Introduction to Energy Efficient Design

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Outline

- Current State of Energy Systems Design
- Implications for Energy Conservation
- Costs
- Barriers to Improvement
Introductions

- Presenters
- Attendees
- Minnesota Power Representatives
Current State of Energy Systems Design


- Designer Selection Process
  - Architects Selected by Owners
  - Engineers selected by Architects
  - Fixed fee
  - Commodity perception
  - Necessary evil
Current State of Energy Systems Design

- Project Design Team
  - Architect
  - Engineers
  - Owner’s Project Manager/Representative
  - Future Users
  - Construction Manager (optional)
  - Future Building Operators (optional)
Current State of Energy Systems Design

- **Engineering Design Process**
  - Building and space types definition by Architect
  - Energy systems schematic design narrative
    - Based on last “similar” project
    - Corporate standard template
- **Design Development**
  - Block load calculations
  - Coordination with Architect for space requirements
  - Rough lay-out of equipment and major distribution routes
Current State of Energy Systems Design

- Engineering Design Process (cont’d)
  - Construction Documents
    - Delay as long as possible due to ever-changing Architectural plans
    - Detailed load calculations
    - Final equipment selections, layout, and distribution sizing
    - Corporate standard specifications
      - O&M training requirements
      - O&M documentation requirements
      - Punchlist & Closeout
Current State of Energy Systems Design

- Engineering Design Process (cont’d)
  - Operations & Maintenance Planning
    - Design engineers with little or no systems operations experience
    - Industry standard boilerplate O&M training requirements
    - Industry standard boilerplate O&M documentation requirements
Current State of Energy Systems Design

- Engineering Design Process (cont’d)
  - Bid Document Addenda
    - Final coordination details
    - Control system design
  - Low Bidder Selected
Current State of Energy Systems Design

- Project Timeline
  - Determination of Need
  - Planning & Funding Approval
  - Designer Selection
  - Design
  - Construction
  - Move-In

- Owner Schedule Constraints
  - Financing
  - Domino affect of relocating people
  - End of leases
Current State of Energy Systems Design

- **Objective of Design Process?**
  - Drawings and specifications for use in bidding
  - Not so much concern about what comes next
Current State of Energy Systems Design

Summary

- Minimal or no analysis of alternate systems
- Architectural-Engineering integration limited to space requirements
- Minimal or no systems operations and integration consideration
- No meaningful, enforceable operations and maintenance planning
Implications for Energy Conservation

- Minimum Energy Code Compliance
- Common Systems Potentially Familiar to Building Operators
  - Most likely to be operated as intended — just by chance, not by planning
- Frustrated Energy-Conscious Owners
  - Inadequate or non-existent design phase comparative systems analysis
- Design Engineers Familiar with Equipment & Systems
  - Lower risk of design errors, change orders, and/or post-construction troubleshooting
Costs

- Design Fees
- Procurement & Installation Costs
- Troubleshooting Costs
- Remediation Costs
- Energy Costs
Barriers to Improvement

- Commodity Design Engineering Fees
- Design Engineers Unfamiliar with New Systems
- Rushed Design Process
- Lack of Experience Evaluating Energy System Options
- Lack of Experience Operating Building Systems
- High Risk/Low Reward for Innovative Design
Preconference Workshop Agenda

- Lighting & Lighting Controls Design
- HVAC & Controls Design
- Case Studies
- Lessons Learned & Best Practices