, standards, and approaches that are “owner focused”
- Supporting fair competitive bidding best practices by developing guide specs that are non-proprietary and non-sole-sourced
- Coordinating internal and external teams to establish ability and commitment
- Reporting, documenting, and baselining the process
- Working with commissioning agents’ procedures and requirements
- Understanding of costs, timing, quality, and reliability requirements
Summary

• Facilities are and will continue to be multi-platform, multi-protocol, multi system
• Communication and integration standards are critical
• New applications, new platforms - common data access
• New requirements emerging for connectivity from the devices to the building to the enterprise
• Multi-Tiered system architecture follows the contractor responsibilities
• An Owner’s Representative can provide management and project oversight and expertise
Questions/Discussion

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