

A photograph of a modern office building interior. The space is open-plan with a mezzanine level. A large, intricate sculpture made of many thin, light-colored wooden slats is the central focus. A man is sitting on a green cushioned bench in front of it. In the background, there are office desks, chairs, and a dining area with tables and chairs. A staircase with a metal railing is visible in the foreground.

# 2017 ASHRAE Technology Awards Phase 2: 451 7th Avenue South; Kirkland, WA Office Building

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# PROJECT OVERVIEW

2 storey office building, 180,000 SF  
Developed owned core and shell  
Tenant driven performance, built to suite



HEALTH  
USER EXPERIENCE  
SUSTAINABILITY

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# Core and Shell and Tenant Improvement Collaboration ..... High Performing Systems



Core and Shell



Tenant Improvement





# Agenda

- 1 **ENERGY EFFICIENCY**

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- 2 **INDOOR ENVIRONMENTAL QUALITY**

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- 3 **INNOVATION**

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- 4 **OPERATION AND MAINTENANCE**

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- 5 **COST EFFECTIVENESS**

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- 6 **ENVIRONMENTAL IMPACT**

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**ENERGY EFFICIENCY**

## Envelope

- External shading
- High performing glazing, walls, roof

## Lighting

- LED
- Lighting controls

## HVAC

- Decoupling ventilation and heating and cooling
- Central plant
- Active chilled beams



# Energy Modeling

- Design Assistance Modeling
- LEED Compliance Modeling

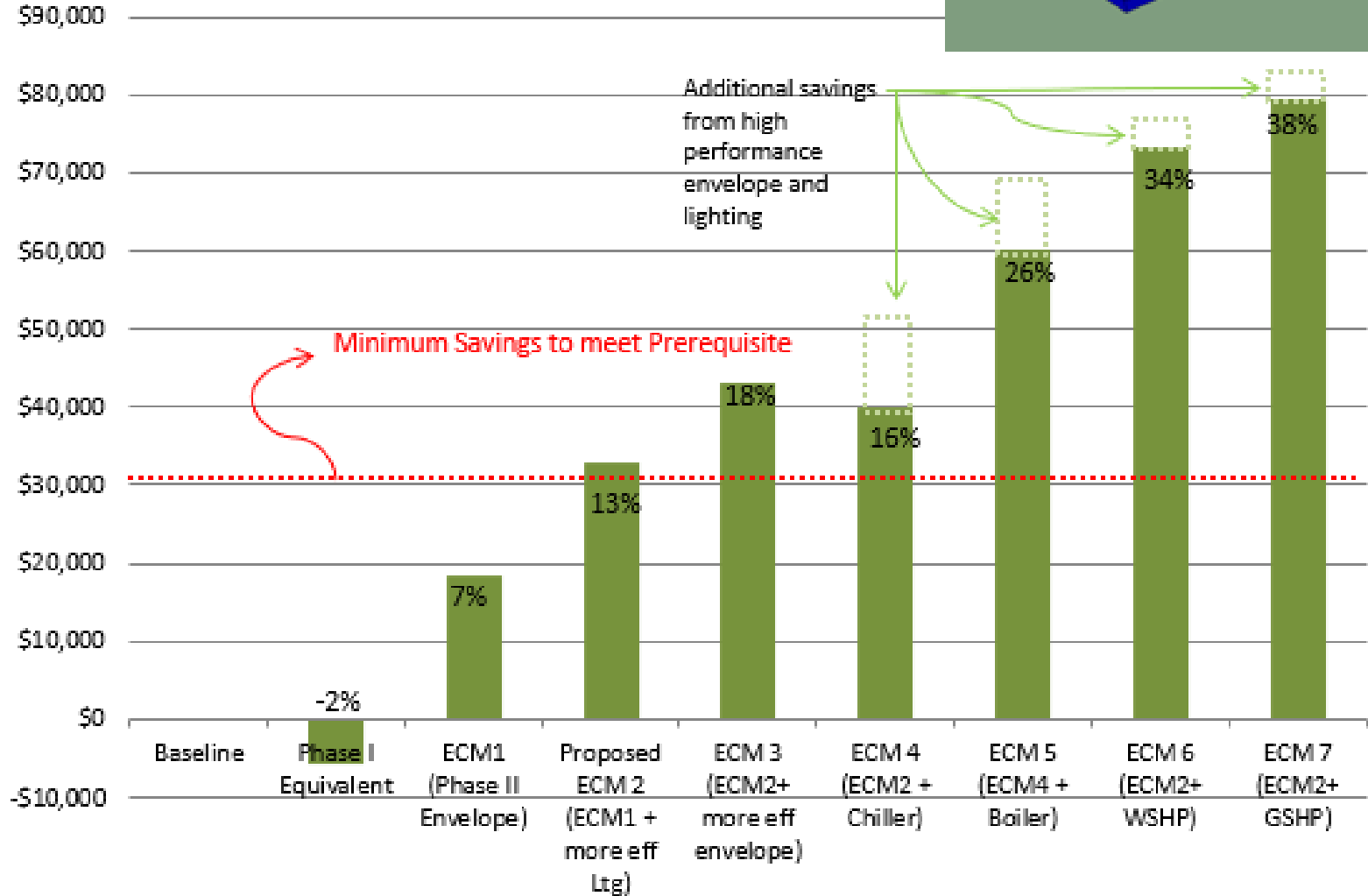
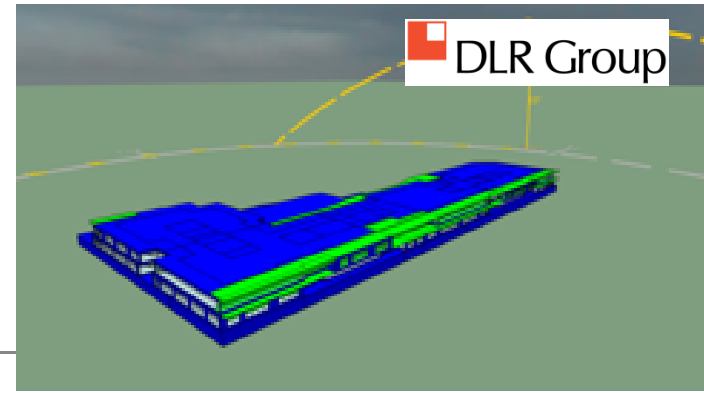


# Life Cycle Cost Analysis

## LEED EA p2 Preliminary Results

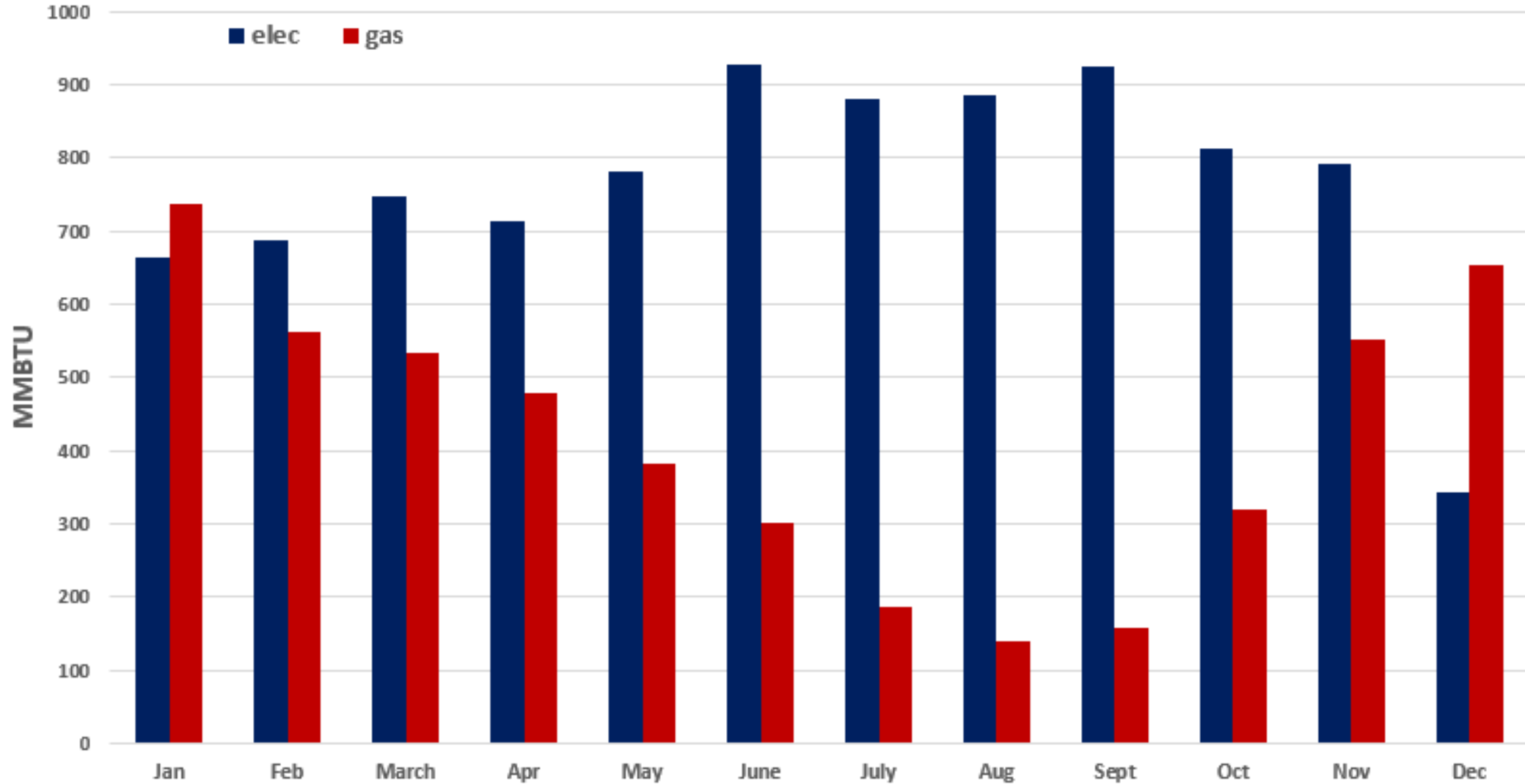
### Annual Utility Cost Savings

\$



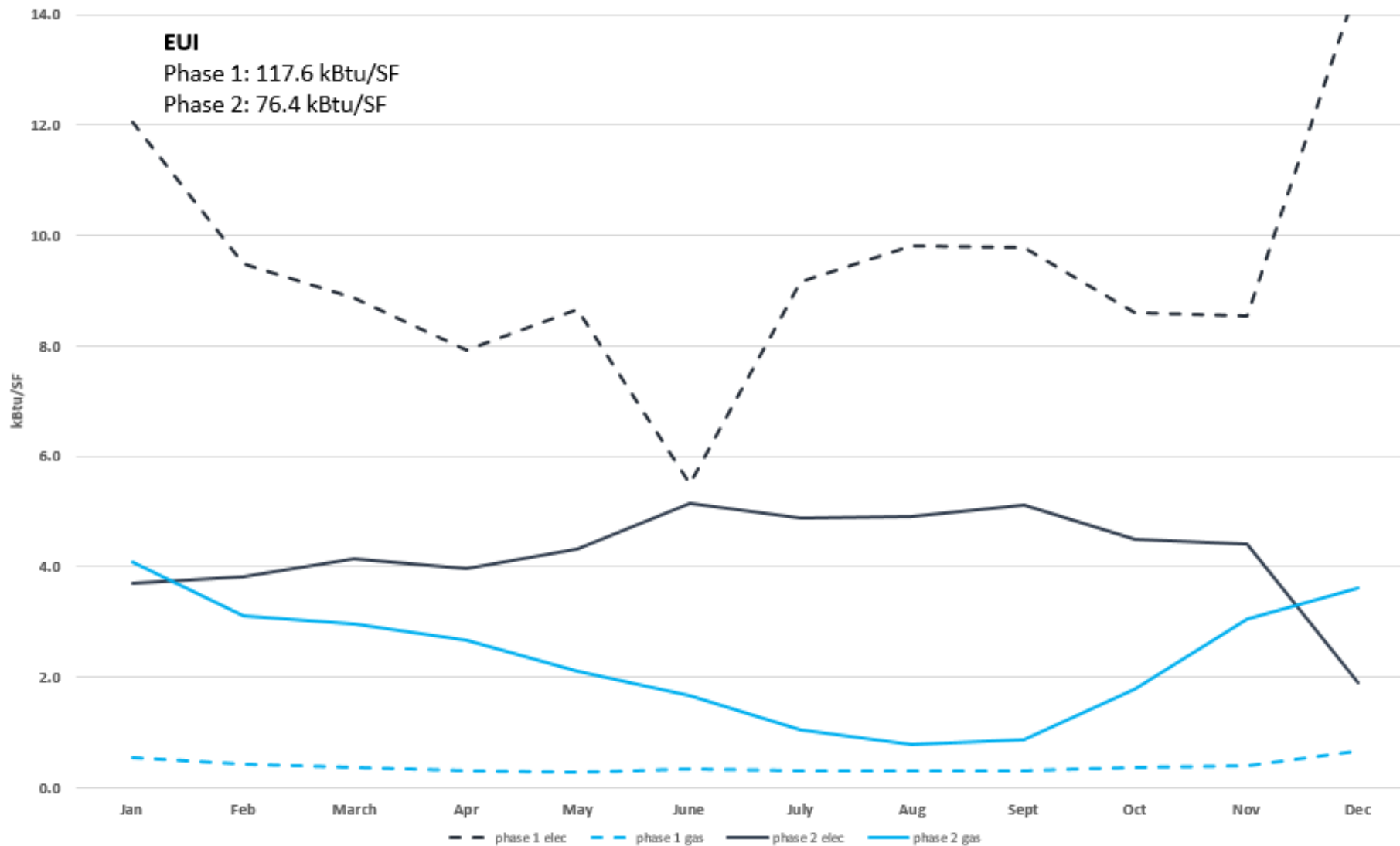


# Measurement and Verification

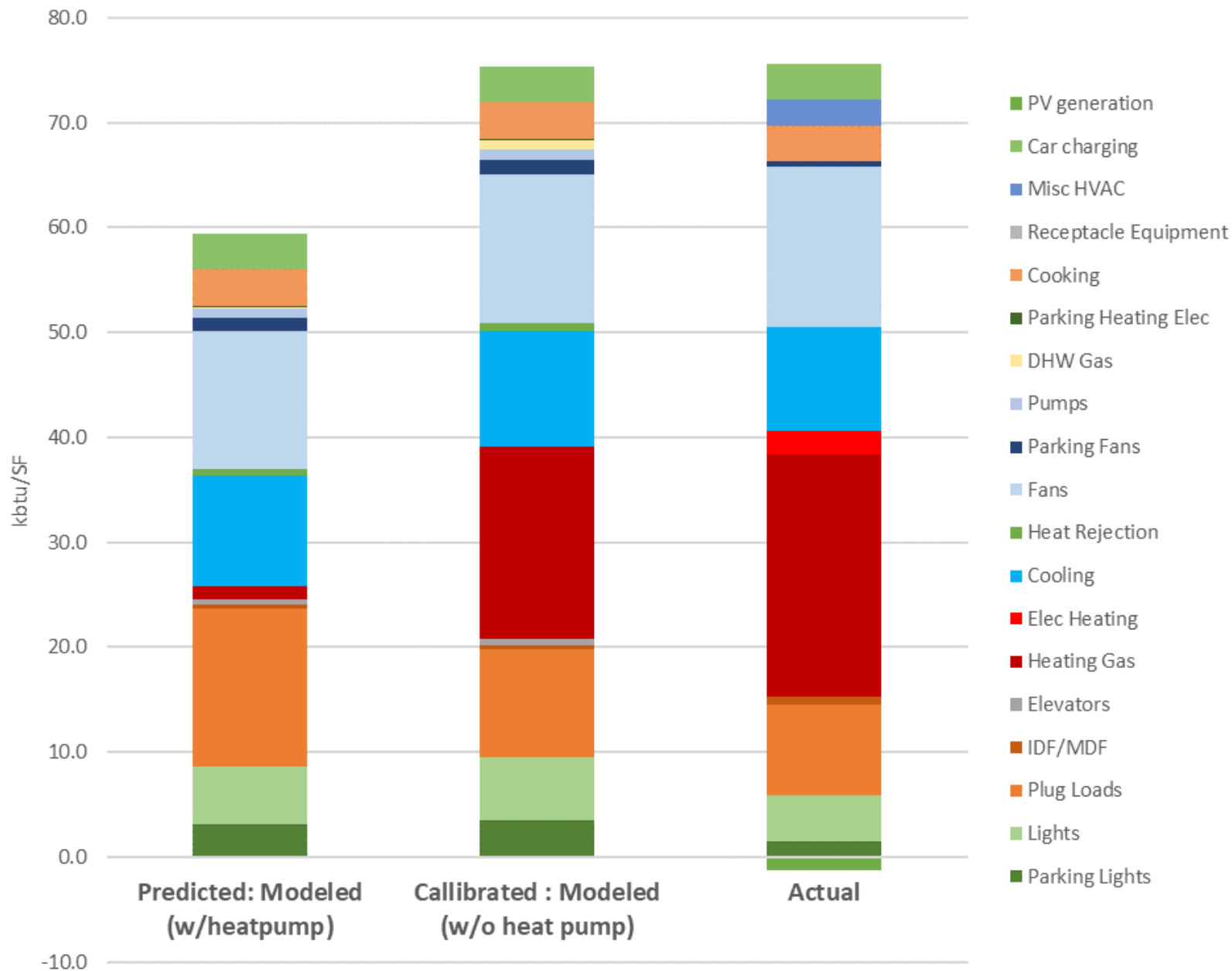


Actual Performance

Comparison to CBECS (25% savings)



Comparison to Phase 1 (36% savings)



Comparison to predicted model

2

**INDOOR ENVIRONMENTAL QUALITY**

## Thermal Comfort

- Zoning & adjustability
- Chilled beam throw and coil sizing

## Indoor Air Quality

- Higher Ventilation rates
- DOAS rezoning during TI
- Minimal system diversity
- Constant volume system
- CO2 sensors

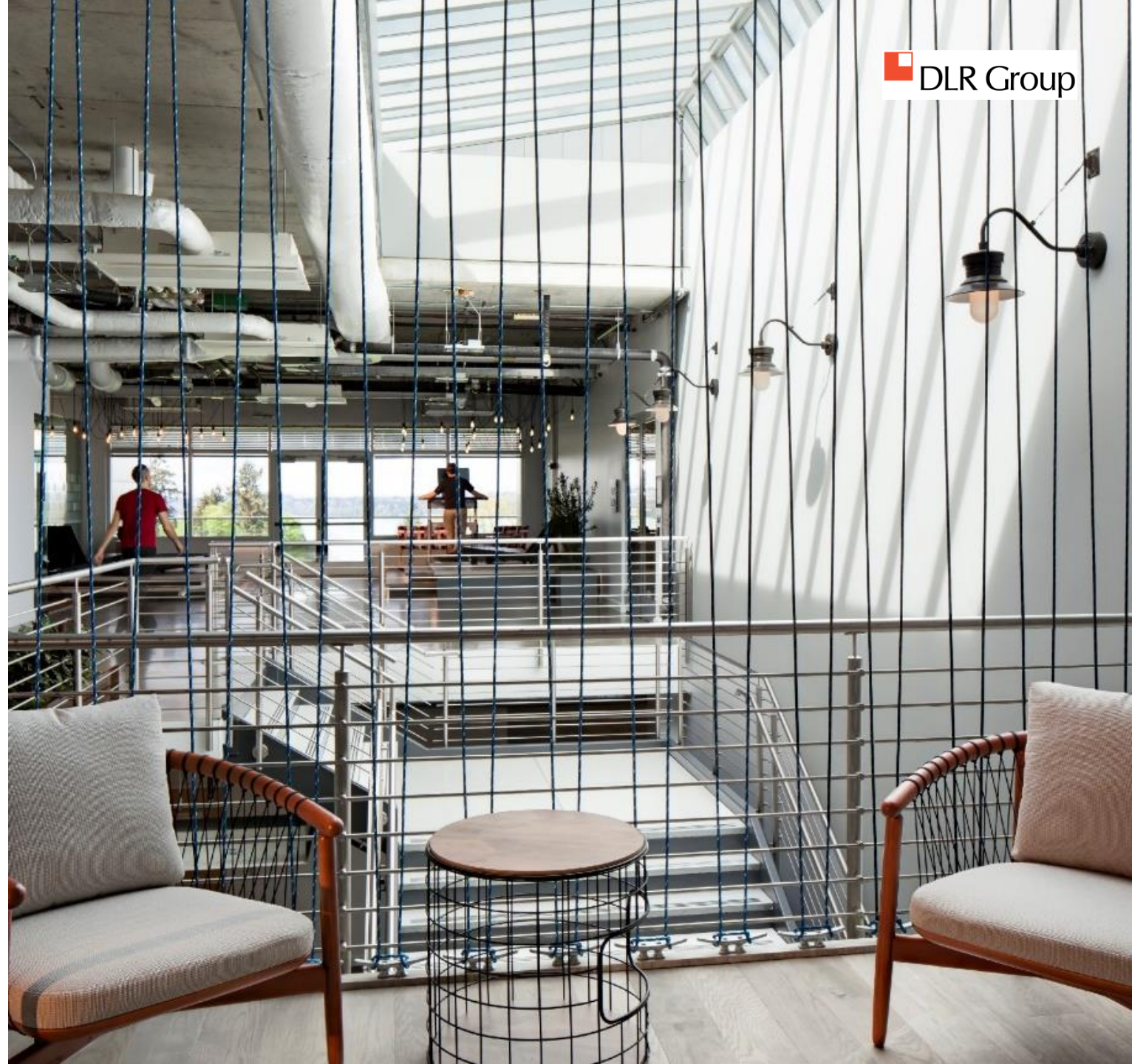
## Acoustics

- Tenant's Noise criteria
- Chilled beam airflow
- Too Quiet



## Visual Comfort

- Open office floor plan
- Large skylights with atrium spaces in the building core
- better circadian rhythm
- Lighting design focused on color temperature,
- Improved controls using the enlightened system



## Coordination

- Large floor plate with 12'-6" Flr to Flr height

## Non office TI spaces

- Fitness center
- Cafeteria
- Tech Talk / large conference room



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**INNOVATION**





Green Roof

HVAC upgrade  
& Central plant

Skylights

Renewables

Pedestrian Bridge

Outdoor  
Connections  
& exterior  
shading

Cistern

Partnership

Cross Kirkland Corridor Park



New Sports field for neighborhood school

Blurred Public / Private line

Community

# The Impact of Green Buildings on Cognitive Function



Design

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**OPERATION AND MAINTENANCE**

## Owner Comments

- Reduced thermal comfort complaints
- Reduced maintenance for systems
- Utility Cost savings

## Tenant Comments

- Improved user experience



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**COST EFFECTIVENESS**

## Largest impact on tenant operations bottom line -

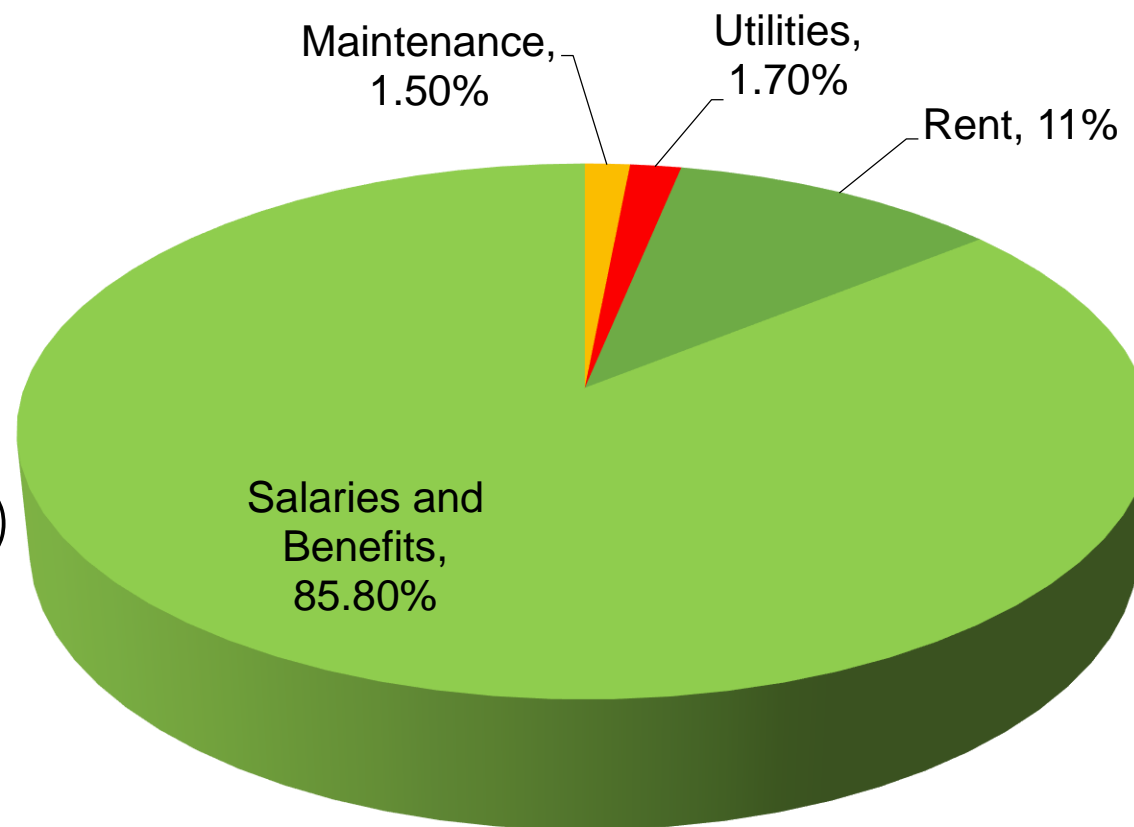
- improved user experience
- Improved productivity due to better indoor air quality, thermal comfort, daylighting, acoustics

## Operational Savings

- Reduced utility costs (incl water savings)

## Reduced floor to floor height

- reduced ductwork
- helped maintain views for the occupants in Phase 1 or existing building on the campus



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**ENVIRONMENTAL IMPACT**

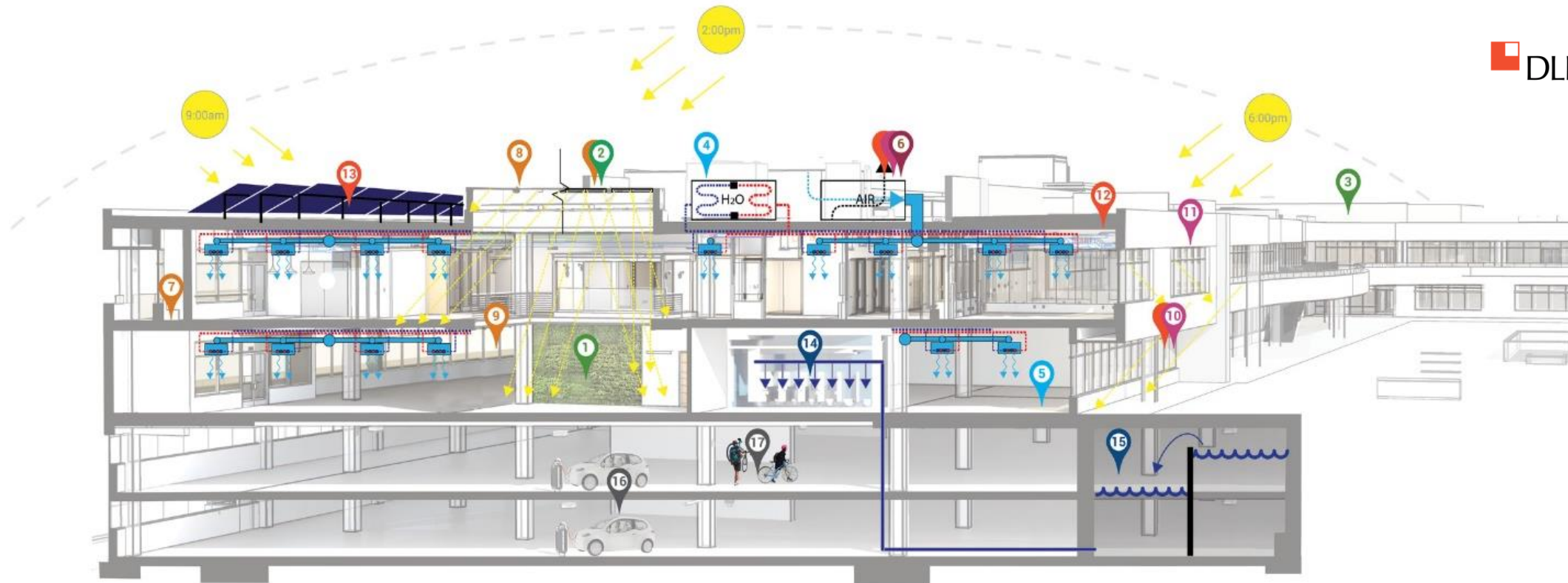




## Challenges became Opportunities:

### LEED Platinum Goal

- Brownfield Development
- Neighborhood school sports field
- Cross Kirkland Corridor
- Rainwater Catchment for reuse
- Renewable
- EV Chargers
- Green Roof
- Health Materials
- High Performance HVAC system
- Energy and Water Savings



### Biophilia

1. Indoor plants and green wall allow air to be filtered and provide an indoor connection to nature.
  2. Skylights allow for visual connection to the sun's movements and shadows.
  3. Green roof provides a connection to nature and solar heat gain mitigation.
- Additionally, the skylight atrium features a nest area that provides a biophilic connection.

### IAQ & Ventilation

4. Dedicated Outside Air System introduces 100% fresh and filtered outside air to the space - carbon filter slot is provided for future use. This system provides 2 times the ASHRAE 62 outside air.
5. Carpet and other healthy materials ensure good indoor air quality.
6. Chilled beam system keeps HVAC noise to a minimum.

### Acoustics

### Visual Comfort

2. Four large skylights provide daylight into the building core.
7. Enlighted system allows for continuous daylight dimming and occupancy control in over 500 individual fixtures throughout the building.
8. Sun Beamer skylights track and direct sunlight within the building core.
9. Daylighting and view windows have decoupled interior shades to cut off glare and maximize daylight.

### Thermal Comfort

6. A four pipe, zoned chilled beam system allows for controllable thermal comfort.
10. Exterior shading devices and high performance glazing allow for maximum light infiltration while reducing glare and heat gain during peak hours.
11. Building overhangs provide shading to interior spaces while creating sheltered outdoor circulation and seating areas.

### Energy

6. Dedicated Outside Air System introduces 100% outside air with heat recovery - this allows for fan energy reduction.
10. Exterior shading and high performance envelope reduce energy loads.
12. Water-to-Water heat pump, supplemented with a boiler and chiller plant for peak heating and cooling, enables free heating and heat rejection during shoulder periods. 55% HVAC energy savings.
13. 60kW Solar Array

### Water

14. Rainwater collection cistern contributes to flushing toilets, urinals, and irrigation.
15. A grey water system collected on site, pumped from the cistern saves 76% water.

### Transportation

16. Electric Vehicle sub-metered charging stations.
17. Integral Bike storage, lockers, and showers.

### Views

Interior design enables panoramic views to the outside from everywhere.

### Materials

Healthy materials used reduce off-gassing and VOC content. Recycled materials met health and transparency criteria.

# Questions?