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Zero Net Energy: Design Strategies?

Three Similar Case Study Buildings, Similar Climate

Some Similar Design Strategies But Some Very Different

Still, Proven ZNE Performance

What Gives…?

1

Three Similar Buildings

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	Floor Area	Annual Energy Use	Installed PV	Excess Produced
DPR Construction	24,000 (2 Stories)	6.6 kwh/sf	4.9 w/sf	1.0 kwh/sf
IBEW-NECA Training Center	45,000 (1 Story)	4.8 kwh/sf	3.4 w/sf	1.1 kwh/sf
435 Indio Way	32,000 (1 Story)	4.0 kwh/sf	3.6 w/sf	0.5 kwh/sf

Some Similar Design Strategies

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	Daylighting	Natural Ventilation	High Efficiency HVAC
DPR Construction	√ (Limited)	No	√
IBEW-NECA Training Center	√	√ (Limited)	√
435 Indio Way	√	√	√

Very Different Design Strategy

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	Well Insulated Building Envelope
DPR Construction	No
IBEW-NECA Training Center	No
435 Indio Way	√

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Clear Design Strategies for California Marine Climates

Daylighting

Natural Ventilation (“Smart”)

Efficient, Decentralized HVAC

2

Proven Design Strategy #1

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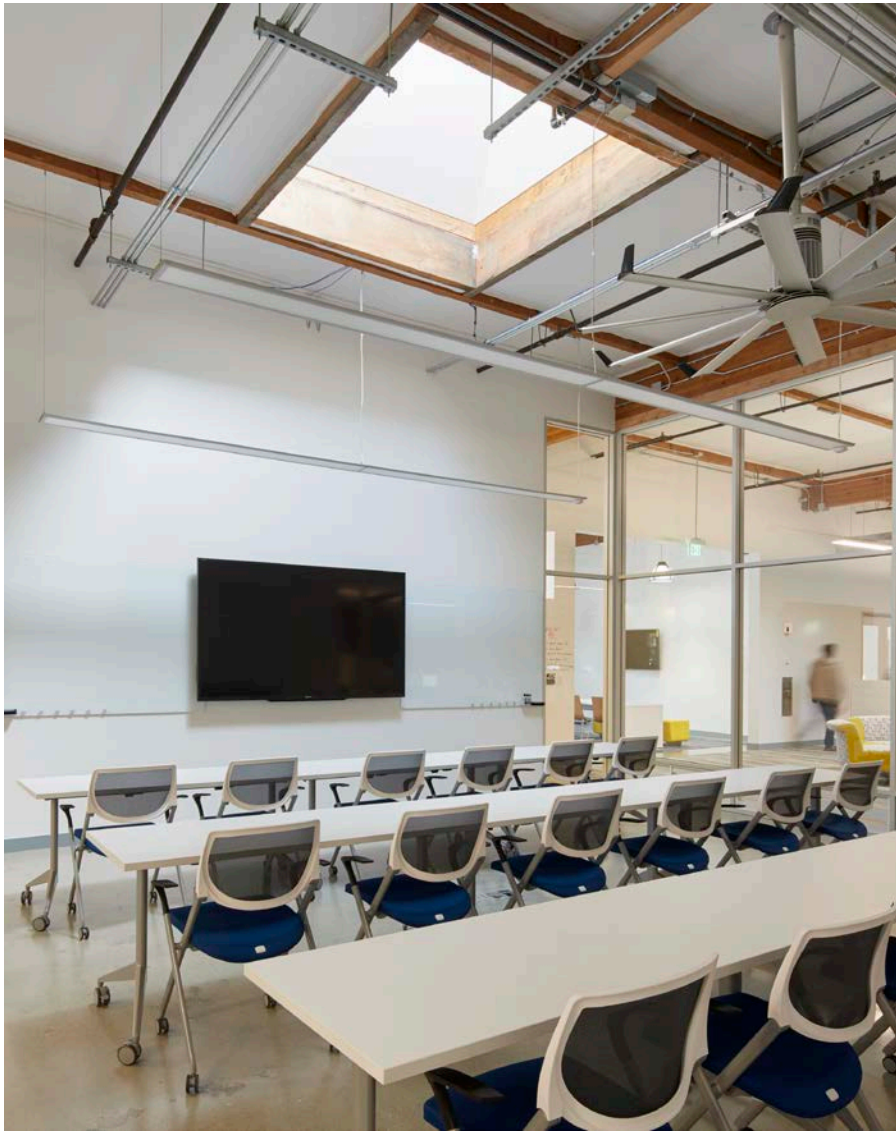
Daylighting

- Requires Architectural Design Skill
- Controls System integration critical part of design
- Can offset 90% of lighting load



Proven Design Strategy #2

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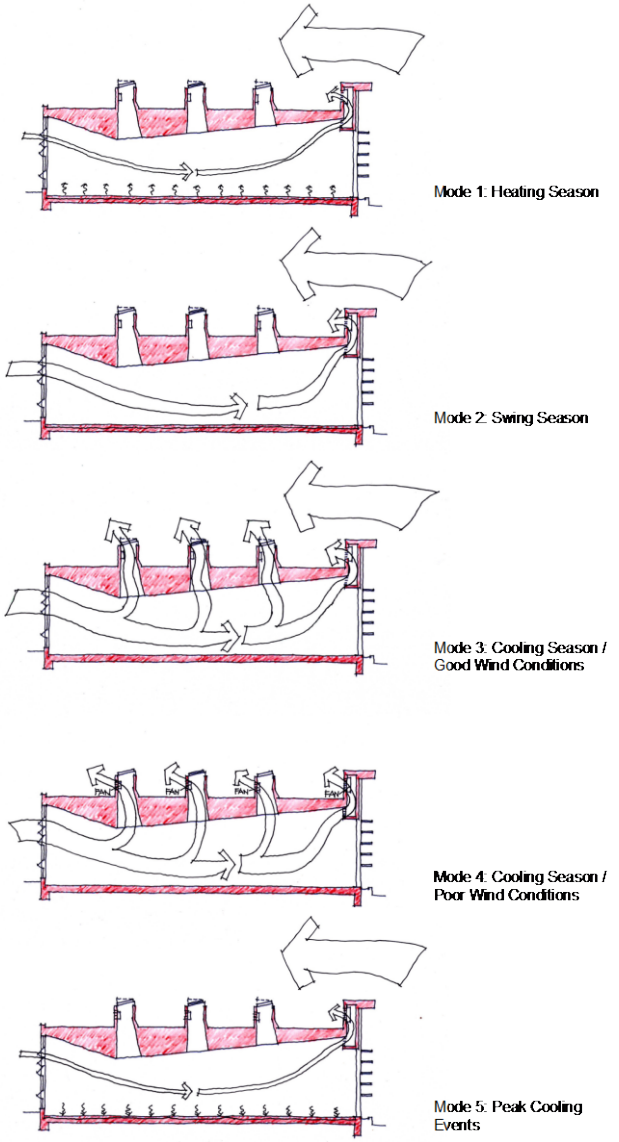
Natural Ventilation

- Really part of HVAC System Design—Mixed Mode Operation
- Good Cooling Strategy! (Night Purging)
- Controls System integration again is critical



Proven Design Strategy #3

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Efficient, Decentralized HVAC Systems

- Avoid Central Plant
- Separate Outside Air Supply from Heating and Cooling
- Controls System integration again! Integrate BMS with other control systems

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Practical Constraints and Real-World Solutions

Building/Site Constraints

Control Systems

Cost

California Code: ZNE Required

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Building/Site Constraints

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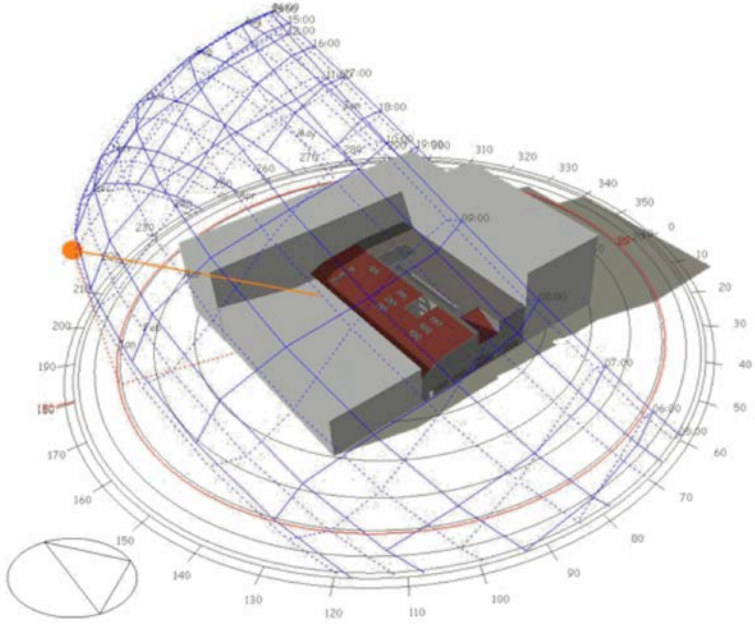
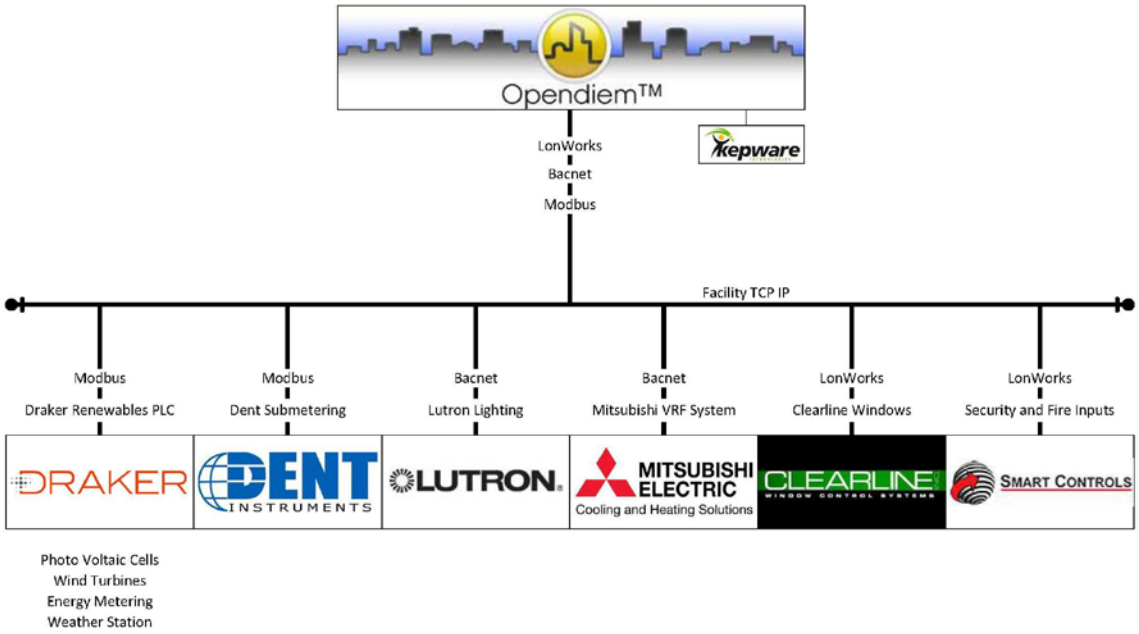
Design Required

- Many strategies are available for us
- It's easy in our climate



Control Systems

- Master System Integrator
  - Coordinates communication protocols
  - Active in design, commissioning and occupancy phases
- Manufacturer's Package
  - Natural Ventilation System Design



Cost

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- PV System Required
  - Costs around $4/watt
  - At 4 watt/sf, that's $16/sf additional first cost for PV system considered in isolation
  - Typical construction cost is $500/sf to $1,000/sf
- For fixed budget project, 2% to 4% is within Architect's normal skill set
- Cost Reductions due to ZNE
  - Simpler HVAC system
  - Lower maintenance and replacement costs
  - Lower energy costs (zero!)
  - As investment property, building is more profitable (lower reserve requirement, earlier lease-up, higher rent, lower tenant churn rate)

California Code: ZNE Required

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2030:
All New Buildings in California to be ZNE

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Q&A