

# Session III: Cost Considerations



**Moderator: Dana Christensen**

**Panelists:**

**Phil Macey**

**Paul Torcellini**

**Rich von Luhrte**



# The Road to Net Zero



**Dana Christensen**

**Deputy Laboratory  
Director Science &  
Technology**

**RSF Workshop**

**July 27-28, 2011**



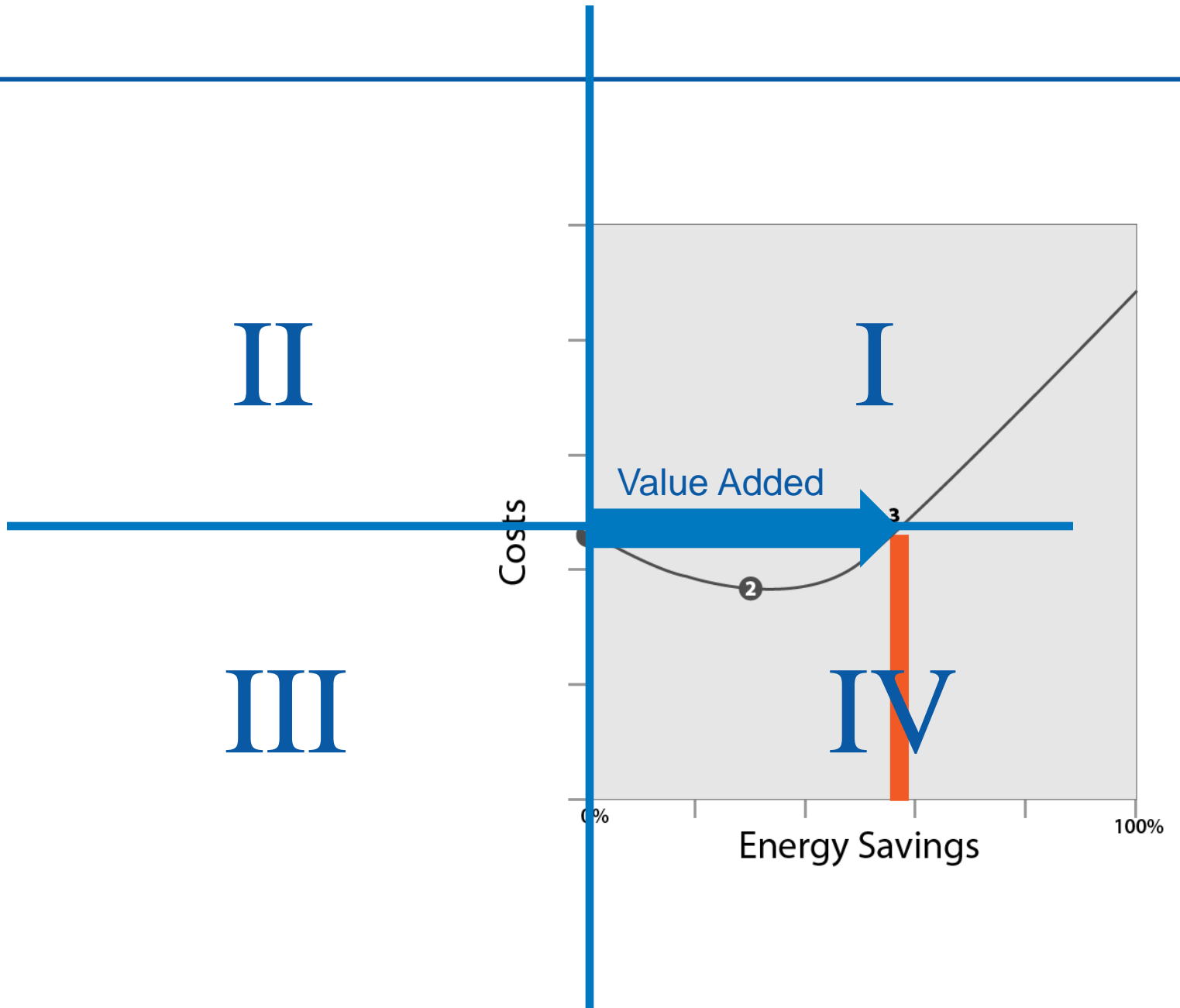
*Innovation for Our Energy Future*

# 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)



RNL

Richard L. von Luhrte FAIA LEED AP  
RNL, President/Principal in charge  
Architect of Record RSF/RSF 2

Performance-  
Based  
Design-build

Substantiation

**PROCUREMENT**

Energy Target /  
Project  
Objectives

Incentive Award  
Fees

Process

Performance  
Objective /  
Energy Target

Cost Control /  
Risk  
Management

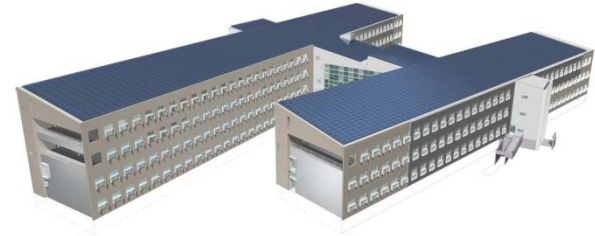
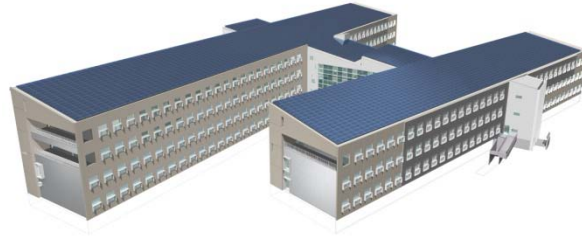
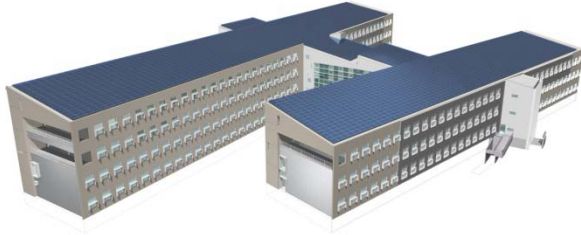
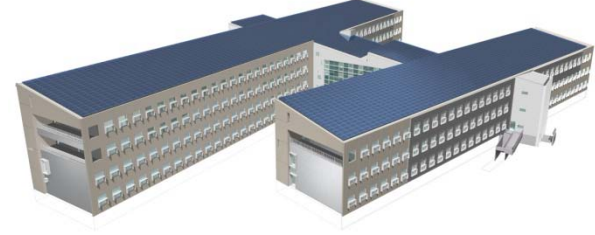
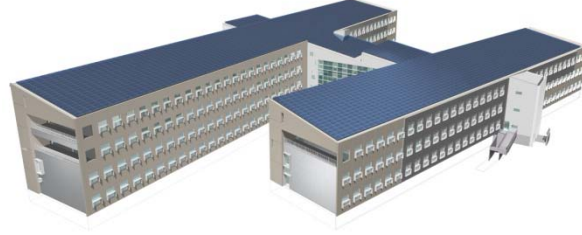
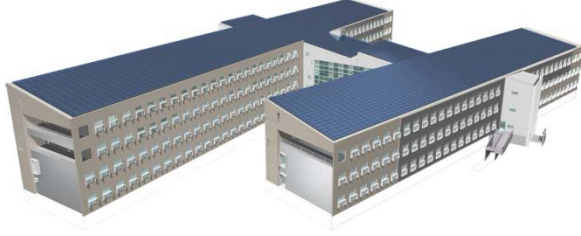
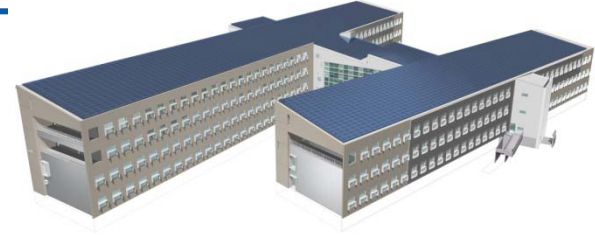
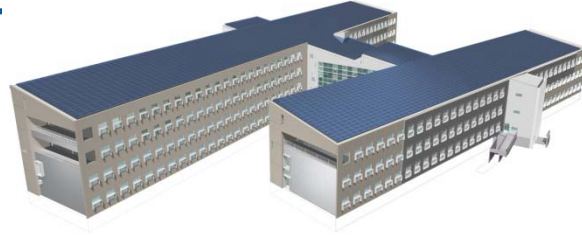
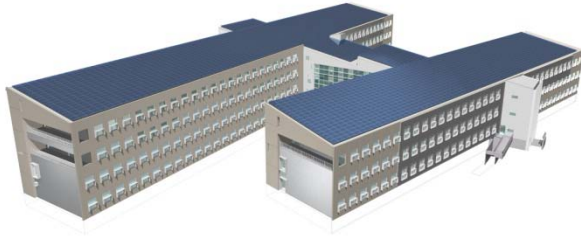
# INTEGRATED DELIVERY

Front Loaded +  
Energy Driven  
Design

Bridge the Gap  
Between Design  
+ Occupancy

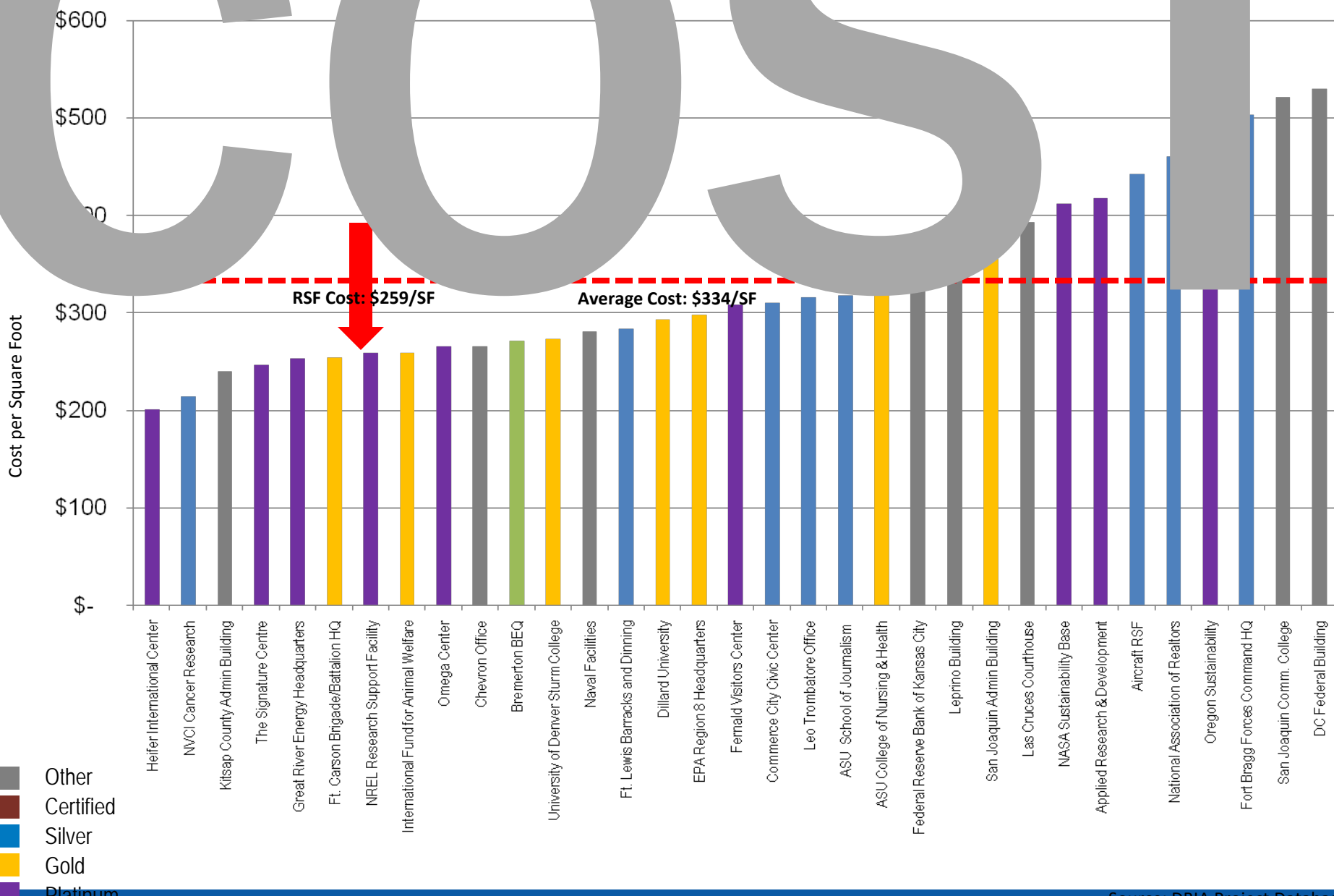
# Process





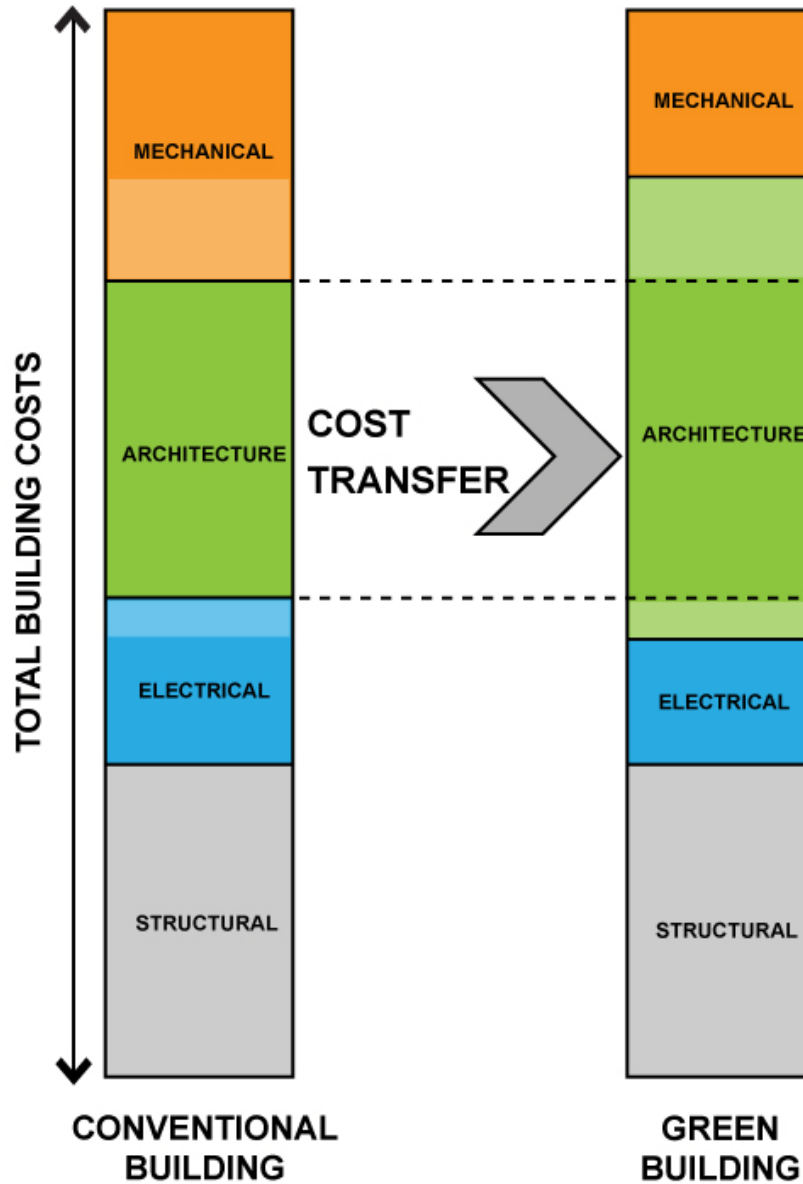
REPLICABLE?

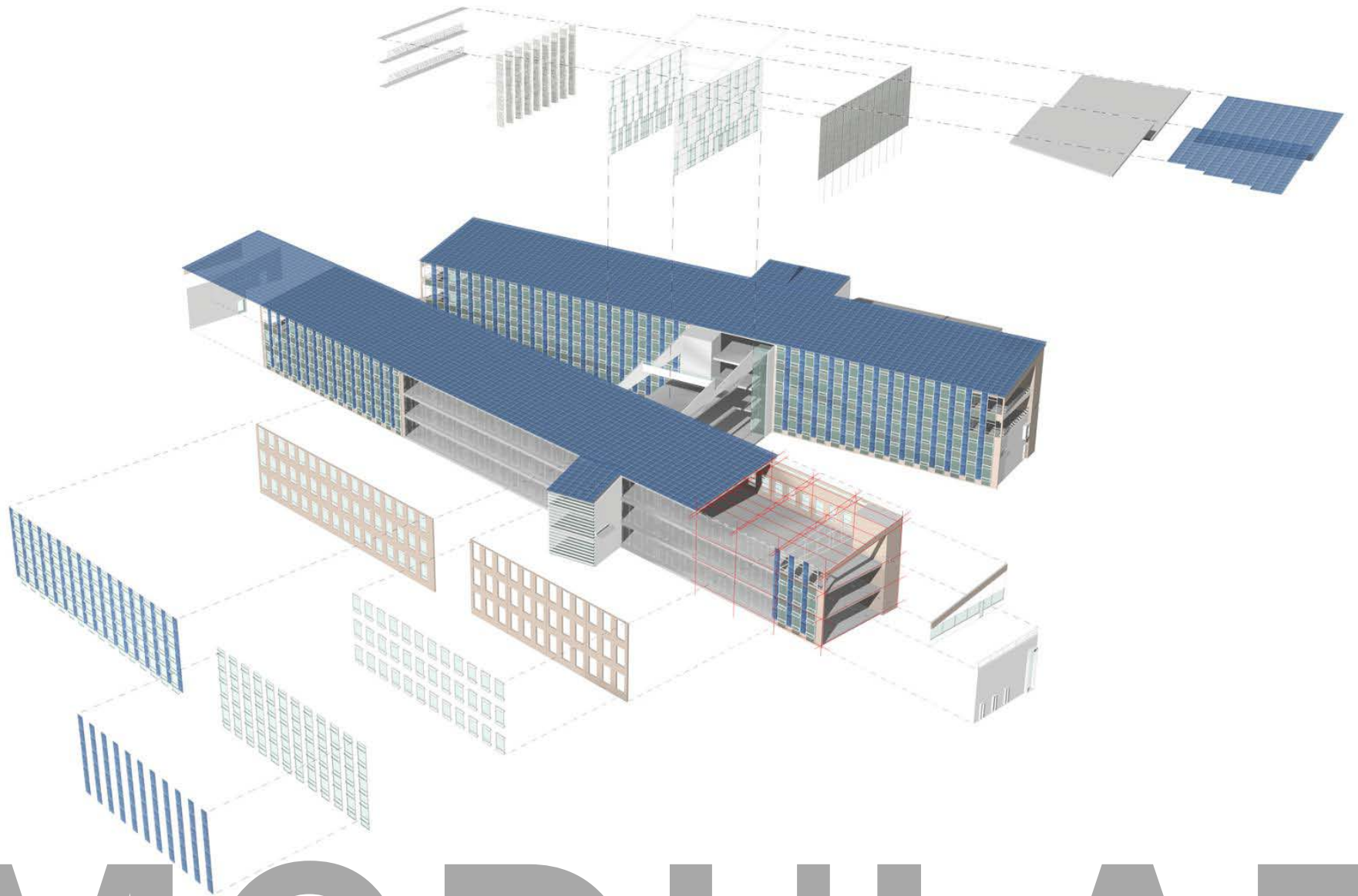
# COST



- Other
- Certified
- Silver
- Gold
- Platinum

# COST TRANSFER





MODULAR

# INTEGRATION



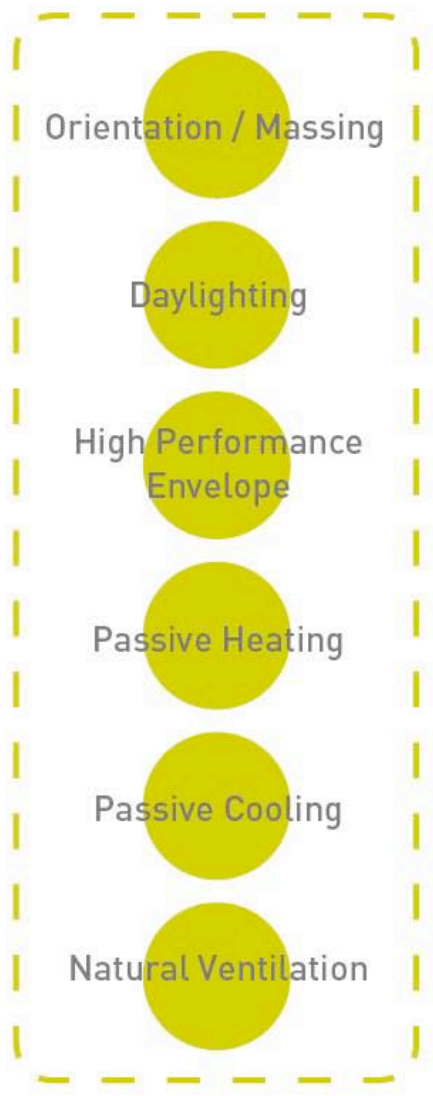
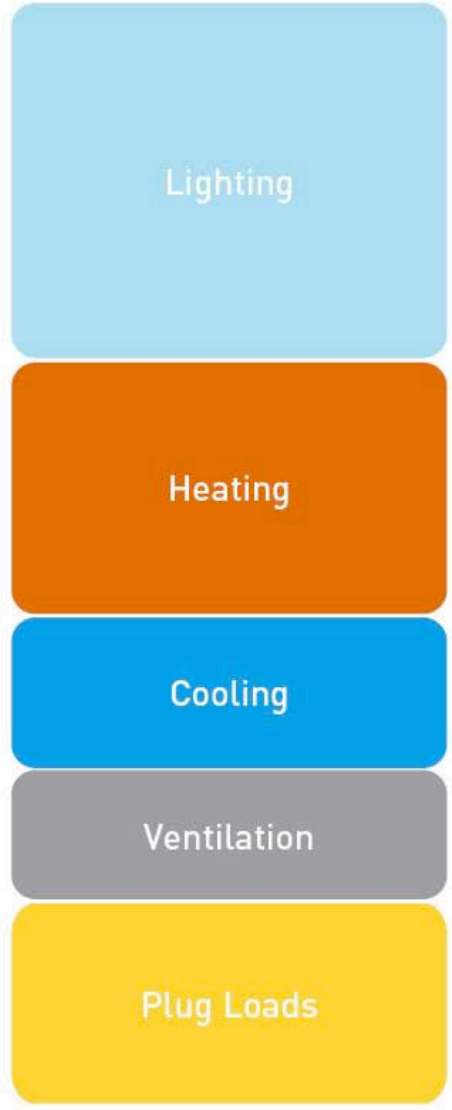
1. Orientation and 60' (18.3m) Depth
2. PV Array
3. Solar Shading / Daylighting
4. 25% WWR
5. Radiant Cooling & Heating

6. Decoupled Ventilation with UFAD
7. Operable Windows
8. Thermal Mass
9. Transpired Solar Collector
10. Thermal Labyrinth

# P

## Passive Design

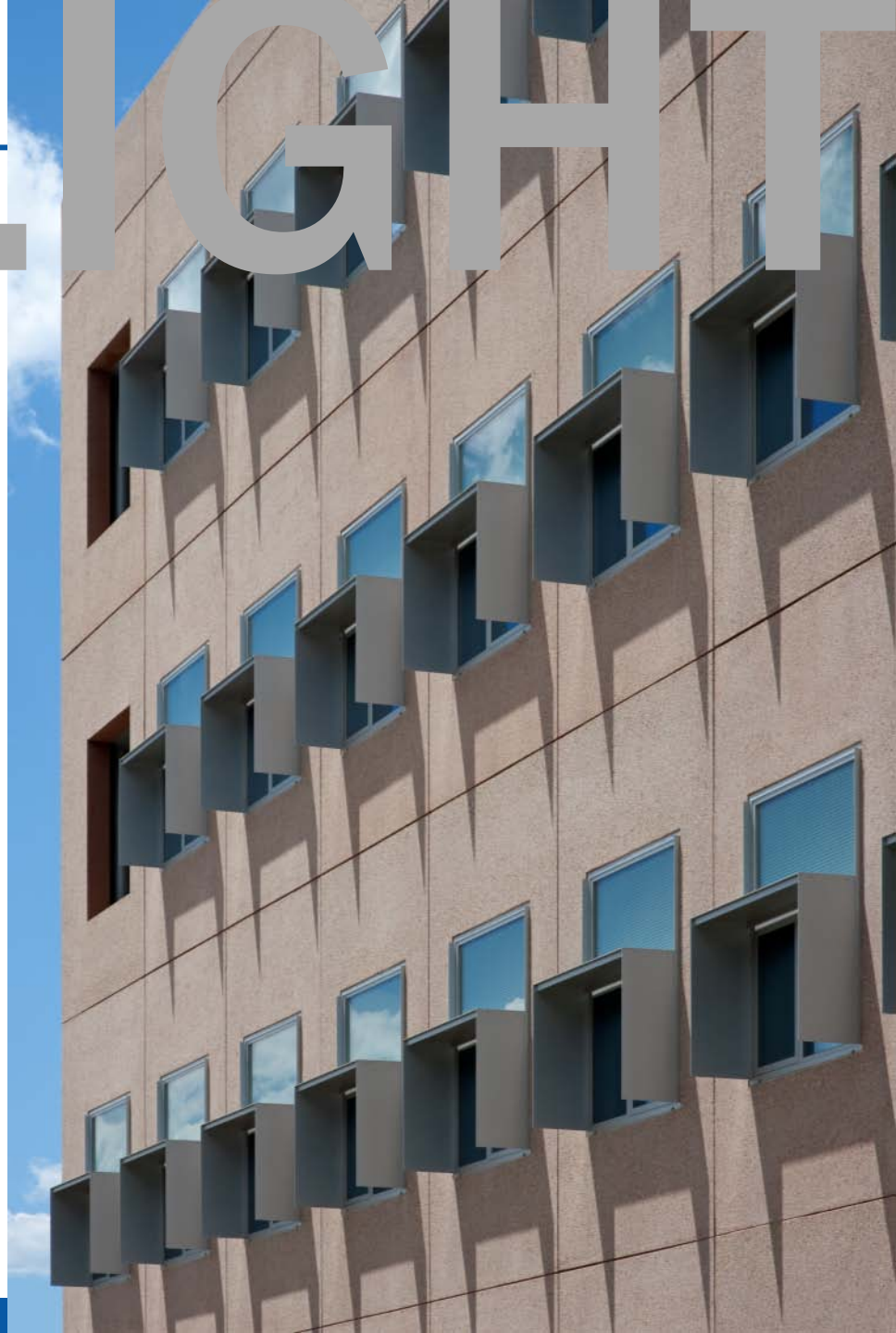
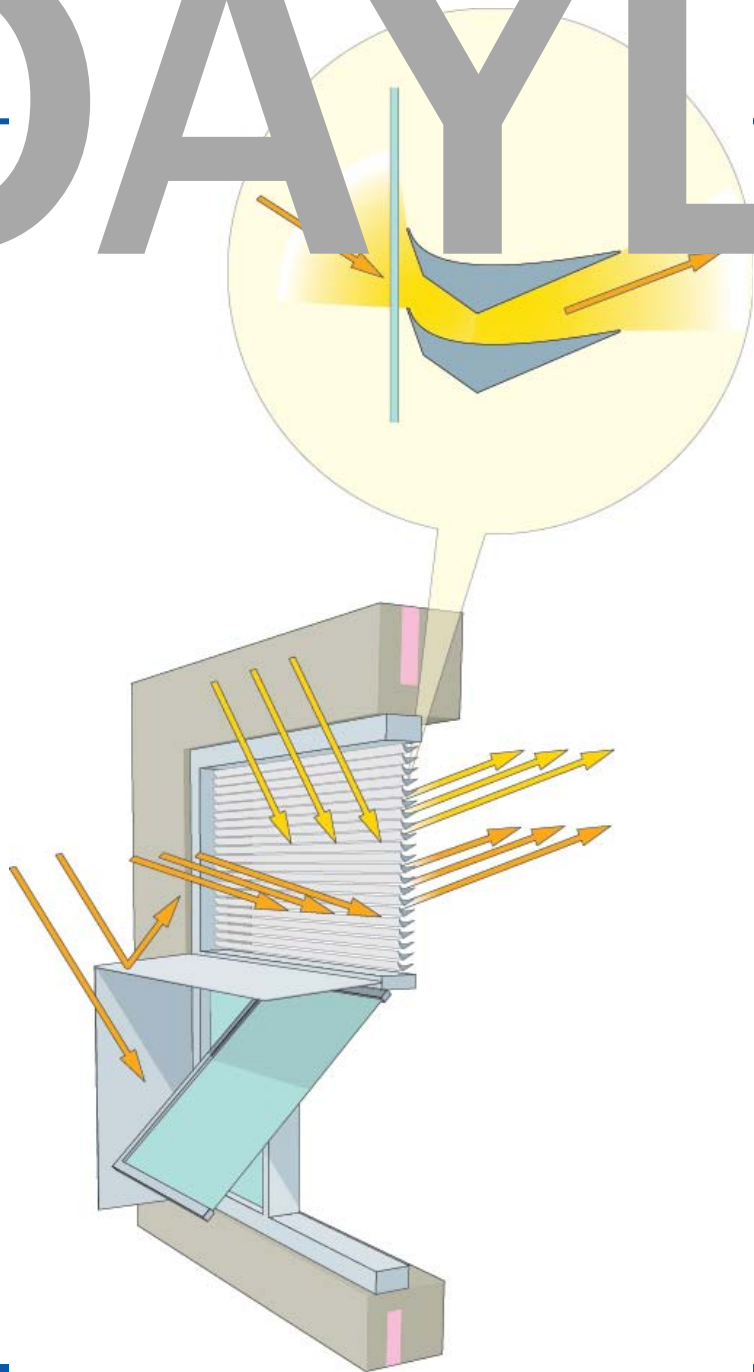
### Baseline Energy Use

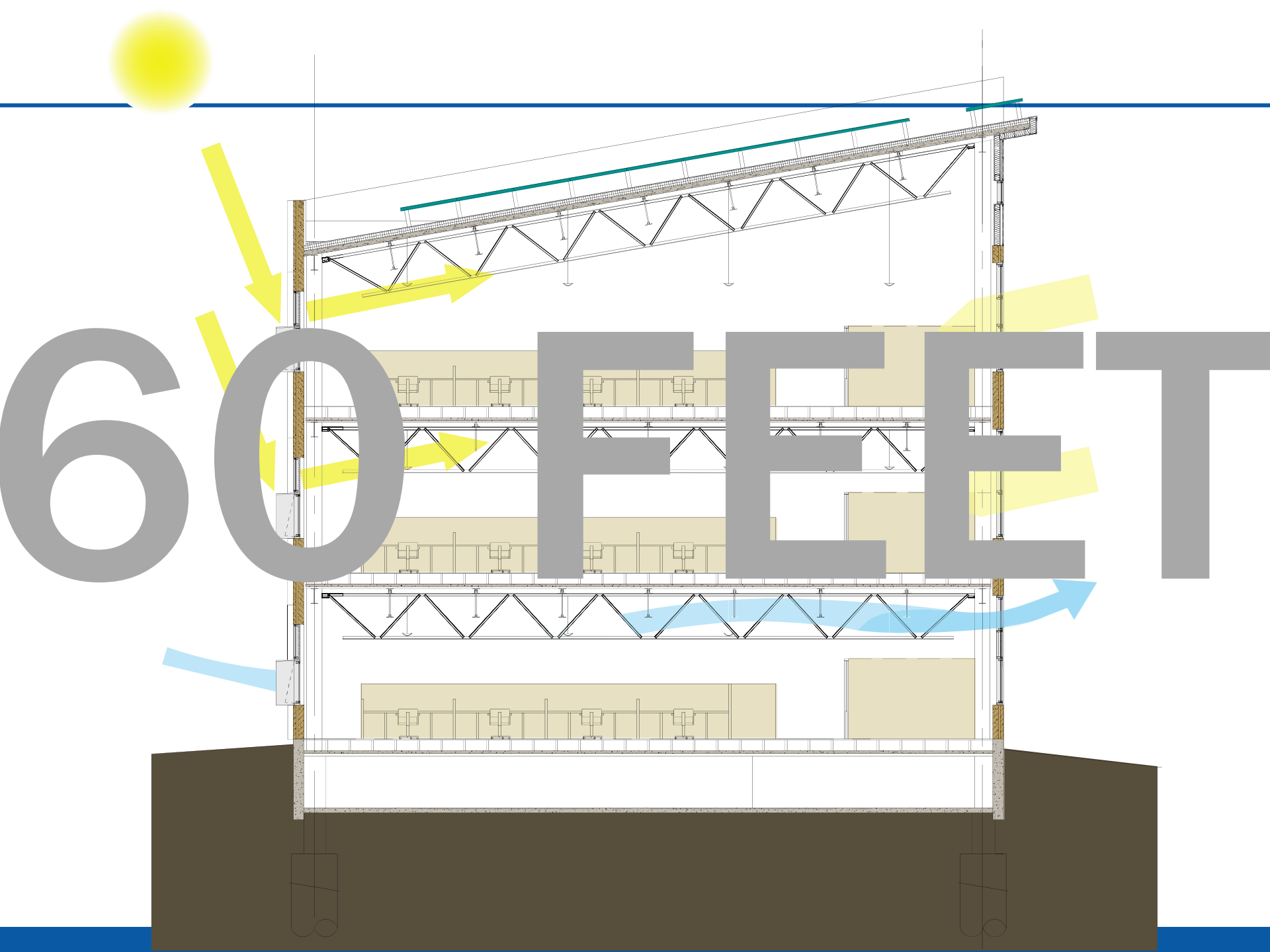


### Reduced Energy Use



# DAYLIGHT





60

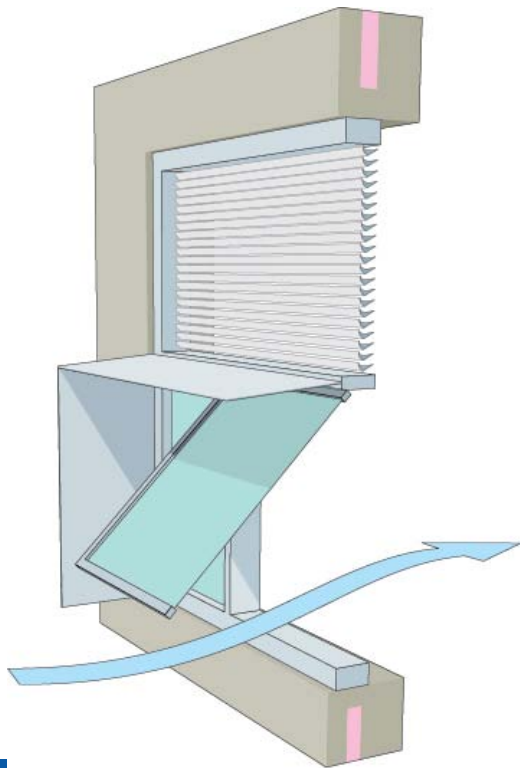
FEET





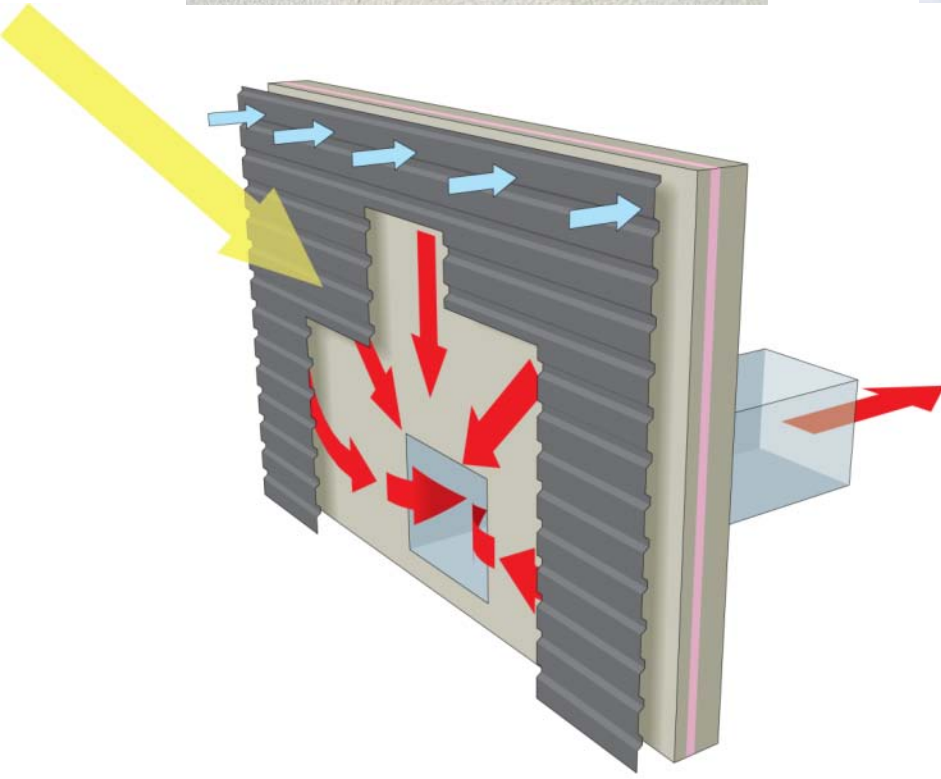
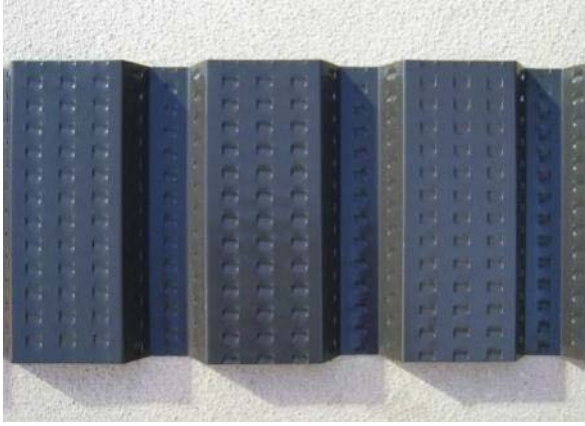
OPEN

# NATURAL VENTILATION

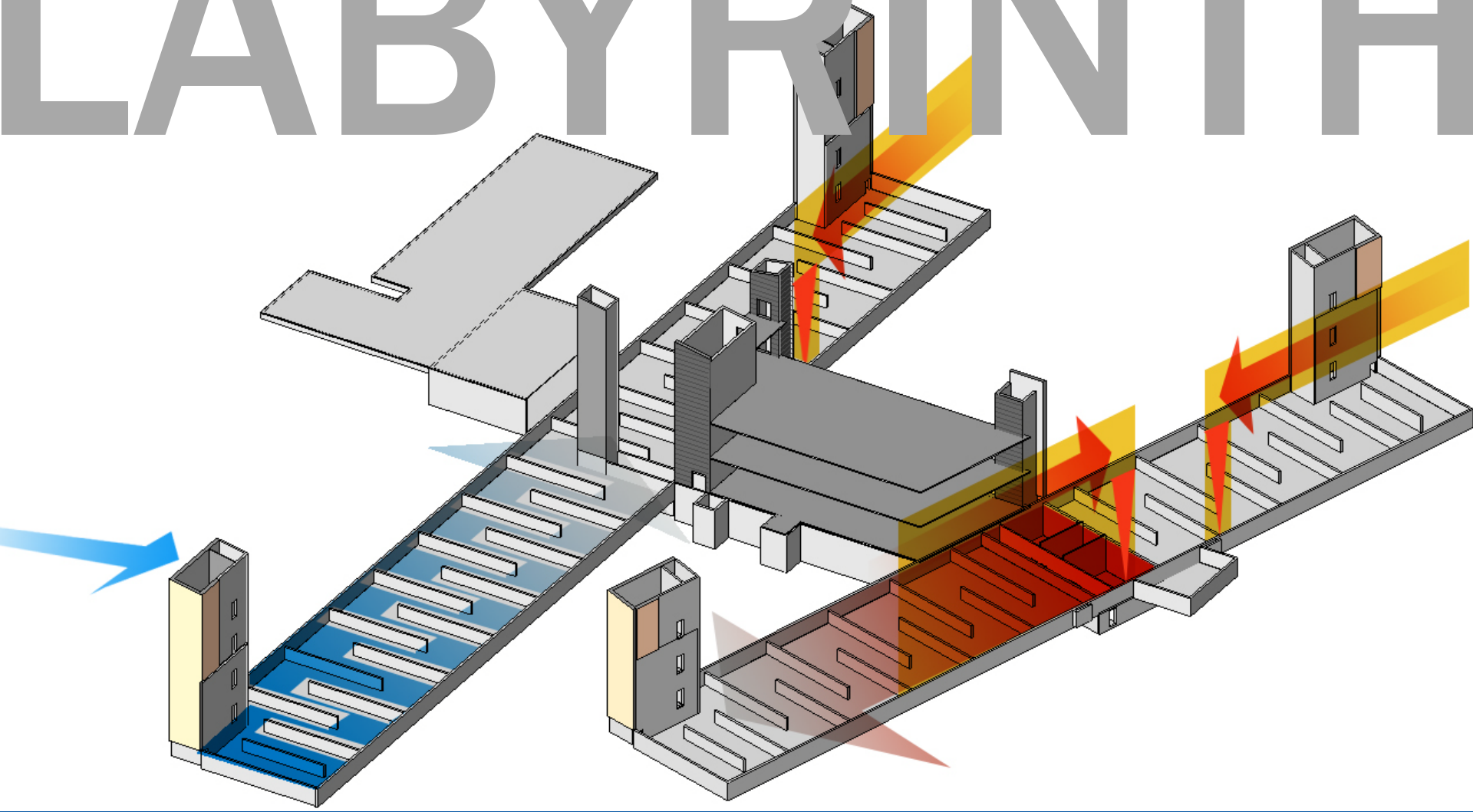


# TRANSPIRED

# SOLAR



# THERMAL LABYRINTH



# PLATINUM

## Green Facts

NREL  
Research Support Facility  
Golden, Colorado

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LEED-NC rating out of 69

**Platinum\*** 59

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Sustainable Sites 12

Water Efficiency 4

Energy & Atmosphere 17

Materials & Resources 7

Indoor Environmental Quality 14

Innovation & Design 5



U.S. Department of Energy's  
National Renewable Energy Laboratory

# Research Support Facility (RSF)



## 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**

# NREL

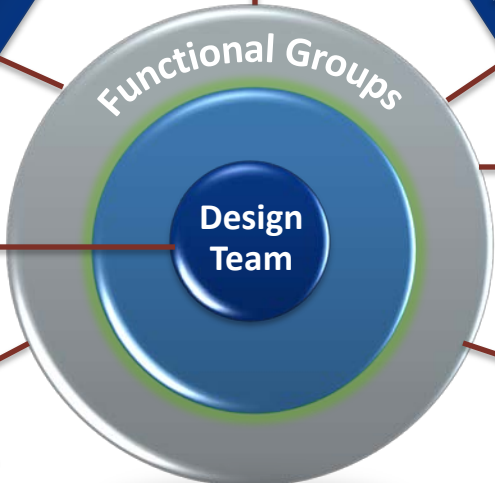
## Executive Team

Construction President  
Architect Project Principal

Construction CEO  
Architect Project Principal

## Project Management Team

Architect Client Project Manager      Construction DB Project Manager



Electrical

Mechanical/  
Plumbing

Precast  
Concrete

Structural  
Steel

Window  
Systems

## Functional Groups

- LEED
- Building Skin
- Budget
- Energy
- Core/Shell
- Interiors & Program
- Commissioning

## Design Team Roundtable

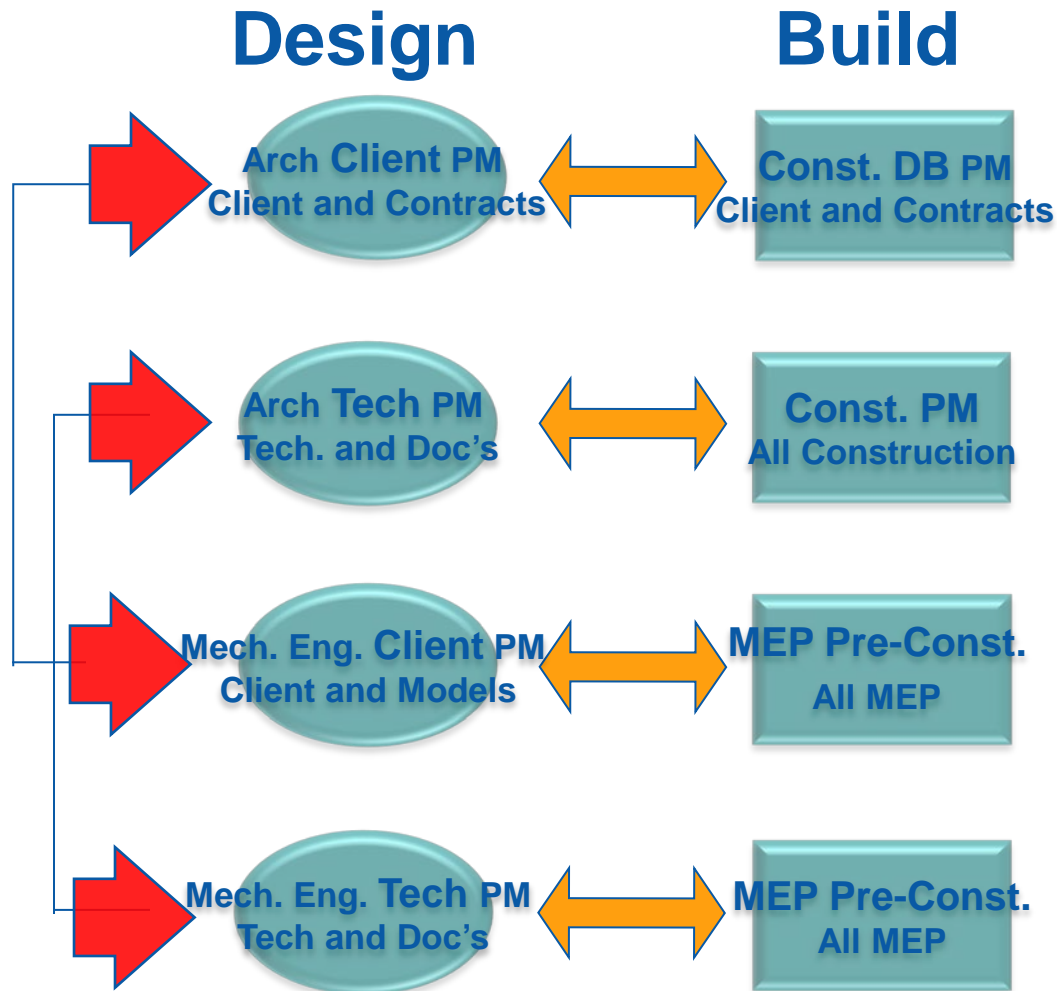
- Sr. Preconstruction Manager
- Design Principal
- Sr. Interior Designer
- **Architectural Technical PM**
- Project Architect
- Construction Project Manger
- MEP Principal

Early Selected Subcontractors



# Constructing Zero Energy

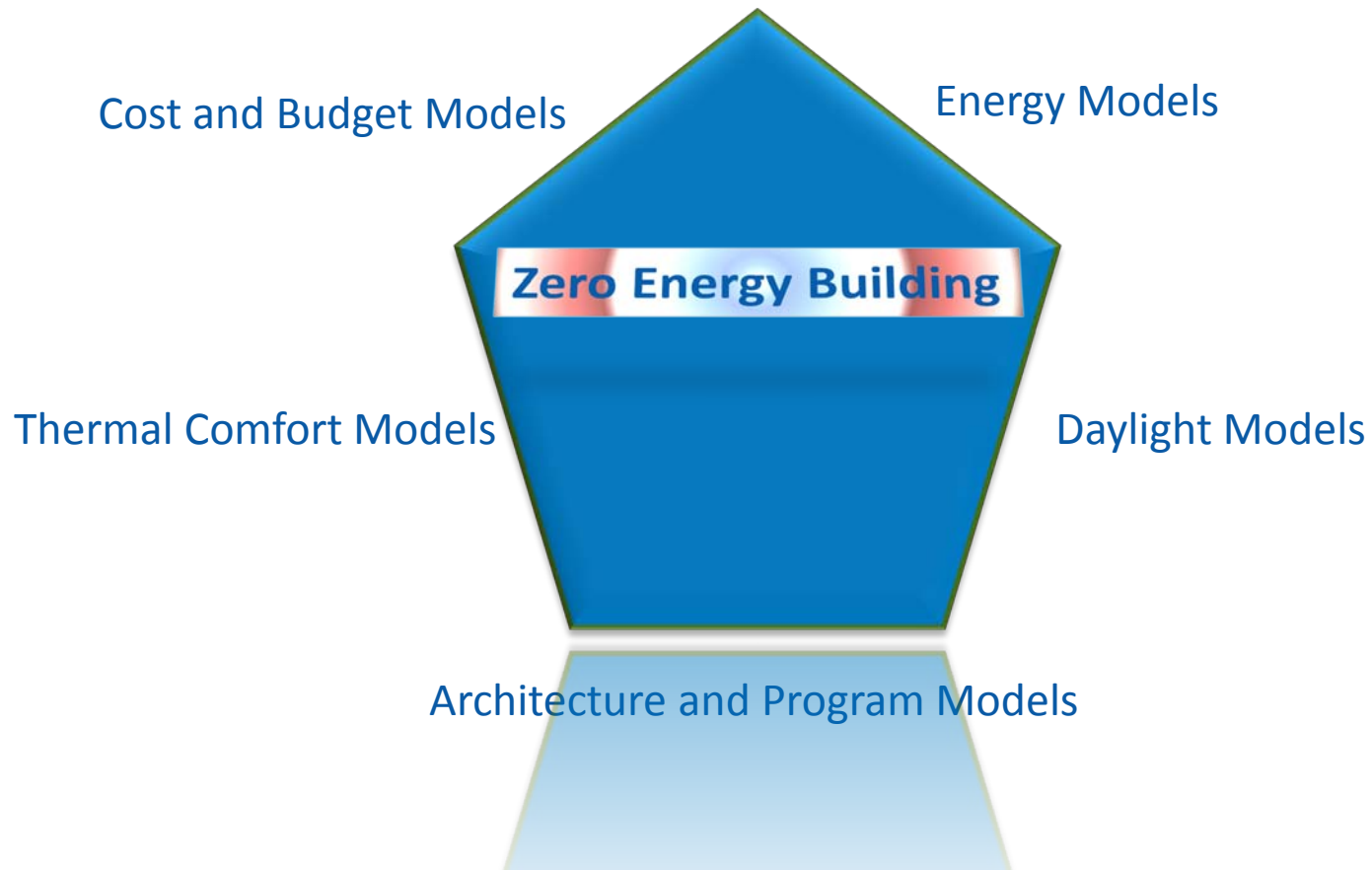
## Leadership Teams



# Constructing Zero Energy

Integrated Design and Construction

## 5 Sided Problem Solving



# 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**

