Session III: Cost Considerations

Moderator: Dana Christensen
Panelists:
Phil Macey
Paul Torcellini
Rich von Luhrte
Managing Costs

Paul Torcellini, PhD, PE
Group Manager,
Advanced Commercial Buildings Research Group
• **Owner made tough decisions up-front**
  • Set budget
  • Sought maximum value for that budget
  • Prioritized goals

• **Design-Build procurement process**
  • Managed the team to the RFP and its substantiation criteria
  • Rewards

• **Allowed design-build team to use creativity to maximize value--innovation**

• **Owner did not solve the problem (but knew the solution existed)**
U.S. Department of Energy’s RESEARCH SUPPORT FACILITY at the National Renewable Energy Laboratory (NREL)

Richard L. von Lahrte FAIA LEED AP
RNL, President/Principal in charge
Architect of Record RSF/RSF 2
Performance-Based Design-build

Substantiation

Energy Target / Project Objectives

Incentive Award Fees
Performance Objective / Energy Target

Cost Control / Risk Management

Front Loaded + Energy Driven Design

Bridge the Gap Between Design + Occupancy

INTEGRATED DELIVERY
Average Cost: $334/SF
RSF Cost: $259/SF
MODULAR
1. Orientation and 60’ (18.3m) Depth
2. PV Array
3. Solar Shading / Daylighting
4. 25% WWR
5. Radiant Cooling & Heating
6. Decoupled Ventilation with UFAD
7. Operable Windows
8. Thermal Mass
9. Transpired Solar Collector
10. Thermal Labyrinth
Passive Design

Baseline Energy Use
- Lighting
- Heating
- Cooling
- Ventilation
- Plug Loads

Passive Design
- Orientation / Massing
- Daylighting
- High Performance Envelope
- Passive Heating
- Passive Cooling
- Natural Ventilation

Reduced Energy Use
- Lighting
- Heating
- Cooling
- Ventilation
- Plug Loads
NATURAL VENTILATION
**Green Facts**

NREL
Research Support Facility
Golden, Colorado

<table>
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<th>Category</th>
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<td>Innovation &amp; Design</td>
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Managing Costs for Net Zero Energy

Philip Macey, AIA  LEED AP
Division Manager - High Performance Building - Haselden Construction
What is different about sustainable projects and their management?

- The traditional approach
  - Balance cost, schedule, and program

- The integrated and green approach
  - Sustainability integrates with all and is a new element
    - Cost – now include the value of energy performance
    - Schedule – balance speed of construction/first cost with energy cost and operations costs
    - Program – now need energy goal in the project description
  - Sustainability – look at whole site and whole building construction, materials and impacts
Constructing Zero Energy

Leadership Teams

Design

Arch Client PM
Client and Contracts

Arch Tech PM
Tech. and Doc's

Mech. Eng. Client PM
Client and Models

Mech. Eng. Tech PM
Tech and Doc's

Build

Const. DB PM
Client and Contracts

Const. PM
All Construction

MEP Pre-Const.
All MEP

MEP Pre-Const.
All MEP
Constructing Zero Energy

Integrated Design and Construction

5 Sided Problem Solving

- Cost and Budget Models
- Energy Models
- Thermal Comfort Models
- Daylight Models
- Architecture and Program Models
Constructing Zero Energy

• The big 5 subcontractors - select early for cost control

  • Structural Steel
  • Mechanical/Plumbing – AHU’s, Hydronic, pumps
  • Electrical – lighting, cabling, electrical distribution
  • Envelope – the single most costly per SF and the most impactful to energy
    • Glass and Glazing
    • Pre-cast concrete wall system
Constructing Zero Energy

- LEED Platinum & Cost Control

  - Security and Sustainability: first attention
  - Focus: Long term pay back
  - Contract requirement okay, must allow DB to control point selections
  - Early, team-wide commitment critical – that means put it in your RFP
  - Will change typical choices and costs
  - Limit cost impacts = do it from start