Implementing Building Performance Outcome Requirements

July 30, 2014

Presented by:

Ryan Colker – NIBS

Mark Frankel – New Buildings Institute

Clark Brockman – SERA Architects

Vikram Sami – ZGF Architects

Clifford Ham – Principal Architect at Administrative Office of the Courts (AOC), *with* Chip Hastie – Clark Construction, Sean Maher – Johnson Controls, Freddy Rayes – Long Beach Judicial Partners LLC, Zenaida Mananquil – Judicial Branch Capital Programs Office

Duane Jonlin – City of Seattle

OUTCOME BASED DESIGN CASE STUDY
EDITH GREEN WENDELL WYATT

NBI Webinar: A Presentation by Clark Brockman, SERA Architects

July 30, 2014

PORTLAND

OREGON

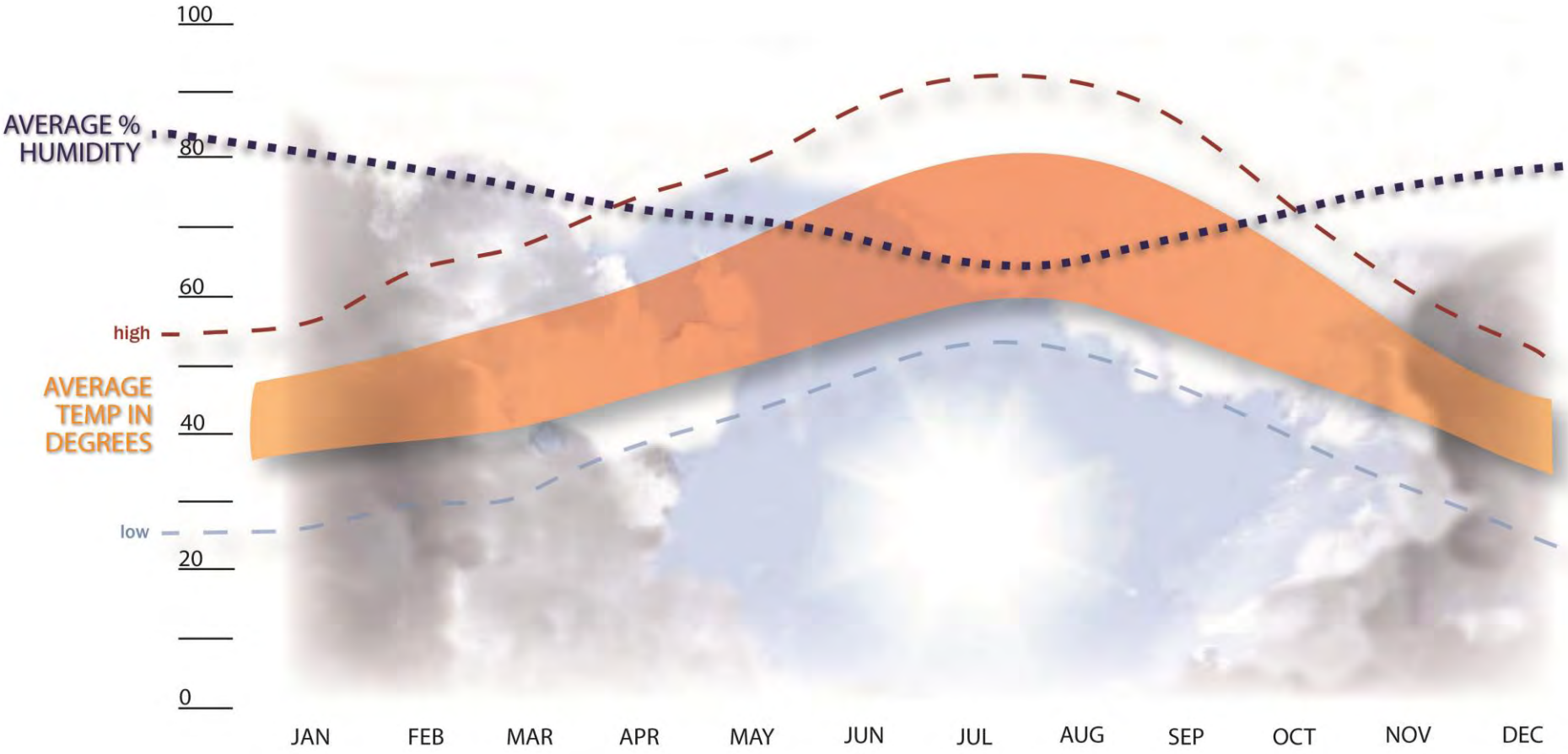
POPULATION: 603,106 (METRO: 2,226,009)

LATITUDE: 45.5236° N

METRO LAND AREA: ~770 Square Miles

CLIMATE

PORTLAND - TEMPERATURE / HUMIDITY

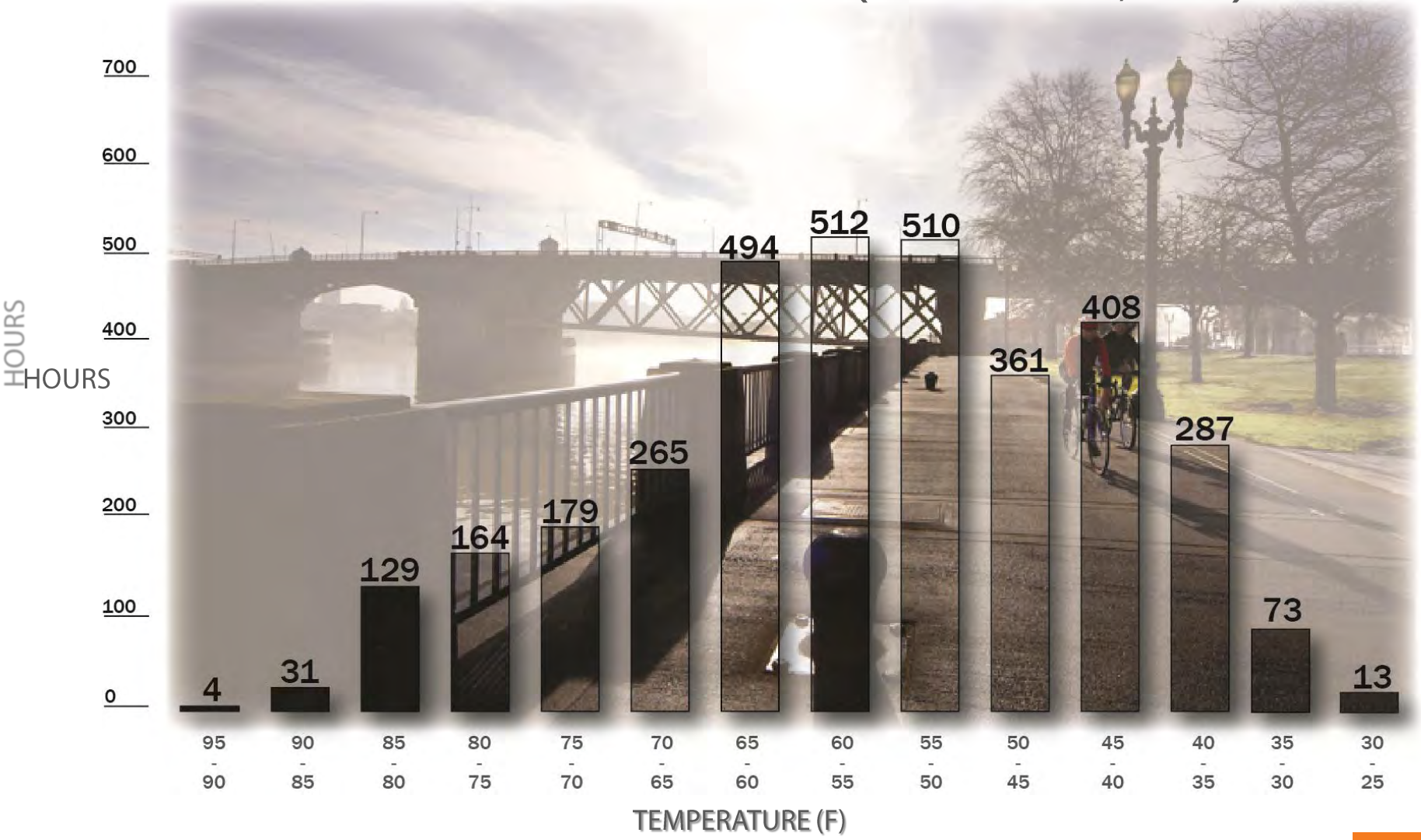


Data Source: TMY3 726980 WMO Station Number
Location: Portland Intl. Airport

SERA

CLIMATE

PORTLAND TEMPERATURE BINS (6AM-7PM, M-F)



SERA

ENERGY USE

PREDICTED vs. ACTUAL (121 LEED BUILDINGS)

"ESSENTIALLY, ALL MODELS ARE WRONG, BUT SOME ARE USEFUL"

- George E.P. Box

Gravesend, Kent, U.K.

PREDICTED vs. ACTUAL ENERGY USE OF LEED BUILDINGS

Source: New Buildings Institute: Energy Performance of LEED NC Buildings, 2008

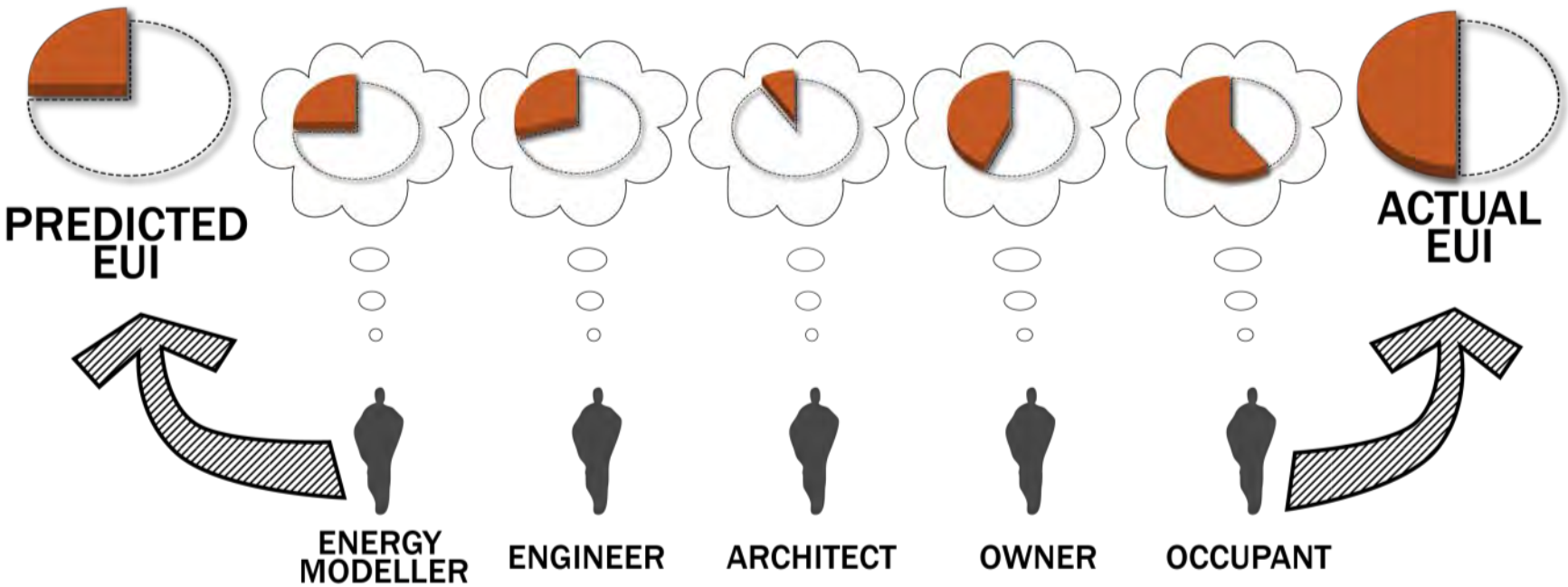
ENERGY USE

REALITY

REMEMBER,
BUILDINGS DON'T
USE ENERGY,
PEOPLE DO.

ENERGY USE

PREDICTED vs. ACTUAL



ENERGY MODEL

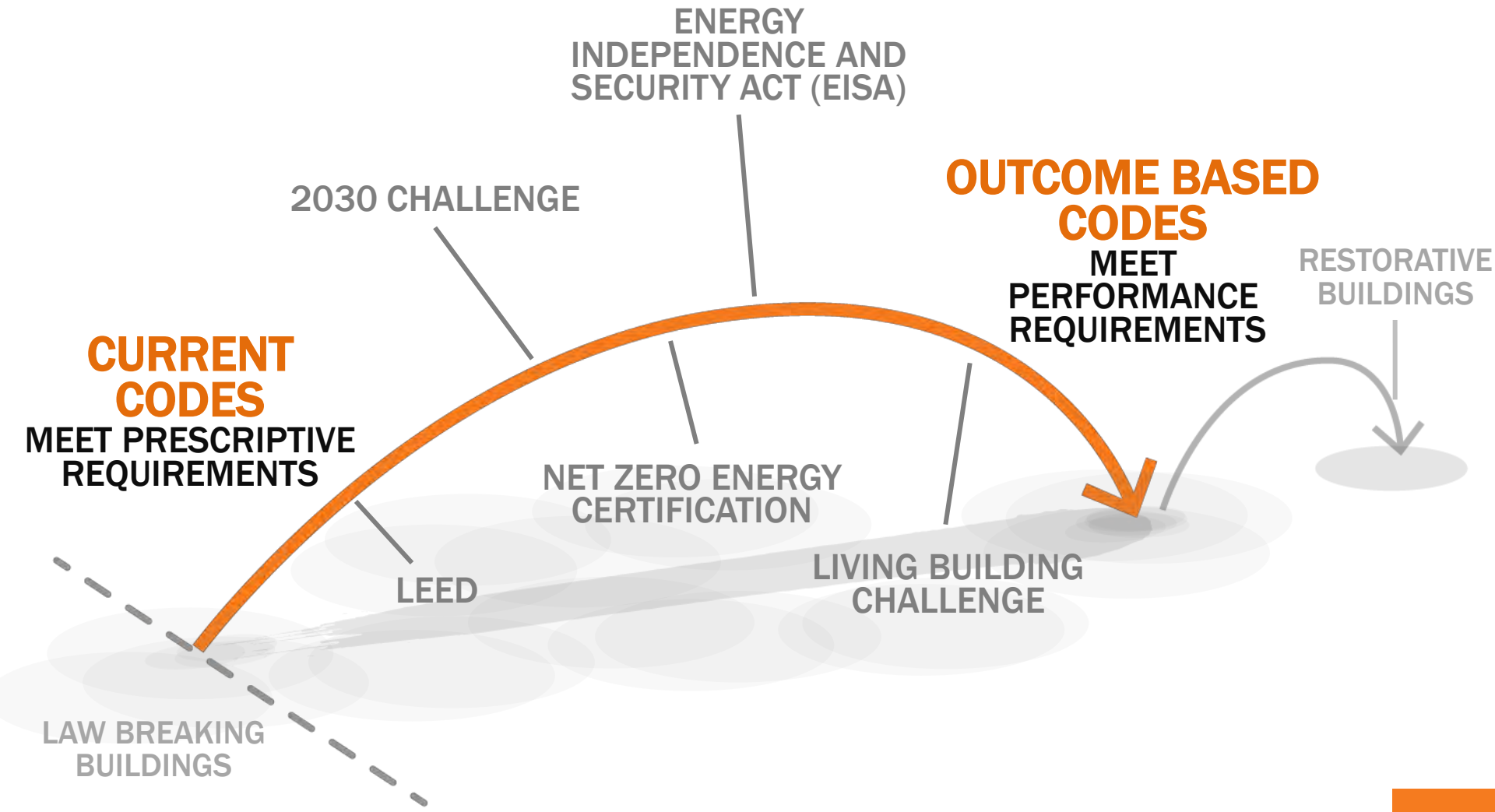
TRACKING LOG

MECHANICAL ENGINEER
ARCHITECT
OWNER (FACILITY)
LIGHTING DESIGNER
OWNER (IT)
ALL TEAM
ELEVATOR CONSULTANT

INTERNAL LOADS	OWNER AND DESIGN TEAM PROVIDED DATA	ENERGY MODEL INPUT
Occupant Density (SF/Person unless otherwise indicated)	OWNER	
BUILDING AVERAGE		
Total Building FTE (# people)		
Short-term visitors <1 hour (average #people/day)		
Long-term visitors >1 hour (average #people/day)		
occupied office sf		
Occupied office sf/ program occupants		
by Space type		
Sample space type - Office		
Lighting Power Density (Watts/SF)	LIGHTING DESIGNER	
BUILDING AVERAGE		
by Space type		
Sample space type - Office		
Plug Load Power Density (Watts/SF)	OWNER	
BUILDING AVERAGE		
by Space type		
Sample space type - Office		
Misc Load Assumptions	ALL TEAM	
BUILDING AVERAGE		
by Space type		
Elevator energy and usage assumptions (kWh)	ELEVATOR CONSULTANT	
Power Demand (kW or hp)		
Energy Use (kWh/yr)		
Quantity		

OUTCOME BASED CODES

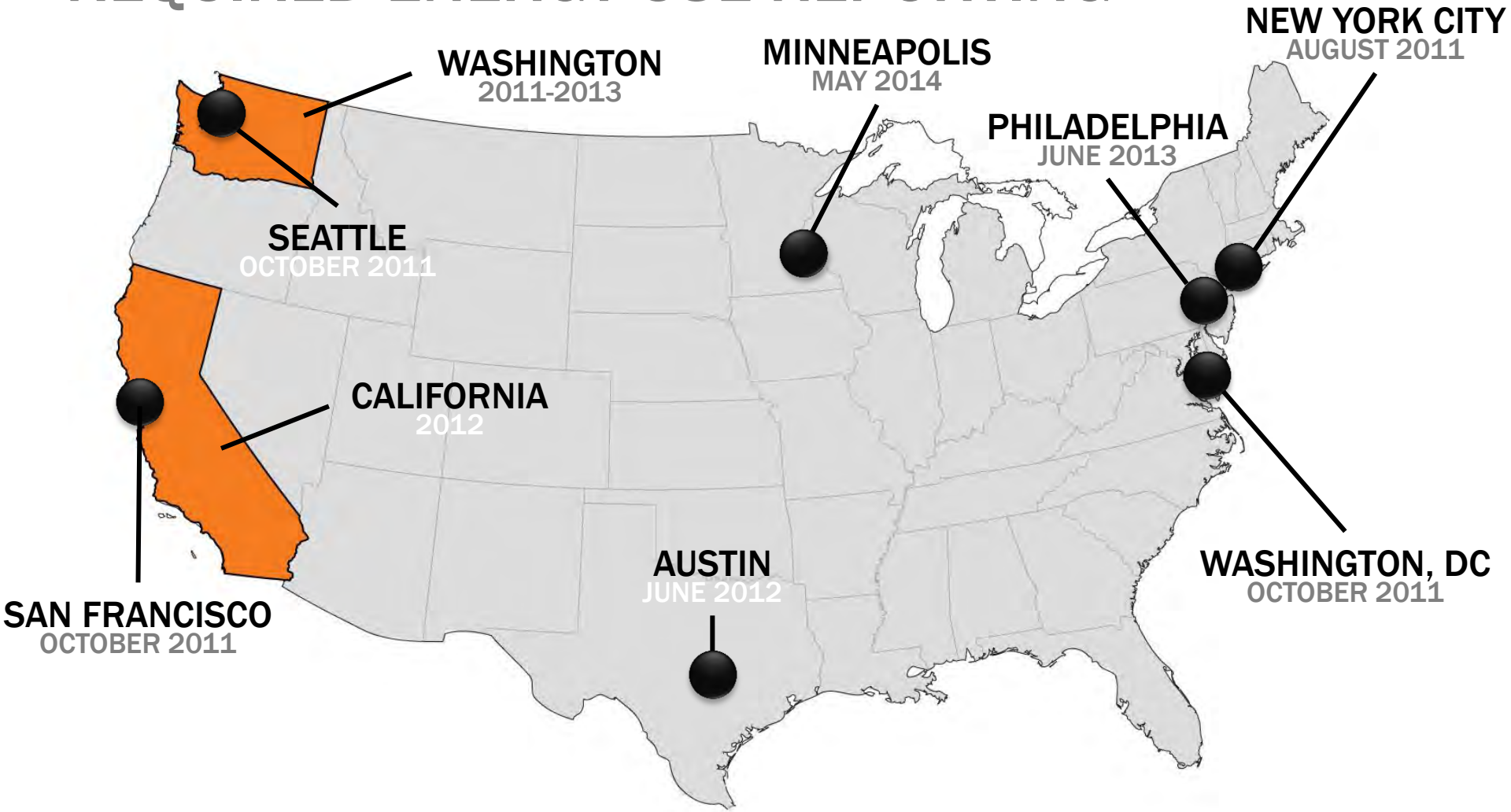
FOCUSED ON ACTUAL PERFORMANCE



SERA

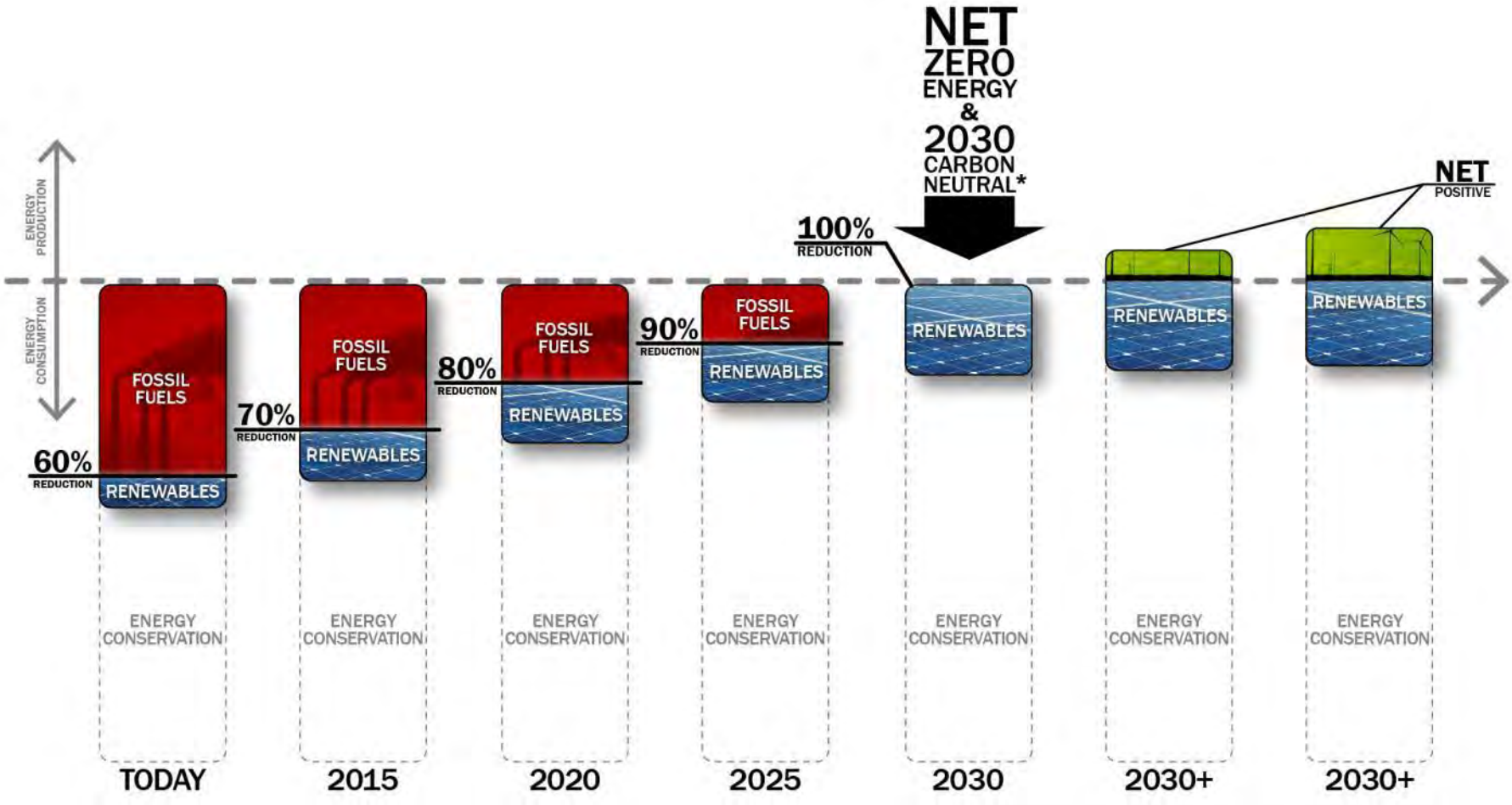
REPORTING

REQUIRED ENERGY USE REPORTING



ARCHITECTURE 2030

REDUCTIONS IN BUILDING FOSSIL FUEL USE



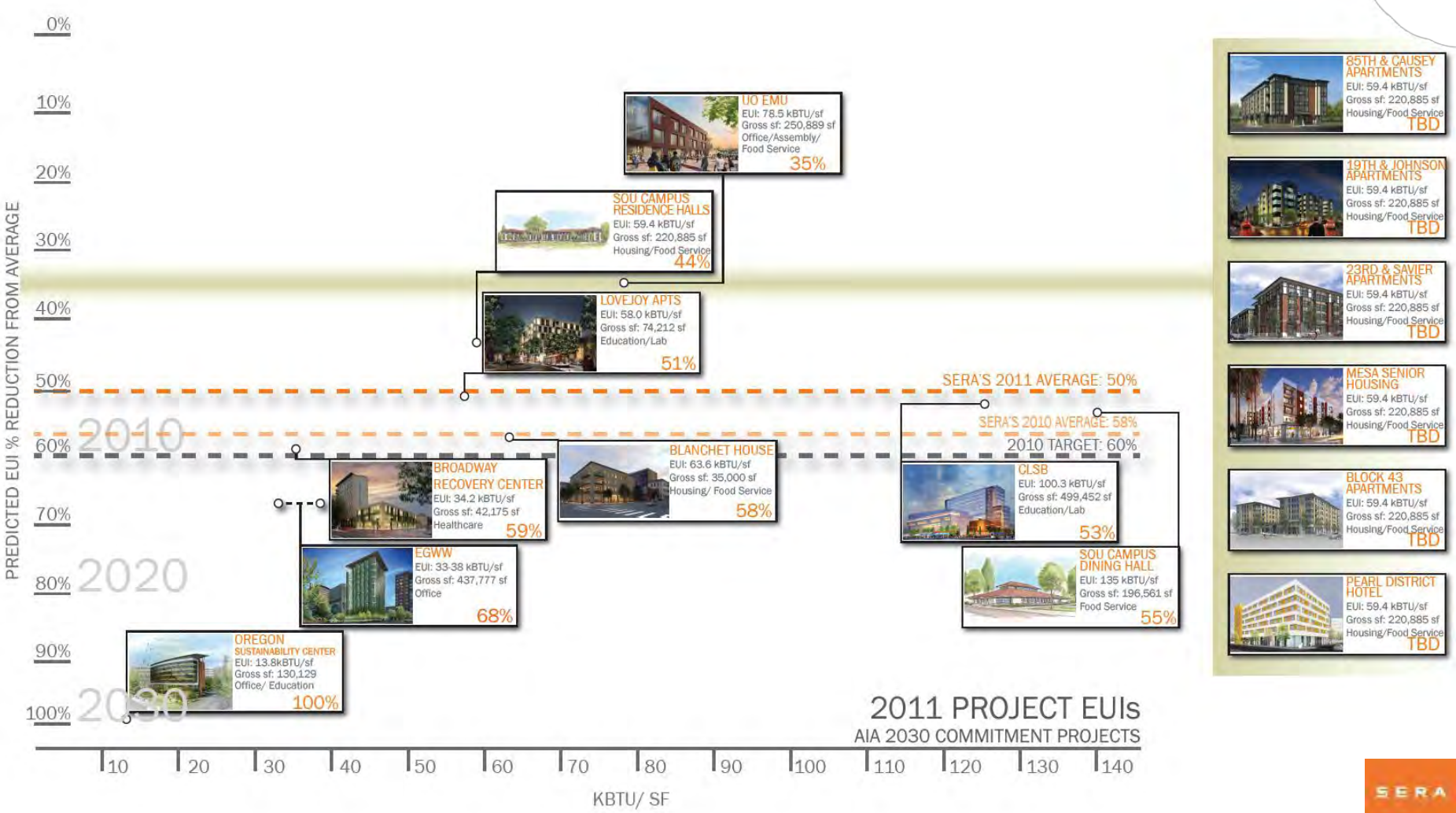
Source: Architecture 2030, based on statistics from Energy Information Administration

* USING NO FOSSIL FUEL GHG-EMITTING ENERGY TO OPERATE

http://architecture2030.org/the_solution/solution_energy

SERA

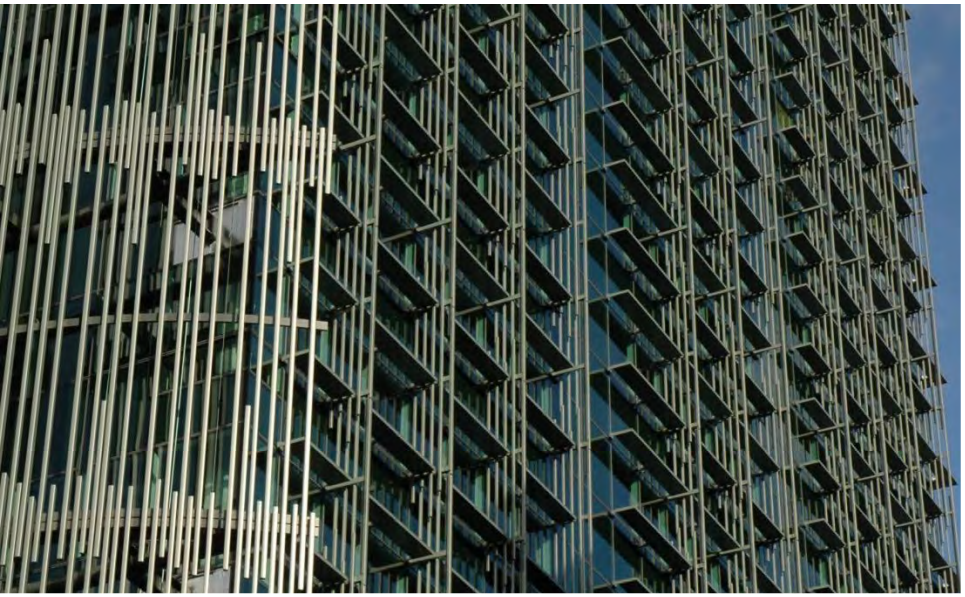
2011 EUI REPORTING



SERA

FEDERAL BUILDING

EDITH GREEN WENDELL WYATT



EDITH GREEN-WENDELL WYATT
FEDERAL BUILDING MODERNIZATION

PROJECT TEAM

EDITH GREEN-WENDELL WYATT
FEDERAL BUILDING MODERNIZATION

Owner:

GSA

A/E Team:

SERA ARCHITECTS

Cutler Anderson Architects
136 Parfitt Way SW
Bainbridge Island, WA 98110

CUTLER ANDERSON ASSOCIATES

STANTEC

INTERFACE

PAE

KPFF

ATELIER DREISEITL

CMc Team:

HOWARD S WRIGHT

Howard S. Wright COMPANIES

BENSON

McKINSTRY

DYNALECTRIC

OTIS

NUPRECON

ARRA and EISA

MINIMUM PERFORMANCE CRITERIA

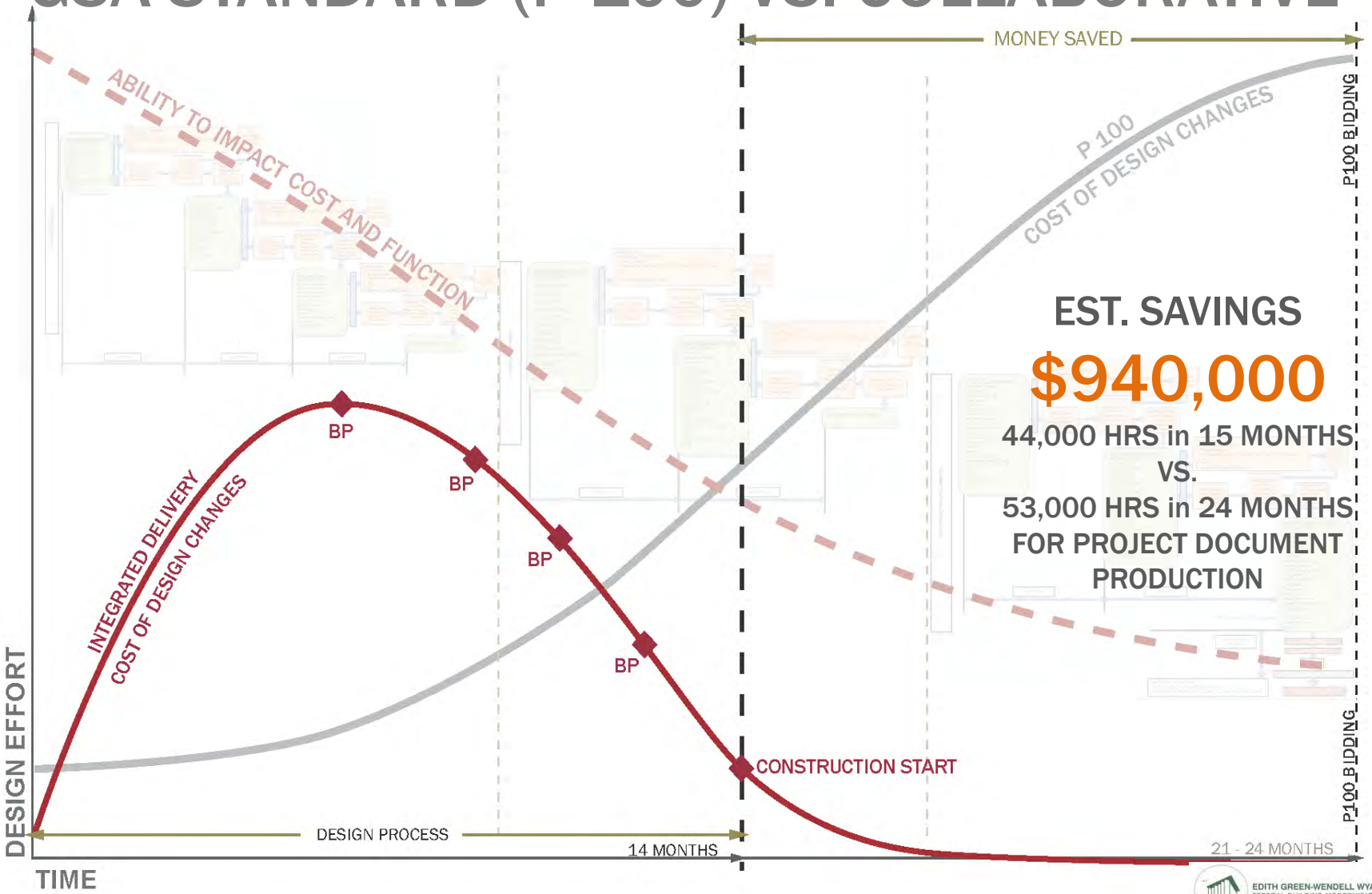
Energy Star Requirements	Water Conservation Requirements	Energy Conservation Requirements	LEED Requirements
Score goal: 97	20% Indoor potable water reduction 50% Outdoor potable water reduction	55% Fossil fuel reduction 30% Energy usage reduction 30% Solar thermal	Gold Required Platinum Goal

ENERGY GOAL


DESIGNED ENERGY UTILIZATION INTENSITY kBTU/SF/yr
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
94
77 – 83 Existing EGWW building (437,777 sf)
34 – 36 +/- 15% Renovated EGWW target range
40
35
32
24
NATIONAL AVERAGE FACILITY
CHESAPEAKE BAY FOUNDATION
MARYLAND
30,600 SF
NREL (WITH DATA CENTER)
COLORADO
218,000 SF
SCHLITZ AUDUBON NATURE CENTER
WISCONSIN
39,000 SF
ALDO LEOPOLD LEGACY CENTER
WISCONSIN
11,900 SF

PROJECT DELIVERY

GSA STANDARD (P-100) VS. COLLABORATIVE



EST. SAVINGS

$940,000

44,000 HRS in 15 MONTHS
VS.
53,000 HRS in 24 MONTHS
FOR PROJECT DOCUMENT PRODUCTION

EDITH GREEN-WENDELL WYATT FEDERAL BUILDING MODERNIZATION

SERA

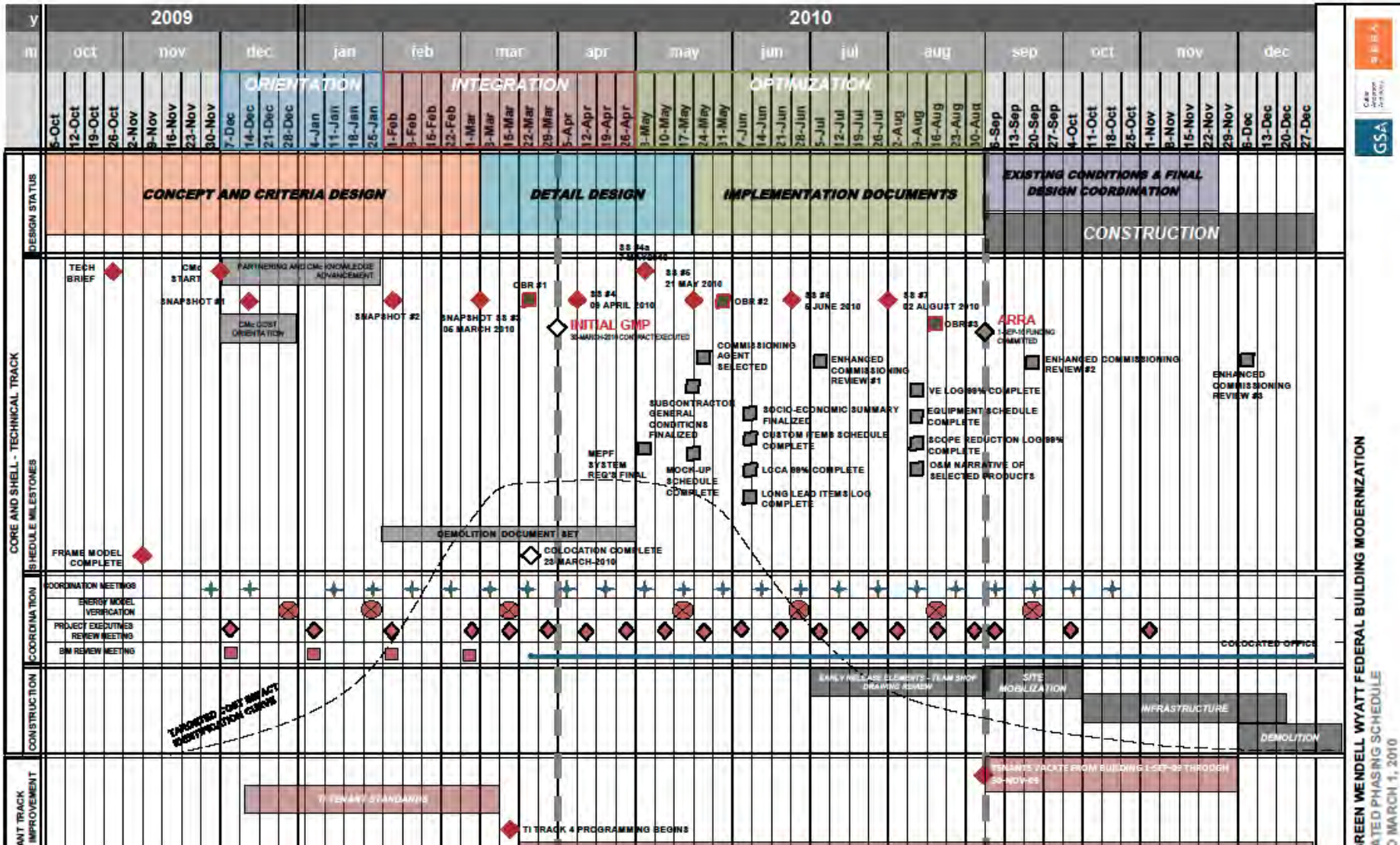
PROJECT DELIVERY

PROJECT CHARTER

- Take ownership of the project.
- Continuously improve the services, disciplines, and project delivery.
- Exceed the energy and water conservation goals of the project.
- Deliver the project using the building information model to its cost effective capacity.
- Challenge each other to find cost savings and schedule improvements to bring the project in at the best value to the American taxpayer, and
- Employ open book, transparent processes.

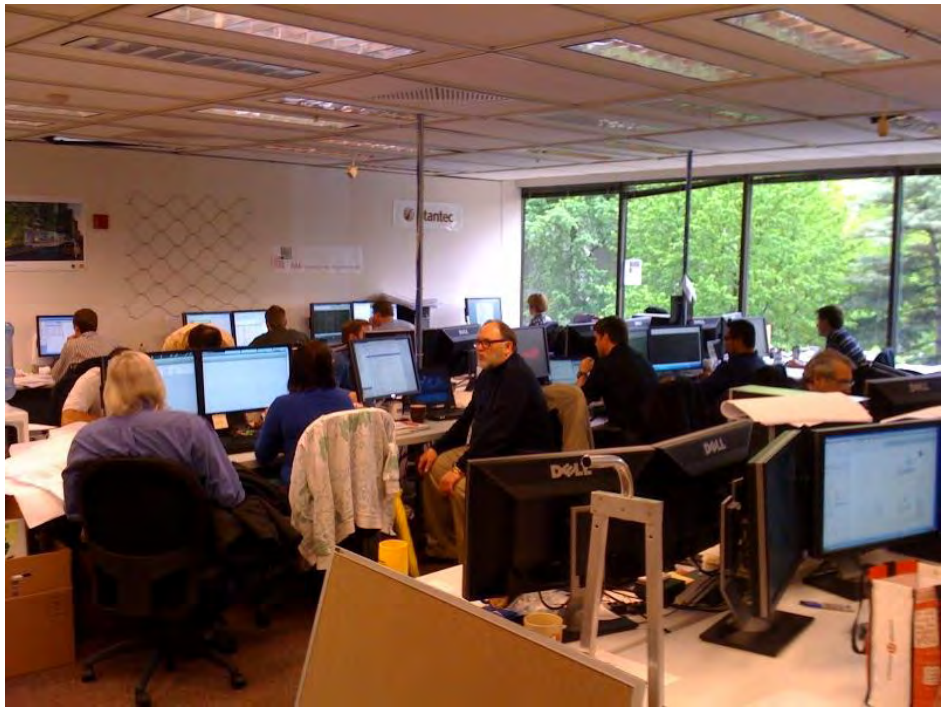
PROJECT DELIVERY

IPD PHASING



COLLOCATION

THE “BIG ROOM” (SHARING SPACE)



EGWW SAVED AN ESTIMATED

$82,000

IN TRAVEL TIME TO MEETINGS
FOR CONSULTANTS WHO WERE COLLOCATED

COLLOCATION

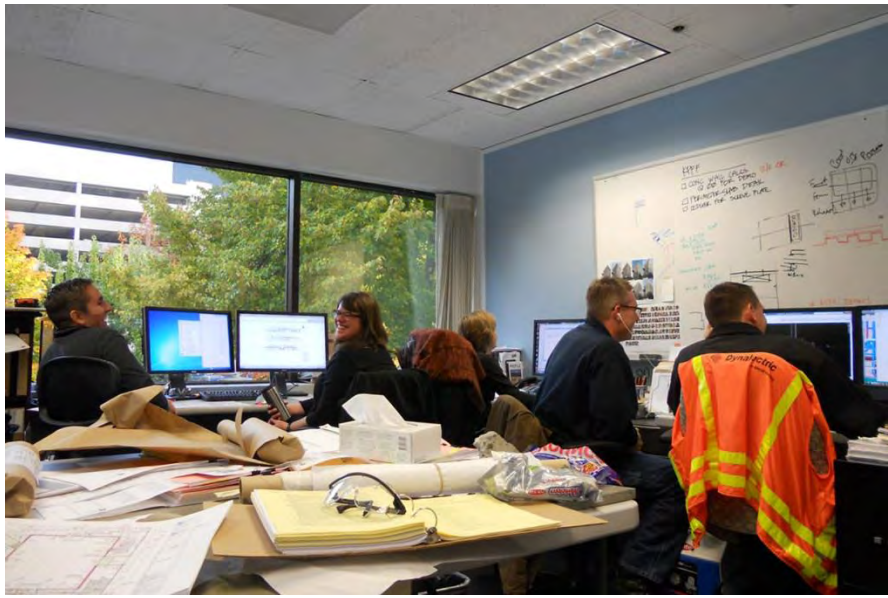
BENEFITS

BETTER COMMUNICATION

- Highly coordinated overall design.
- Fewer assumptions made by disconnected design team members.
- More spontaneous design coordination discussions.
- Better understanding of other disciplines' work flows and design problems.

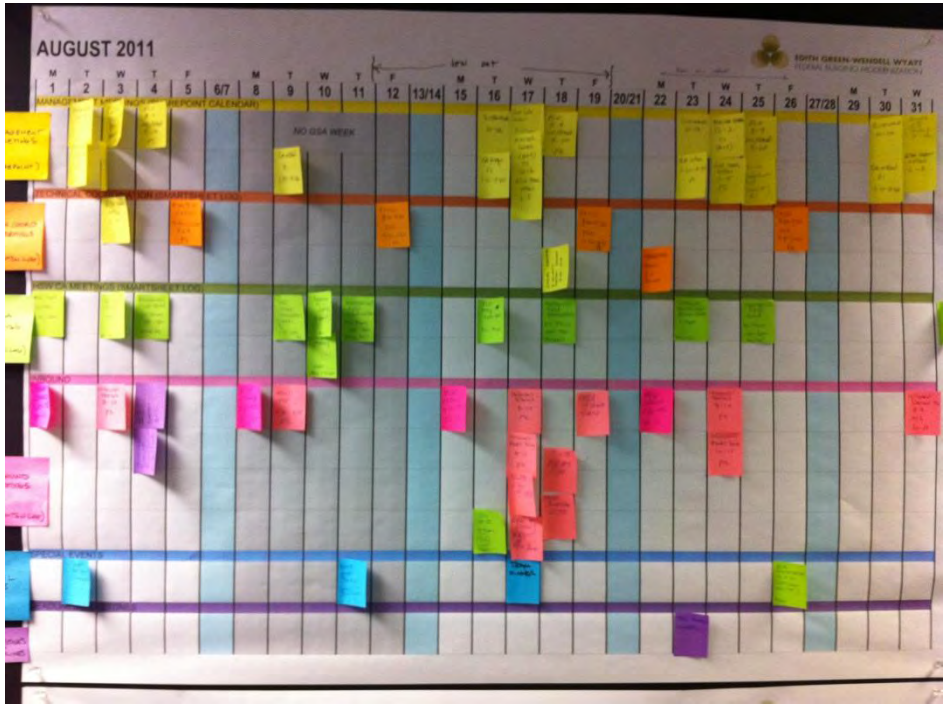
LESS WASTED TIME

- Less time spent waiting for answers from email and voicemail.



COLLOCATION

COLLABORATION TOOLS



Living Calendar

Tech Meeting Calendar

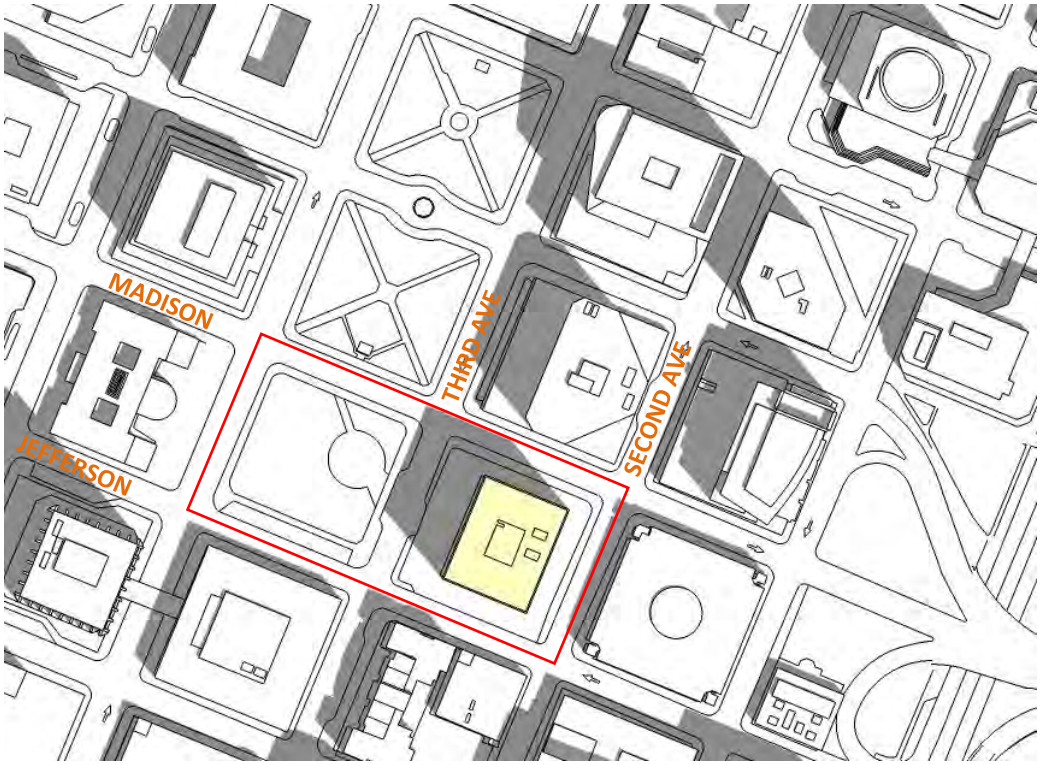
	INVITE SENT	MEETING	MEETING AGENDA	DAY	DATE	TIME	Location	LEAD	SERA	HSW Te
1		Past Meetings								
352		Steel Ceiling Coordination Meeting				2-4:30				
353										
354	✓	Security Dwg Review		Wed	07/20/11	3:00-4:00	Palace 2	SERA	Jim, Jen	Matthew
355	✓	Radiant Panel Submittal Review		Thurs	07/21/11	2:30-3:30	Palace 1	HSW	Jim/Suzanne	Matthew
356	✓	Electrical TI Electrical	HSW, Dyna, West Hills LLC	Wed	07/27/11	11:30-12:30	Palace 1	HSW		Rhonnda,
357	✓	Mechanical Field Coordination MeetING: (Repeating Thursday Team Coordination Meeting)	HSW, McKinstry, HVAC	Thu	07/28/11	1:00 - 3:00	Palace 1	HSW		Mike
358	✓	Inspection and Testing Curtainwall	Benson, HSW discuss the inspection and testing process for the curtain wall system.	Wed	08/03/11	9:30-11:30	Palace 1	HSW		Ryan, Dou
359	✓	Mechanical Field Coordination MeetING (Repeating Thursday Team Coordination Meeting)	HSW, McKinstry, HVAC	Thu	08/04/11	1:00 - 3:00	Palace 1	HSW		Mike
360	✓	Electrical TI Electrical - Follow - up	HSW, Dyna, West Hills LLC	Wed	08/10/11	3:00 - 4:00	Palace 1	HSW		Rhonnda,
361	✓	Mechanical Field Coordination MeetING (Repeating Thursday Team Coordination Meeting)	HSW, McKinstry, HVAC - CANCELLED	Thu	08/11/11	1:00 - 3:00	Palace 1	HSW		Mike
362	✓	Mechanical Field Coordination MeetING (Repeating Thursday Team Coordination Meeting)	HSW, McKinstry, HVAC	Thu	08/18/11	1:00 - 3:00	Palace 1	HSW		Mike
363	✓	Mechanical Field Coordination MeetING (Repeating Thursday Team Coordination Meeting)	HSW, McKinstry, HVAC	Thu	08/25/11	1:00 - 3:00	Palace 1	HSW		Mike
364	✓	Mechanical Field Coordination MeetING (Repeating Thursday Team Coordination Meeting)	HSW, McKinstry, HVAC	Thu	09/01/11	1:00 - 3:00	Palace 1	HSW		Mike
365	✓	HUD Design Orientation meeting	SERA, GSA, HUD	Tues	08/09/11	1:30 - 3:00	Palace 2	SERA	ROBERTA	
		INBOUND Pricing Guide Orientation	GSA expert to review pricing guide nuances with SERA, HSW to understand division of warm lit shell.	TBD	TBD - february	TBD	Palace 2	SERA	Suzanne, Roberta, Natasha, Elizabeth,Carissa, Stuart, Jennifer	Troy, Scot
366										
367		INBOUND Health Unit DO#2	Design Orientation #2	Tues	08/23/11	1:00 - 3:00	Palace 2	SERA	Roberta	
368	✓	Touch Up Paint Review	HSW Meeting with AIG	Wed	08/10/11	1:30 - 4:00	Palace 2	HSW		Ryan
369	✓	AIA Presentation	HSW	Fri	08/26/11	3:00 - 4:30	8th Floor Conf Rm	HSW		Matthew
370	✓	PLA Meeting	HSW - Unions	Tues	08/16/11	2:00-3:00	Palace 2	HSW		Dan
371	✓	PLA Meeting	HSW - Unions	Tues	10/17/11	2:00-3:00	Palace 2	HSW		Dan
372	✓	PLA Meeting	HSW - Unions	Tues	12/19/11	2:00-3:00	Palace 2	HSW		Dan
373	✓	PLA Meeting	HSW - Unions	Tues	09/19/11	12:00 - 3:00	Palace 2	HSW		Dan
374	✓	PLA Meeting	HSW - Unions	Tues	11/21/11	12:00 - 3:00	Palace 2	HSW		Dan

Cloud Based Shared Documents

- Design Issues Log
- Constructability Issues Log
- Technical Meeting Log

ANALYSIS

BUIDLING ORIENTATION



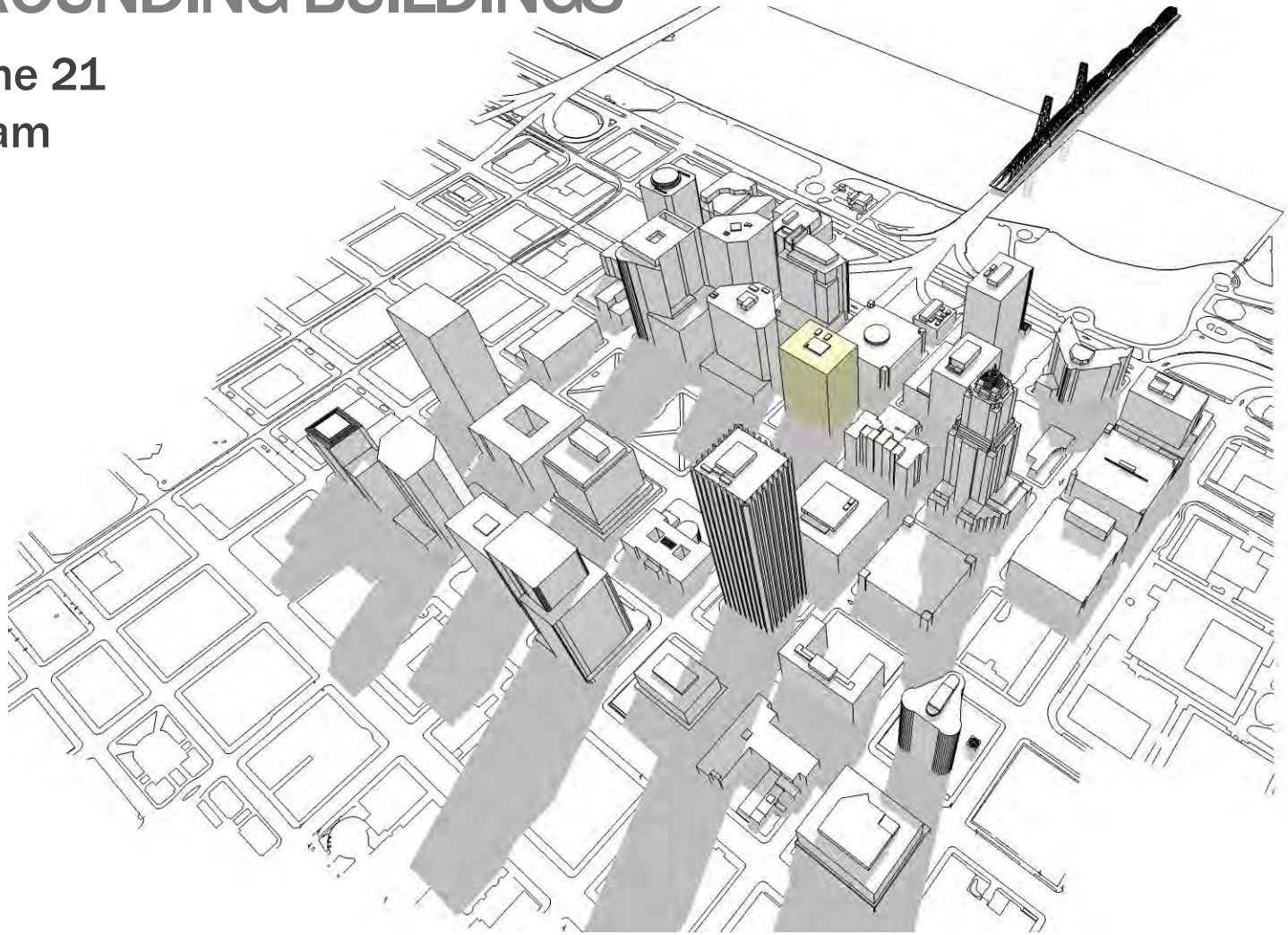
Transform a 512,400 square foot, 18-story, 1974 office building into a LEED Platinum cornerstone of GSA's green building portfolio.

BUDGET: $ 141,000,000

ENVELOPE STUDY

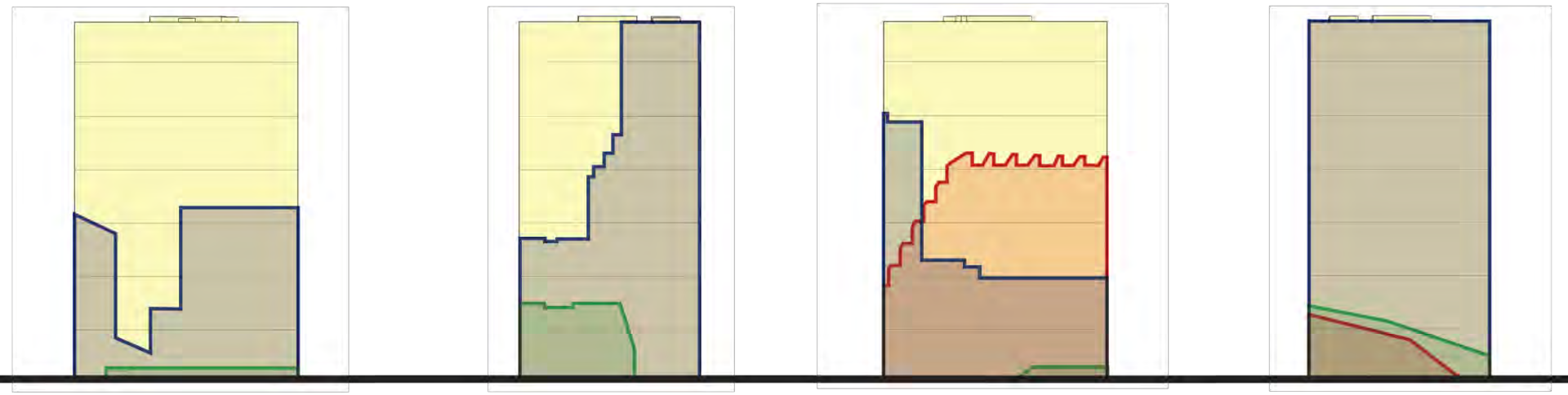
SURROUNDING BUILDINGS

June 21
8 am



ENVELOPE STUDY

SHADING FROM ADJACENT BUILDINGS



East Elevation
10 am

South Elevation
2 pm

West Elevation
4 pm

North Elevation
8 am

Shaded Area

March / September

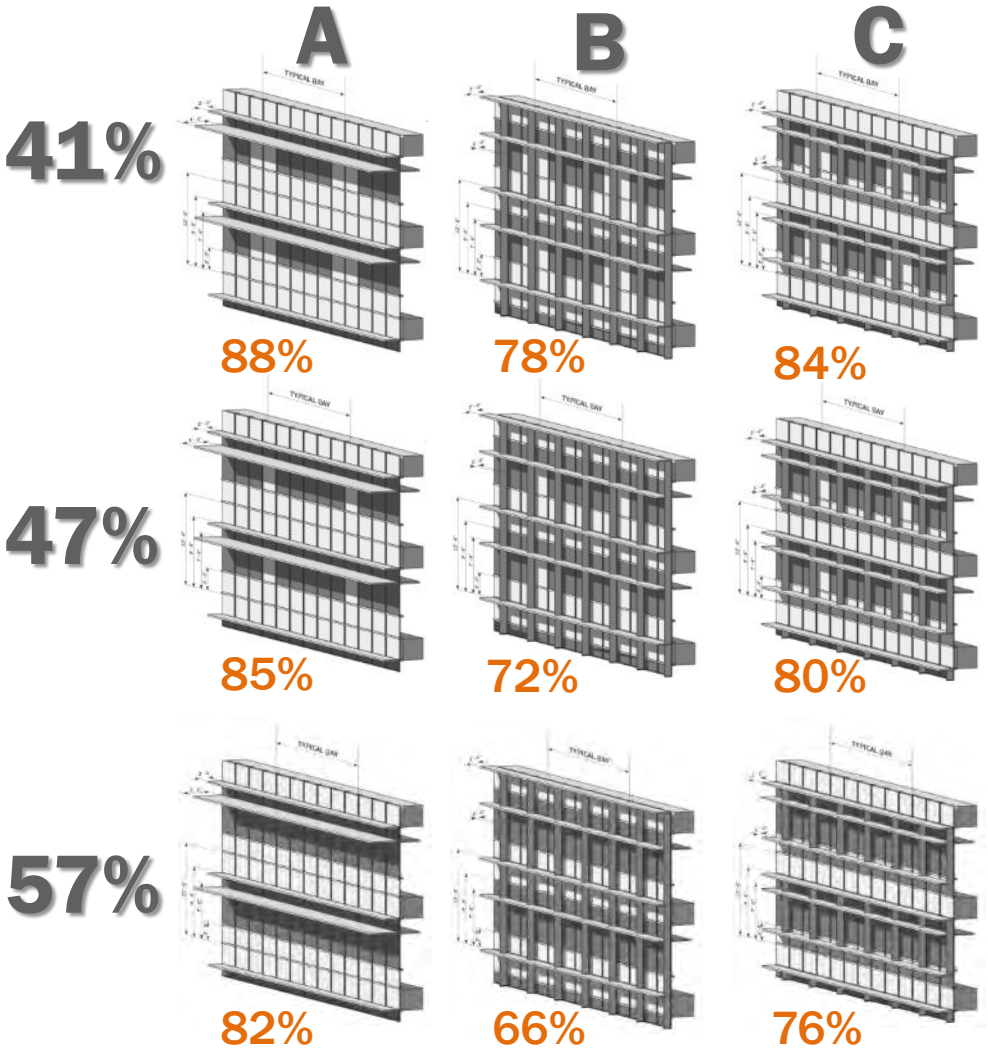
June

December

EDITH GREEN-WENDELL WYATT
FEDERAL BUILDING MODERNIZATION

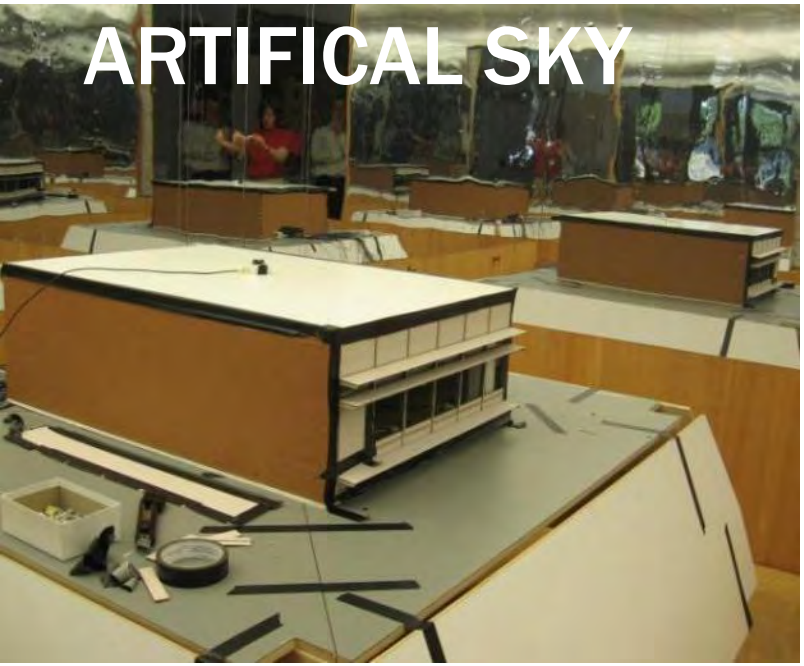
SHADING STUDY

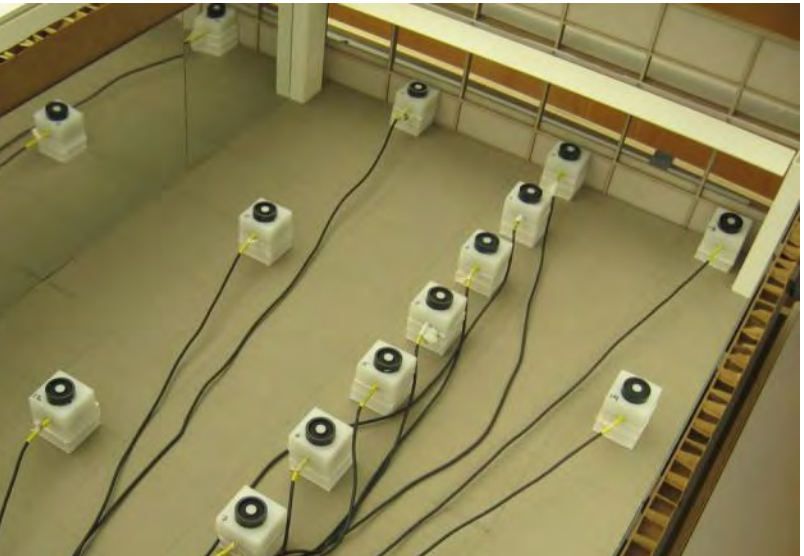
HELIDON TESTING

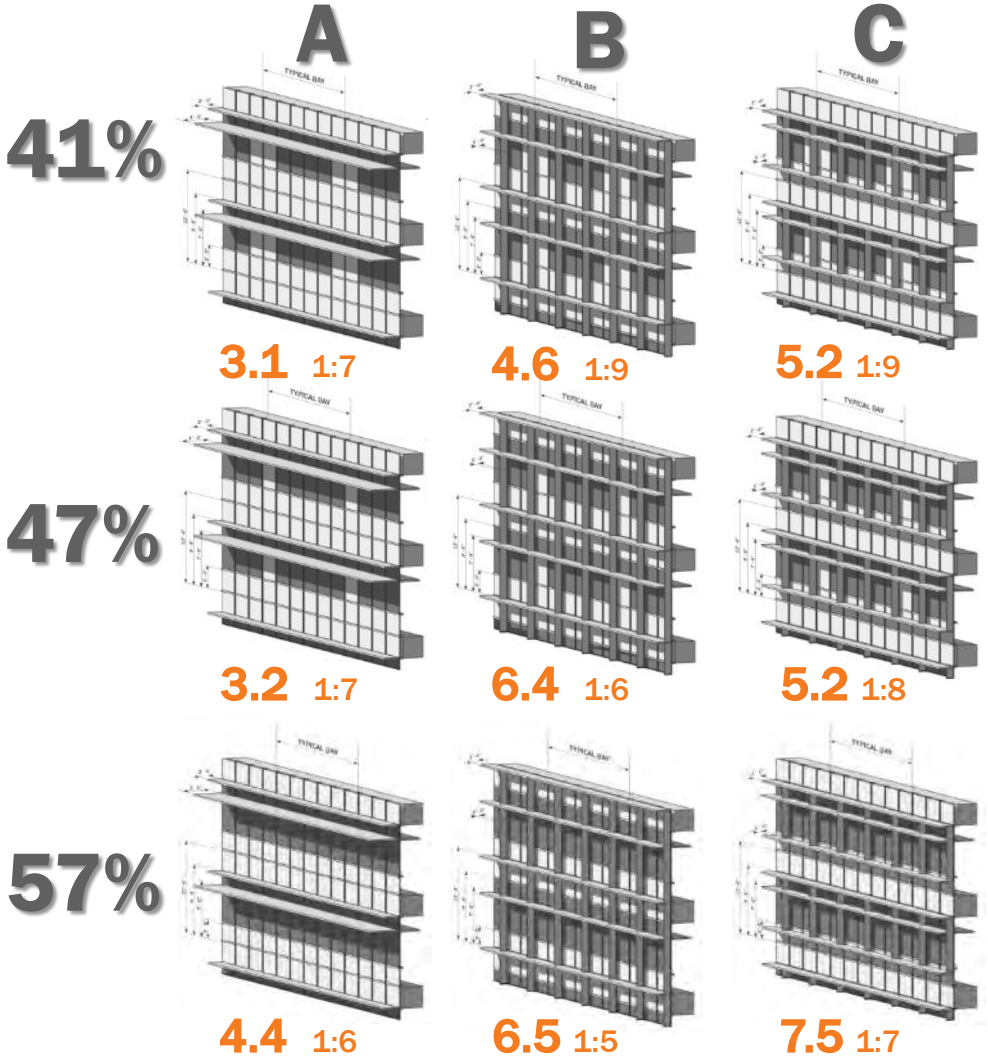


% annual shading, south facade

DAYLIGHT STUDY







Daylight Factor min/max ratio 16 ft perimeter zone

DAYLIGHT STUDY

ENERGY SAVINGS

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
01:00	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
02:00	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
03:00	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
04:00	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
05:00	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
06:00	12%	12%	12%	12%	9%	8%	9%	12%	12%	12%	12%	12%
07:00	55%	45%	29%	32%	24%	21%	24%	31%	54%	55%	55%	55%
08:00	43%	30%	19%	21%	15%		15%	21%	32%	52%	43%	52%
09:00	31%	20%							19%	32%	31%	36%
10:00	23%									21%	23%	28%
11:00	17%										17%	22%
12:00	15%										15%	18%
13:00	15%										15%	19%
14:00	21%										21%	26%
15:00	32%										32%	37%
16:00	46%	32%	20%							20%	46%	56%
17:00	61%	51%	32%						18%	30%	61%	61%
18:00	55%	55%	55%	19%	14%		14%	18%	28%	46%	55%	55%
19:00	52%	52%	52%	30%	23%	20%	23%	30%	51%	52%	52%	52%
20:00	30%	30%	30%	30%	22%	19%	21%	30%	30%	30%	30%	30%
21:00	23%	23%	23%	23%	23%	23%	23%	23%	23%	23%	23%	23%
22:00	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%
23:00	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
24:00	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%

times when
no electric lighting
is required to light the daylight zone of the building
(0'-16' from the window)

% = energy savings if lights are dimmed

times when there is no daylight

times when there is no electric power draw

STUDY RESULTS

A HYBRID SOLUTION

Thermal analysis

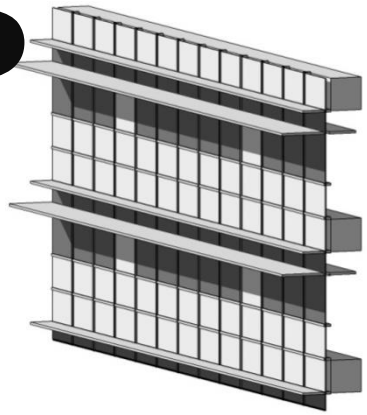
- Percentage glazing
- Shading

Daylight analysis

- Surrounding buildings shading
- Building integrated shading
- Interior light quality
- Energy savings

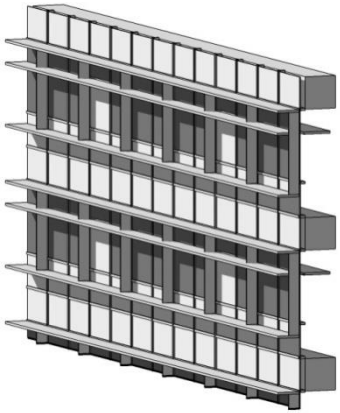
Ongoing Studies

- Energy Sensitivity Analysis



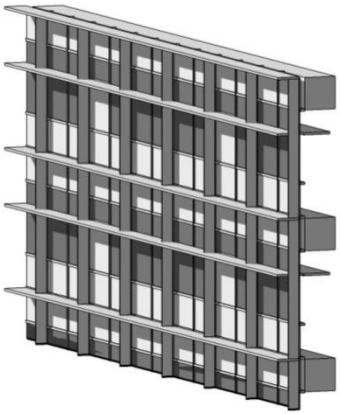
A

East 80%
South 85%
3.2 ave. daylight factor



B

East 72%
South 72%
6.4 ave. daylight factor

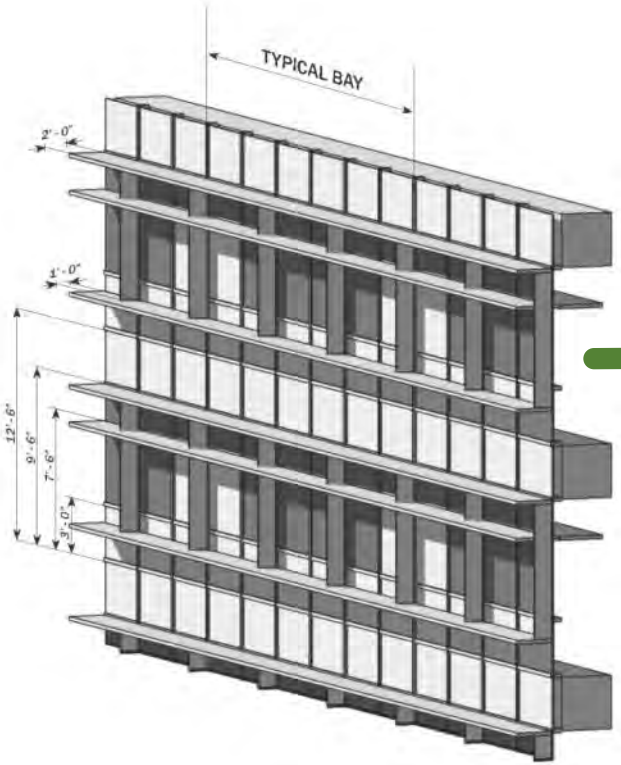


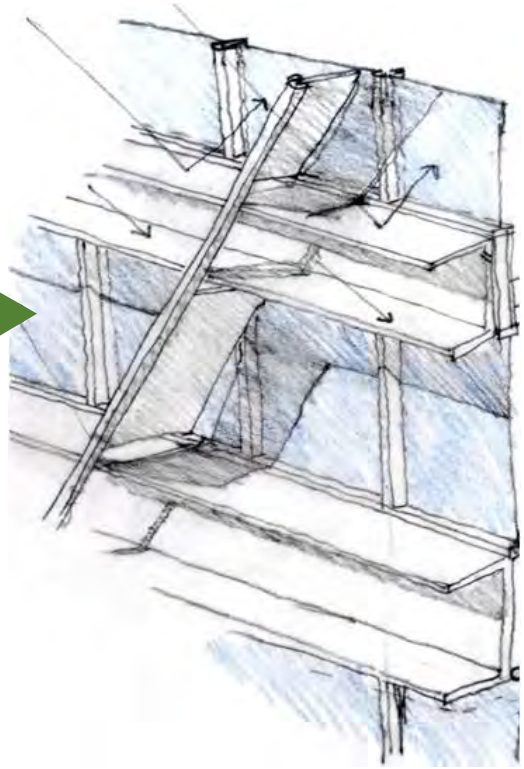
C

East 82%
South 80%
5.2 ave. daylight factor

DATA DRIVEN DESIGN

FROM STUDY TO DESIGN TO CONSTRUCTION





REEDS ON EAST FAÇADE

DESIGN/ANALYSIS

EAST & SOUTH ELEVATION STRATEGIES

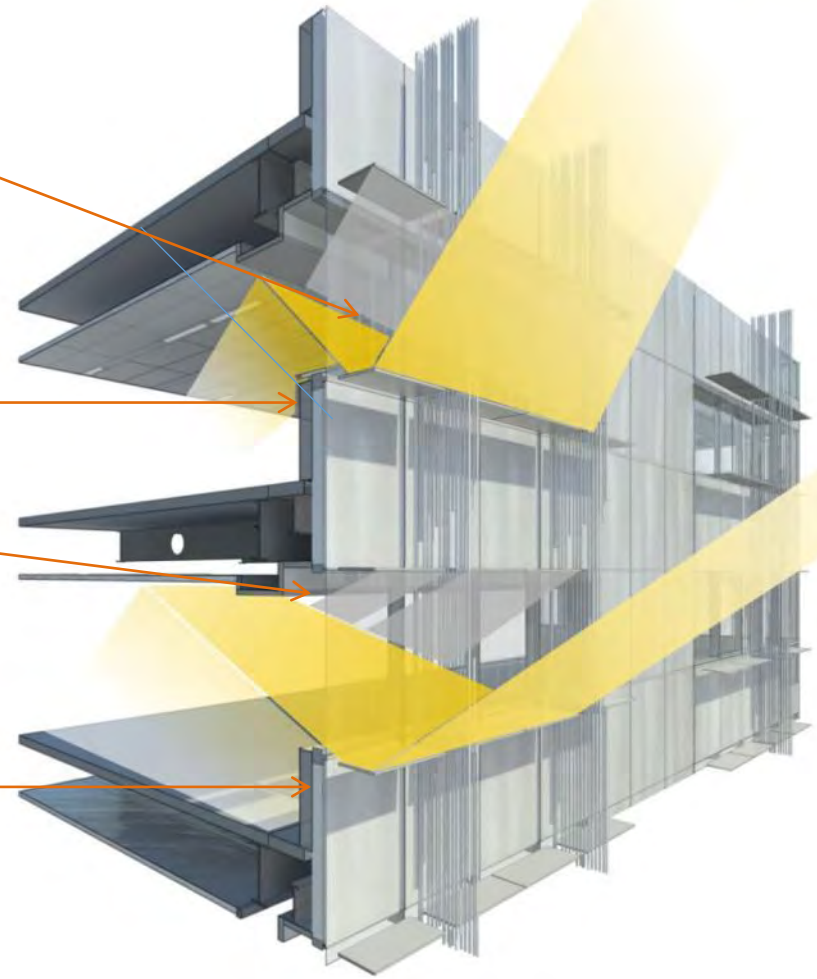
Summer mid-day sun (high angle)

Low Glazing to Wall Ratio
40% glazing

Low Infiltration Rate
0.06 CFM

Well-Insulated Wall

Daylighting
Light shelves bounce light 16ft. into interior



Equinox morning sun (lower angle)

DESIGN/ANALYSIS

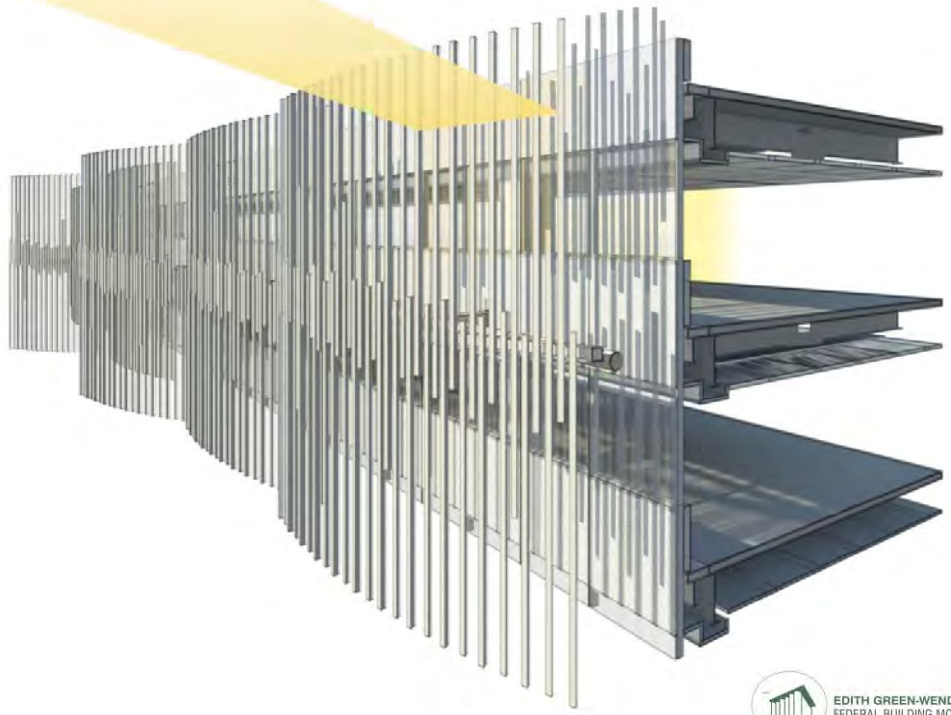
WEST ELEVATION SHADING STRATEGY

Shading reduces the heat gain on the building minimizing the energy needed for cooling.

West Facade
Reeds provide avg. 50% shading

South & East Facades
Combination vertical + horizontal shades

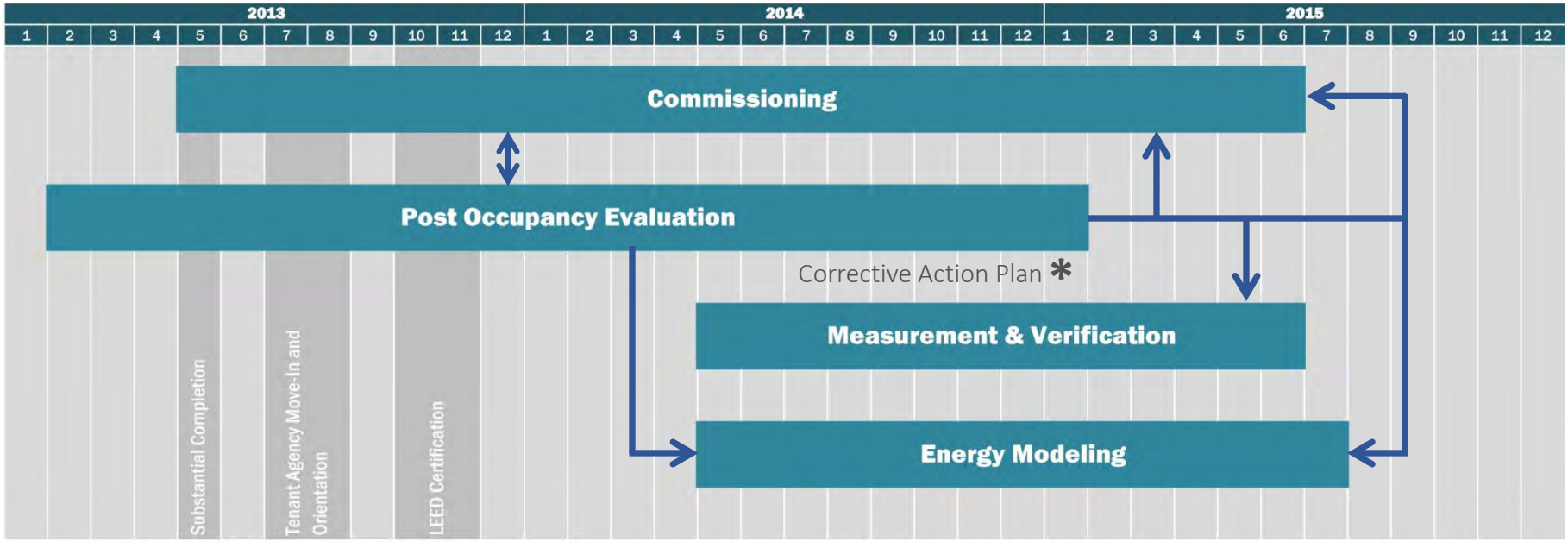
North Facade
No shading



PROJECT DELIVERY

MOCK UPS AND PRODUCT SELECTION

AFTERCARE
TUNING PERFORMANCE



TENANT ORIENTATION
TRAINING AND MILESTONES

TENANT DESIGN PROCESS

PROGRAMMING | CONFIG PLANS | DESIGN INTENT | DOCUMENTATION | CONSTRUCTION | MOVE-IN

PROJECT KICK-OFF:
INTRODUCTION
PROJECT GOALS
DESIGN PROCESS

PROJECT GUIDELINES:
SHARED AMENITIES
MODEL UNIT
51 STANDARDS

CHECK-IN:
COMMITTEES
OCCUPANT BEHAVIOR

WALK-THROUGH:
CONFIRM
ELEC/DATA

ORIENTATION SYMPOSIUM:
GEOGRAPHY
SYSTEMS
GOALS
INVOLVEMENT

TENANT ORIENTATION
TRAINING SYMPOSIUM

KNOW YOUR BUILDING

- Design History
- Systems and Strategies
- Sustainability Goals

KNOW YOUR IMPACT

- Occupant Behavior
- Shared Resources

KNOW YOUR NEIGHBORS

- Property Manager
- Green Team / Tenant Agencies

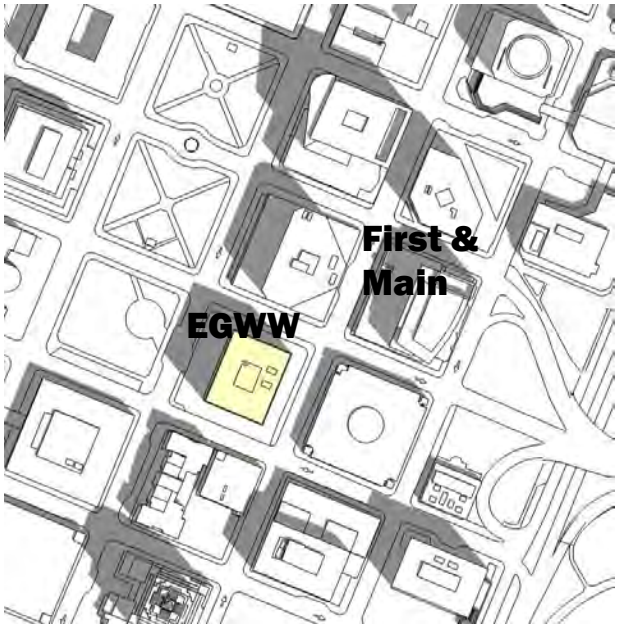
POST OCC EVALS
OCCUPANT SATISFACTION SURVEYS

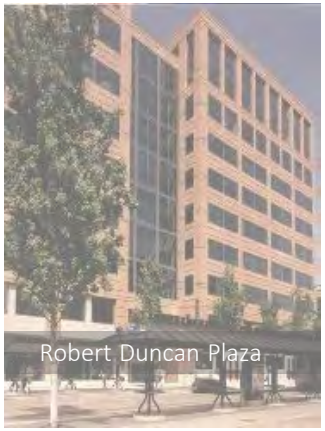
BEFORE & AFTER MOVE

Survey 3 largest agencies in their Existing Office spaces:

- First & Main Building
  2010 Class-A office building
  LEED-C&S Platinum
  One block away from EGWW

- Robert Duncan Plaza
  1991 office building
  Downtown Portland





POST OCC EVALS

CBE OCCUPANT SATISFACTION SURVEYS

INDOOR ENVIRONMENTAL QUALITY (IEQ)

- Thermal Comfort
- Lighting / Daylighting
- Indoor Air Quality
- Acoustics

+ Office Layout, Furnishings & General Satisfaction

Thermal Comfort

How satisfied are you with the temperature in your workspace?

Very Satisfied Very Dissatisfied

Overall, does your thermal comfort in your workspace enhance or interfere with your ability to get your job done?

Enhances Interferes

Air Quality

How satisfied are you with the air quality in your workspace (i.e. stuffy/stale air, cleanliness, odors)?

Very Satisfied Very Dissatisfied

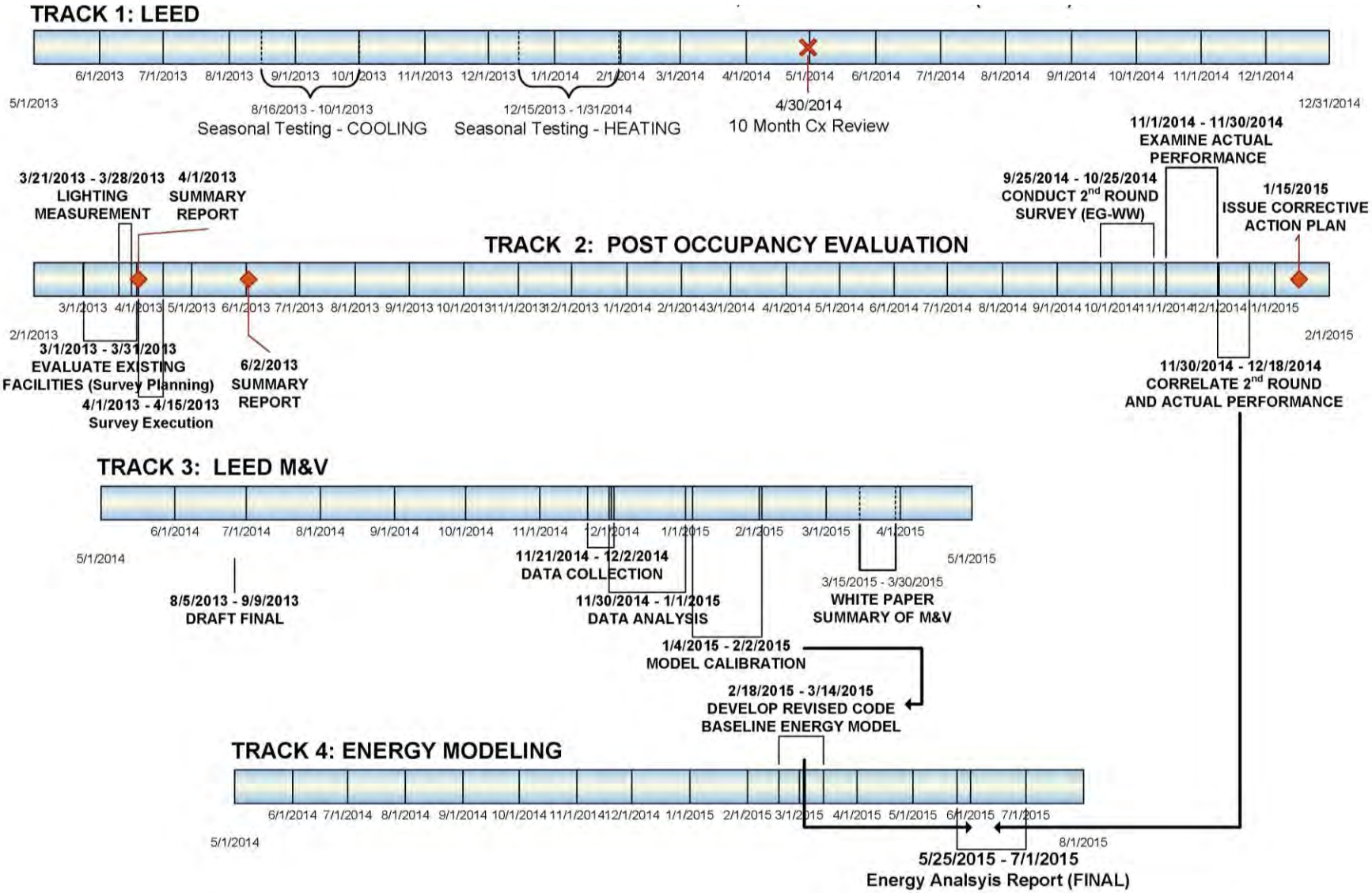
Overall, does the air quality in your workspace enhance or interfere with your ability to get your job done?

Enhances Interferes

University of California, Berkeley – Center for the Built Environment (CBE)

POST OCC STUDIES

CBE, LBNL, M+V, MODELS and more...



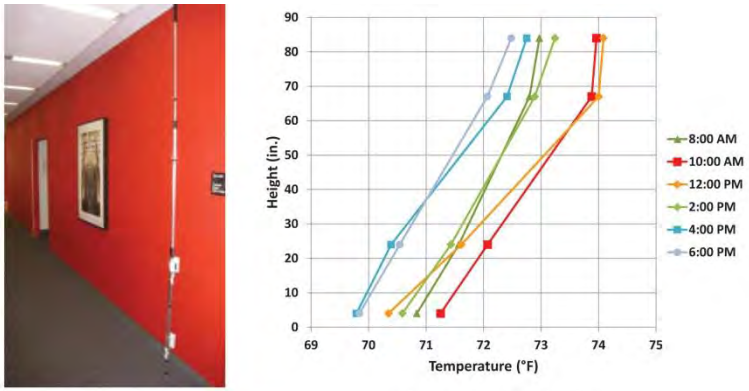
POST OCC EVALS
PHYSICAL MEASUREMENTS

INDOOR ENVIRONMENTAL QUALITY (IEQ)

- Thermal Comfort
- Electric Lighting
- Daylighting
- Indoor Air Quality
- Acoustics

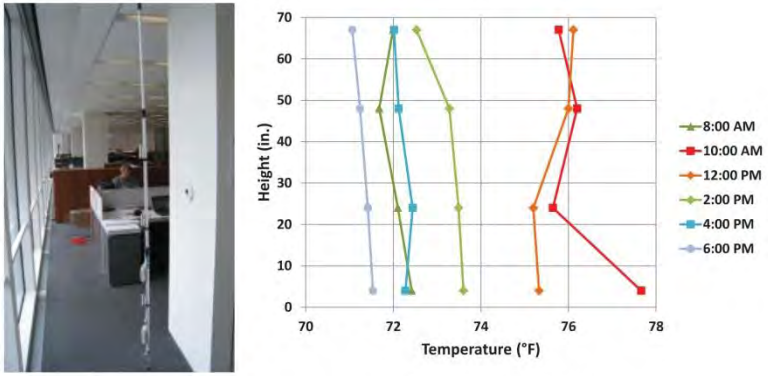
CORRELATE TO DESIGN

- IEQ parameters
  Lighting & Daylighting Studies
  Acoustics expectations
  Thermal Comfort Study
- Energy model assumptions



a) Photo of pole b) Temperature vs. height

Figure 20. East interior zone stratification pole and example hourly temperature profiles, 9/14/2011.



a) Photo of pole b) Temperature vs. height

Figure 21. East perimeter zone stratification pole and example hourly temperature profiles, 9/14/2011.

University of California, Berkeley – Center for the Built Environment (CBE)

COMMISIONING
ONGOING TUNING & OPTIMIZATION

SEASONAL TUNING

CALIBRATE ENERGY MODEL

CONNECT TO MEASUREMENT & VERIFICATION

- Tie into M&V and energy modeling cross-walk

TIE-IN WITH POST OCCUPANCY EVALUATIONS

- Involvement in corrective Action plan from occupant satisfaction

ONGOING M&V

ENERGY & WATER PERFORMANCE

ENERGY END USE METERS

- Major systems submetered

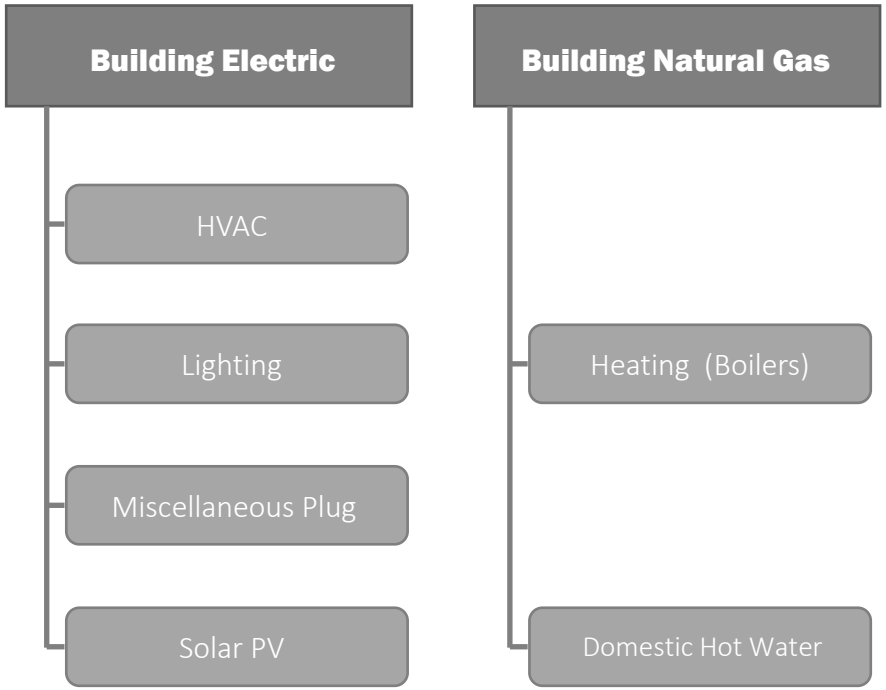
CORRELATE ACTUAL PERFORMANCE TO DESIGN

- Cross walk to early design energy model

CALIBRATED MODEL FOR ONGOING OPTIMIZATION

WATER CALCULATOR

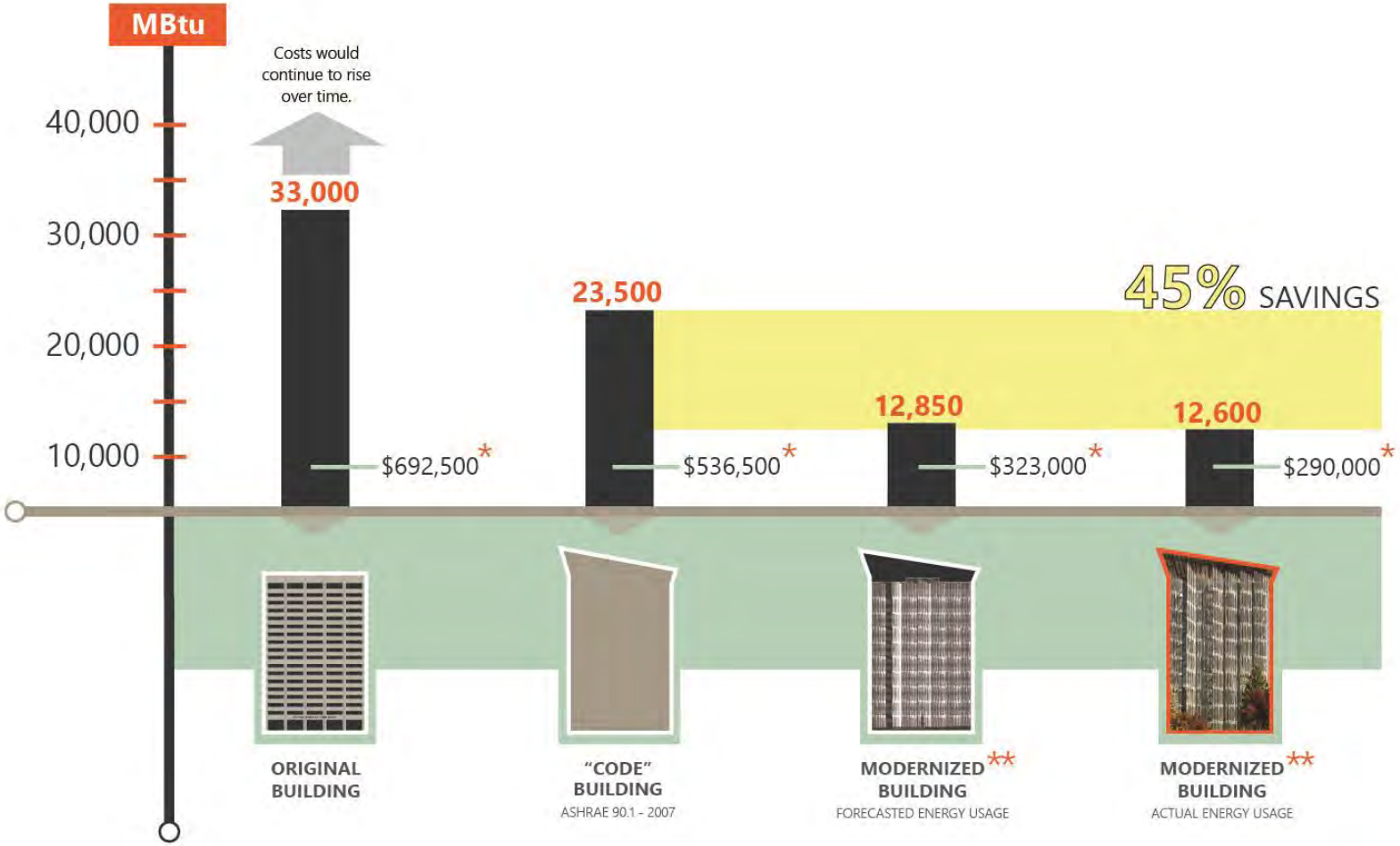
- Potable Water Use
- Rainwater catchment & Reuse



EDITH GREEN - WENDELL WYATT FEDERAL BUILDING

ANNUAL ENERGY USAGE

Calculated Based on AVERAGE Monthly Usage from May to December 2013



* Calculated at 2013 energy cost.

** Modernized building includes a 14% increase in leasable area compared to the original building.

GSA SERA

THANK YOU!

Questions / More Information:

Clark Brockman

clarkb@serapdx.com

Principal, Sustainability

SERA

www.serapdx.com

Clark Brockman: http://serapdx.com/people/clark-brockman/

Sustainability Resources Group:
http://serapdx.com/services/sustainability-resources/

LinkedIn: Clark Brockman
Twitter: @clarkbrockman

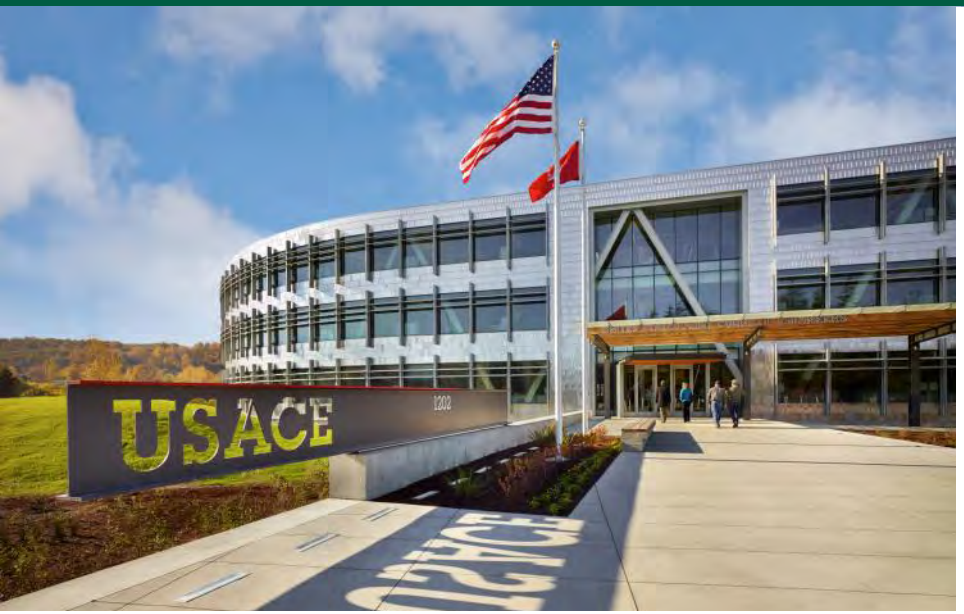
DESIGNING FOR BETTER ENERGY OUTCOMES

Vikram Sami
LEED BD+C, BEMP

ZGF
ZIMMER GUNSUL FRASCA ARCHITECTS LLP

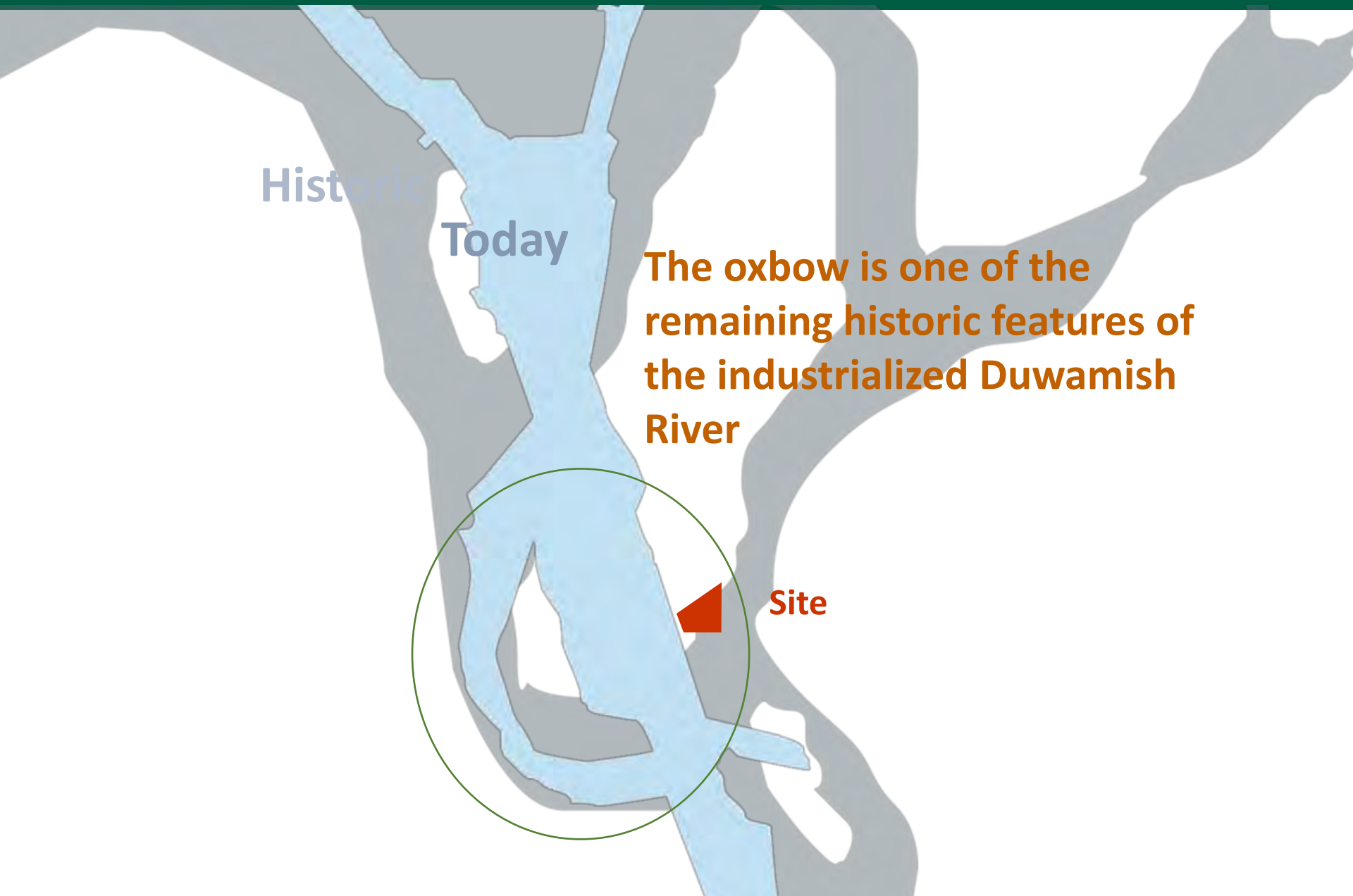
Federal Center South

ZGF
ZIMMER GUNSUL FRASCA ARCHITECTS LLP



Duwamish River Bed

ZGF
ZIMMER GUNSUL FRASCA ARCHITECTS LLP

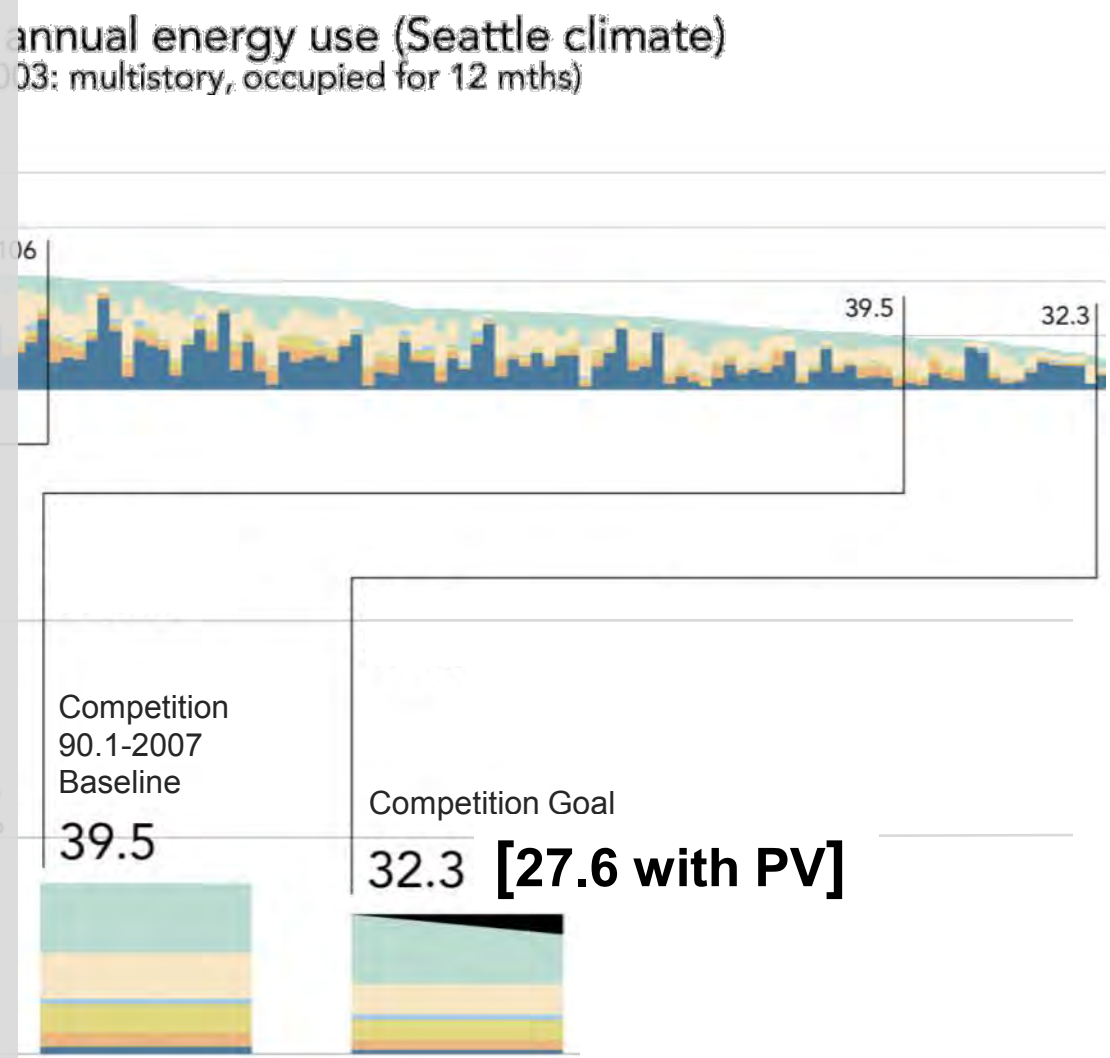


Overall Energy Goals

ZGF
ZIMMER GUNSUL FRASCA ARCHITECTS LLP

Contract:

- 0.5% of total project cost at risk
- Approx $350K ($1.75/ft^2)
- Risk shared between
  - Design Team (1/3)
  - Construction Team (2/3)
- 1 Year M&V
- Document assumptions thoroughly



The Collaborative Workplace

ZGF
ZIMMER GUNSUL FRASCA ARCHITECTS LLP

Flexibility. Efficiency. Daylight.
Unified. Open.

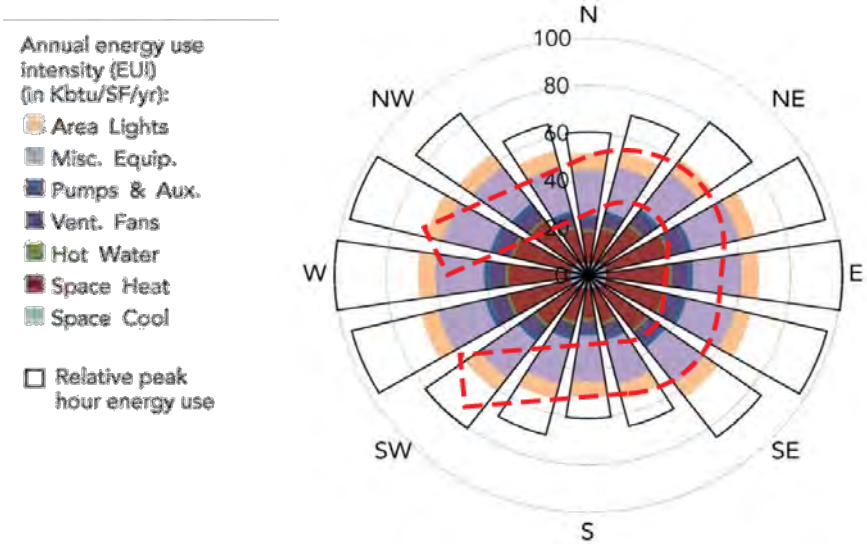
Interaction. Collaboration.
Central and convenient.

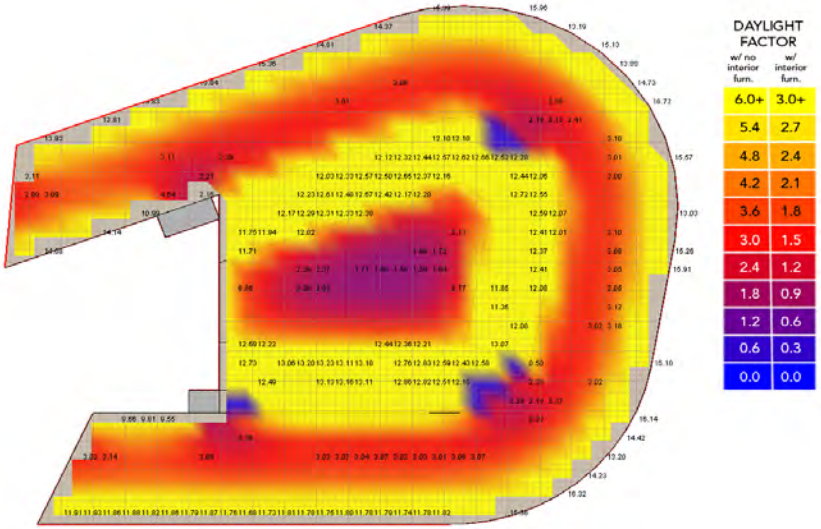
No “Silos”.

Optimize Mechanical Systems

Optimize Structural

Builds Community





Optimizing Workplace for Daylight & Views

ZGF
ZIMMER GUNSUL FRASCA ARCHITECTS LLP

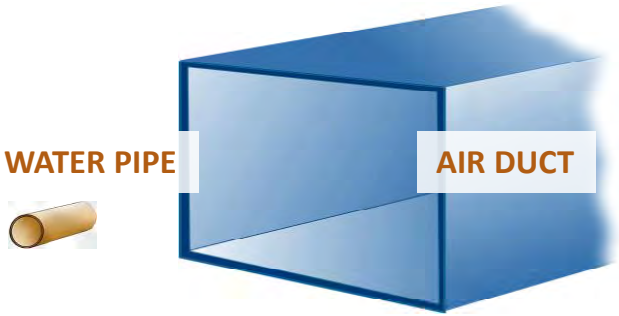
Original Workplace

21st Century Workplace

Decoupled Ventilation and Conditioning

ZGF
ZIMMER GUNSUL FRASCA ARCHITECTS LLP

Flow Cross Section Ratio
1 : 327



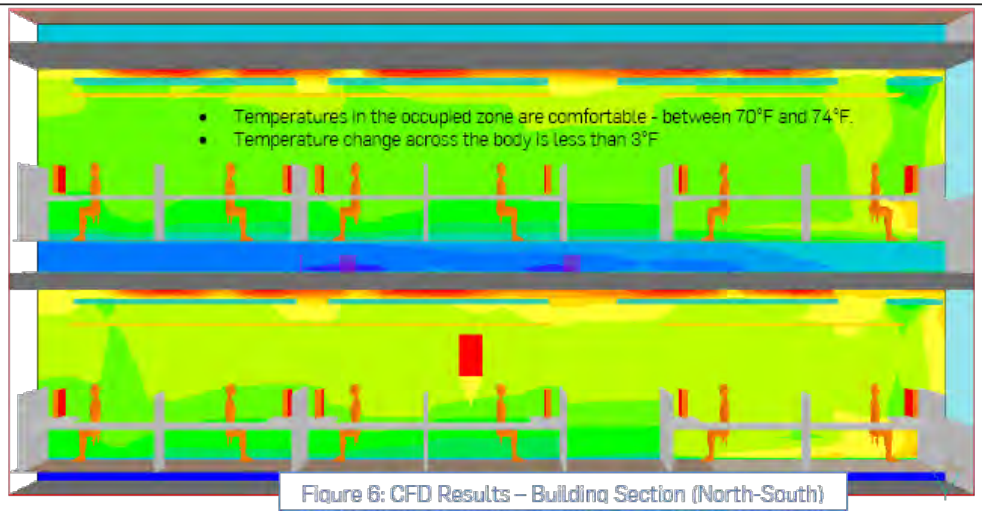
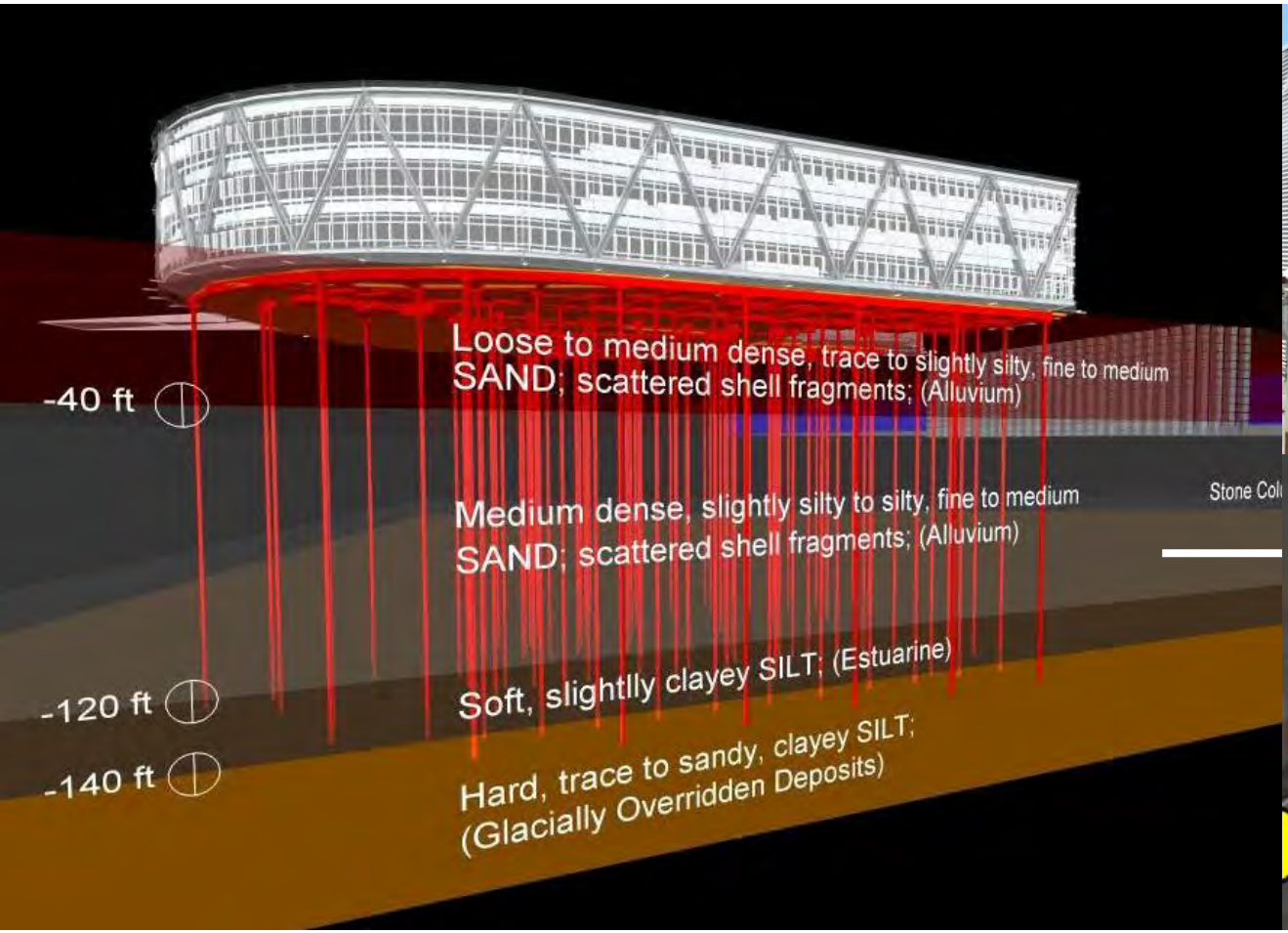


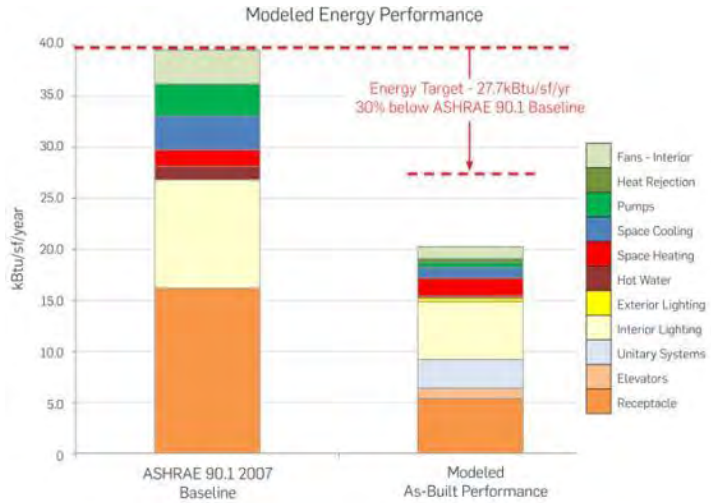
Figure 6: CFD Results – Building Section (North-South)

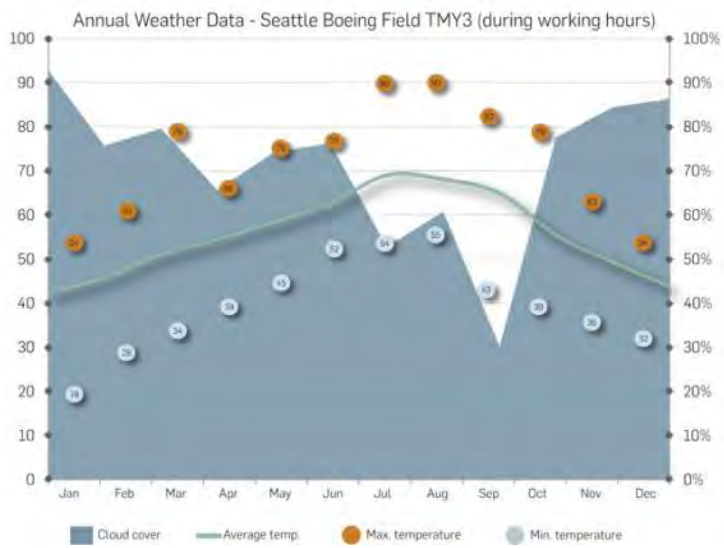
Thermal Storage & Geo Exchange

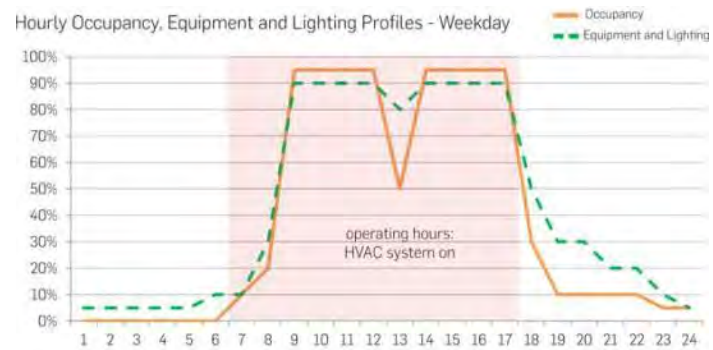
ZGF
ZIMMER GUNSUL FRASCA ARCHITECTS LLP

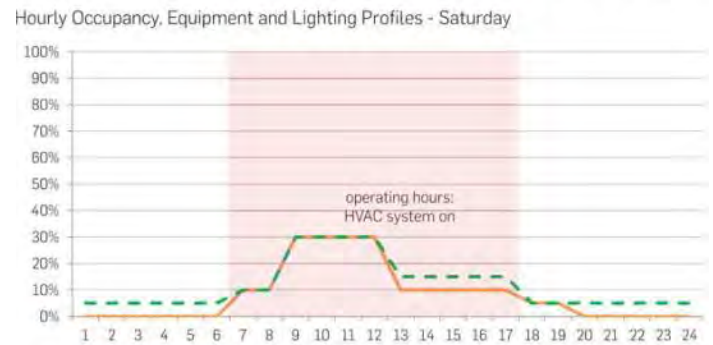


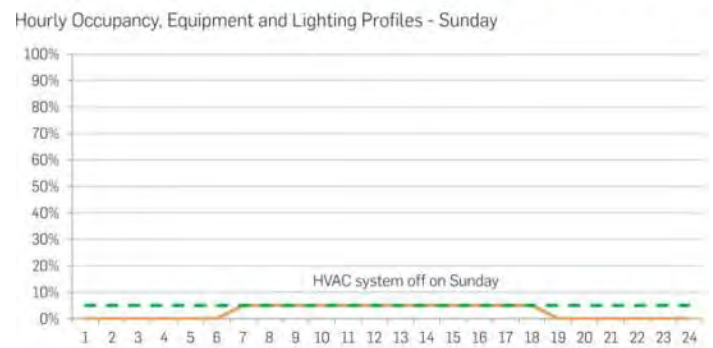
Energy Model Assumptions





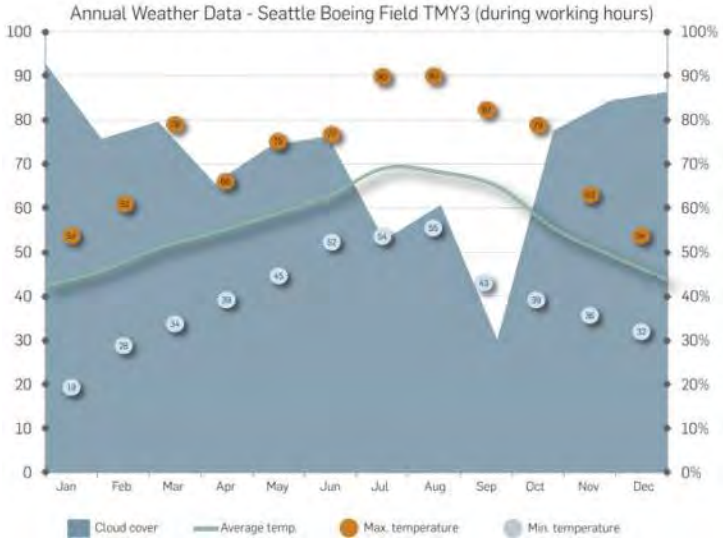






Weather *[adjustments]*

ZGF
ZIMMER GUNSUL FRASCA ARCHITECTS LLP



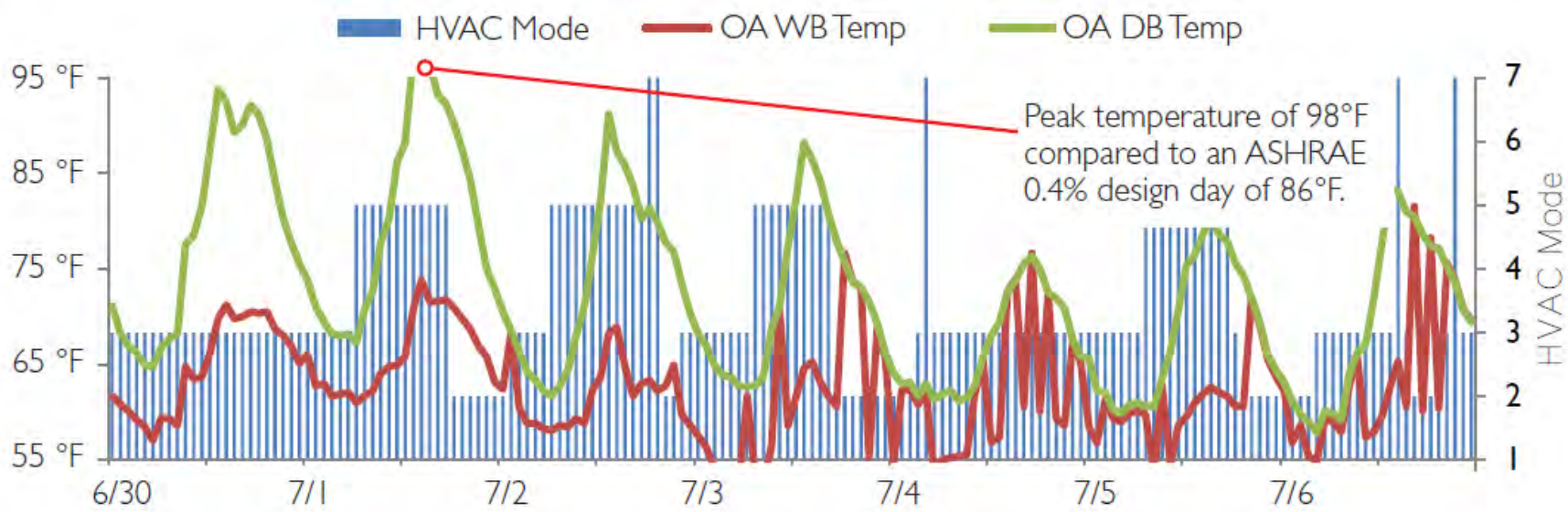
WEATHER ADJUSTMENTS: JUNE

HDD MODELED	HDD MEASURED	VARIATION
44.0	44.6	101%

CDD MODELED	CDD MEASURED	VARIATION
14.9	17.6	118%

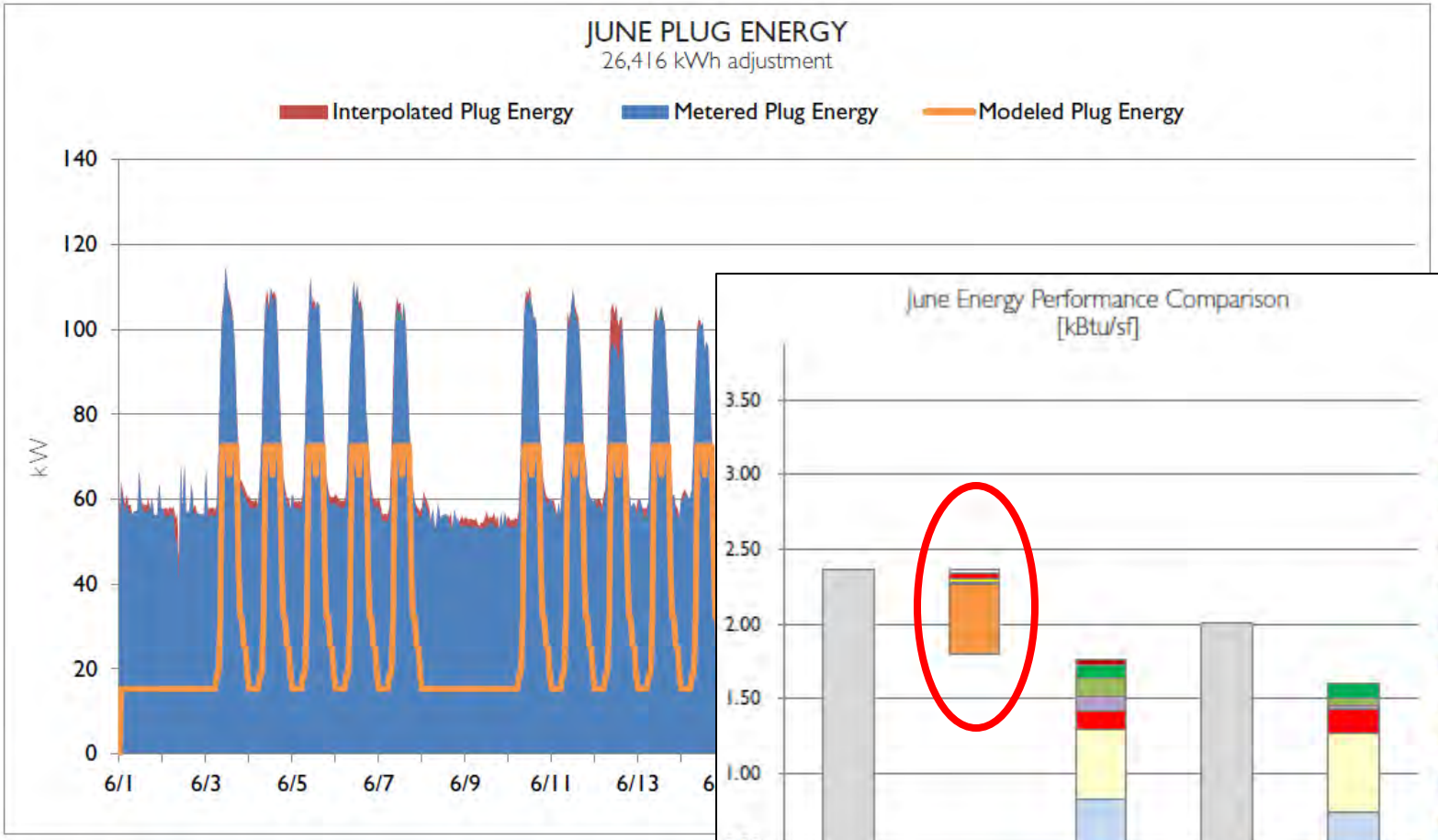
(modeled heating energy) x (1 - HDD variation)
+
(modeled cooling energy x (1 - CDD variation)
=
weather adjustment

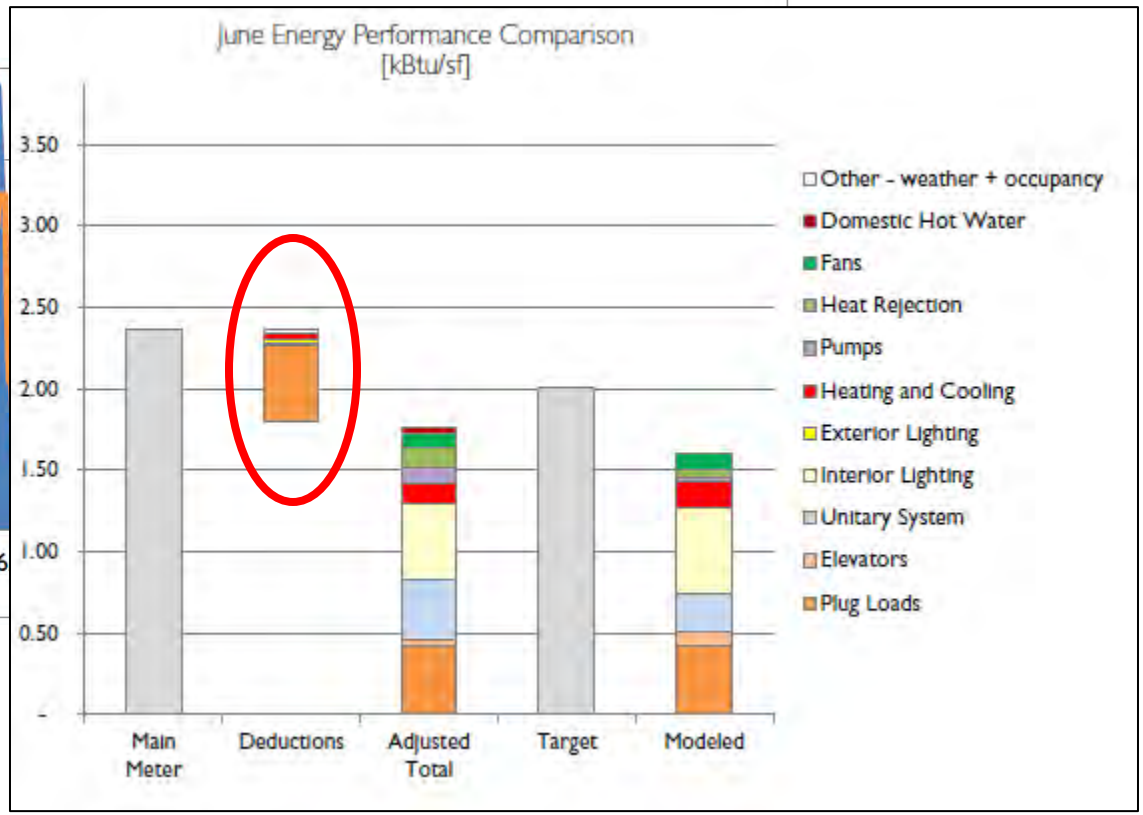
1,279kWh x -1% + 7,523kWh x 18%= 1,379kWh



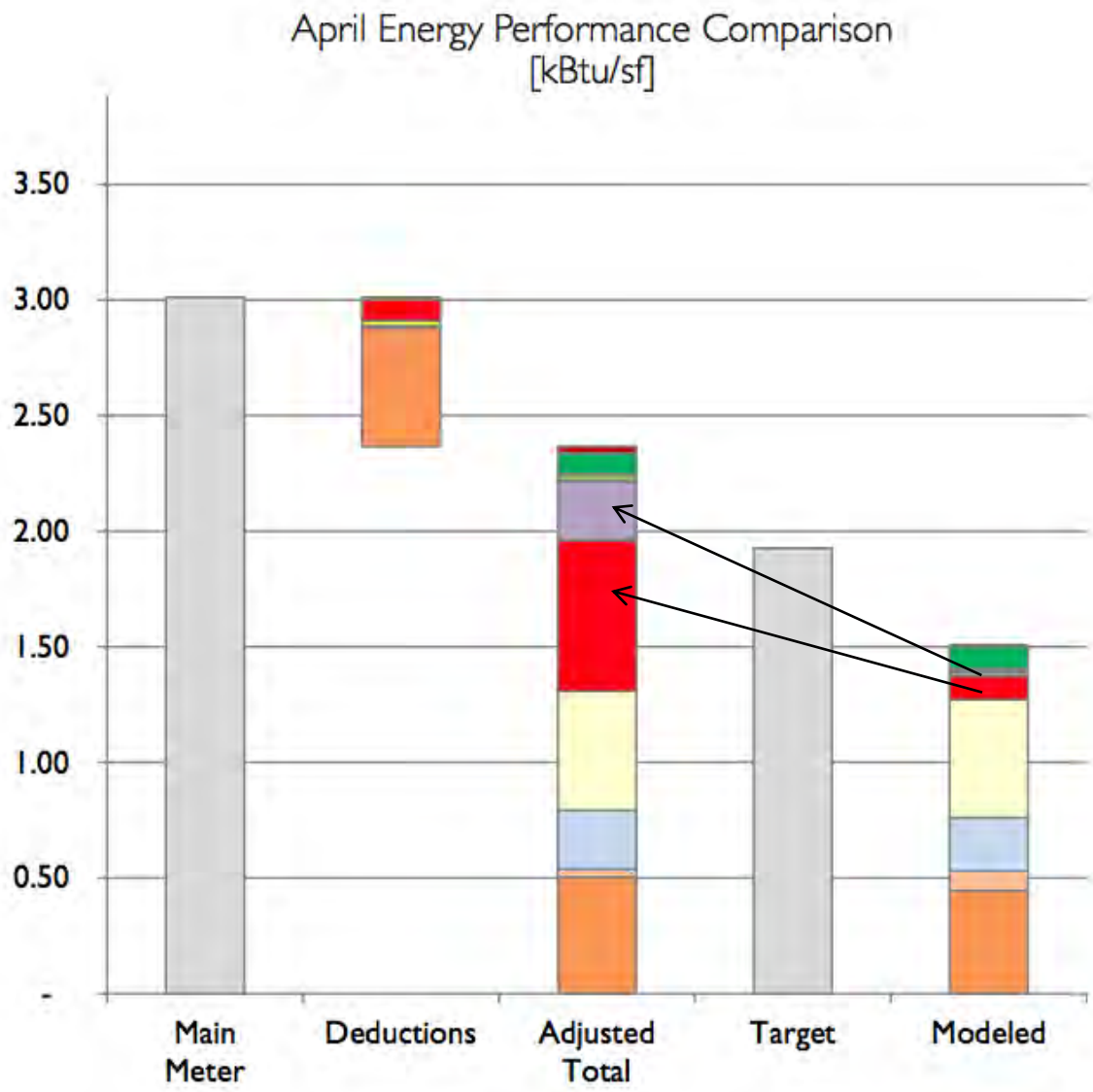
Whether *[it is operated as modeled]*

ZGF
ZIMMER GUNSUL FRASCA ARCHITECTS LLP





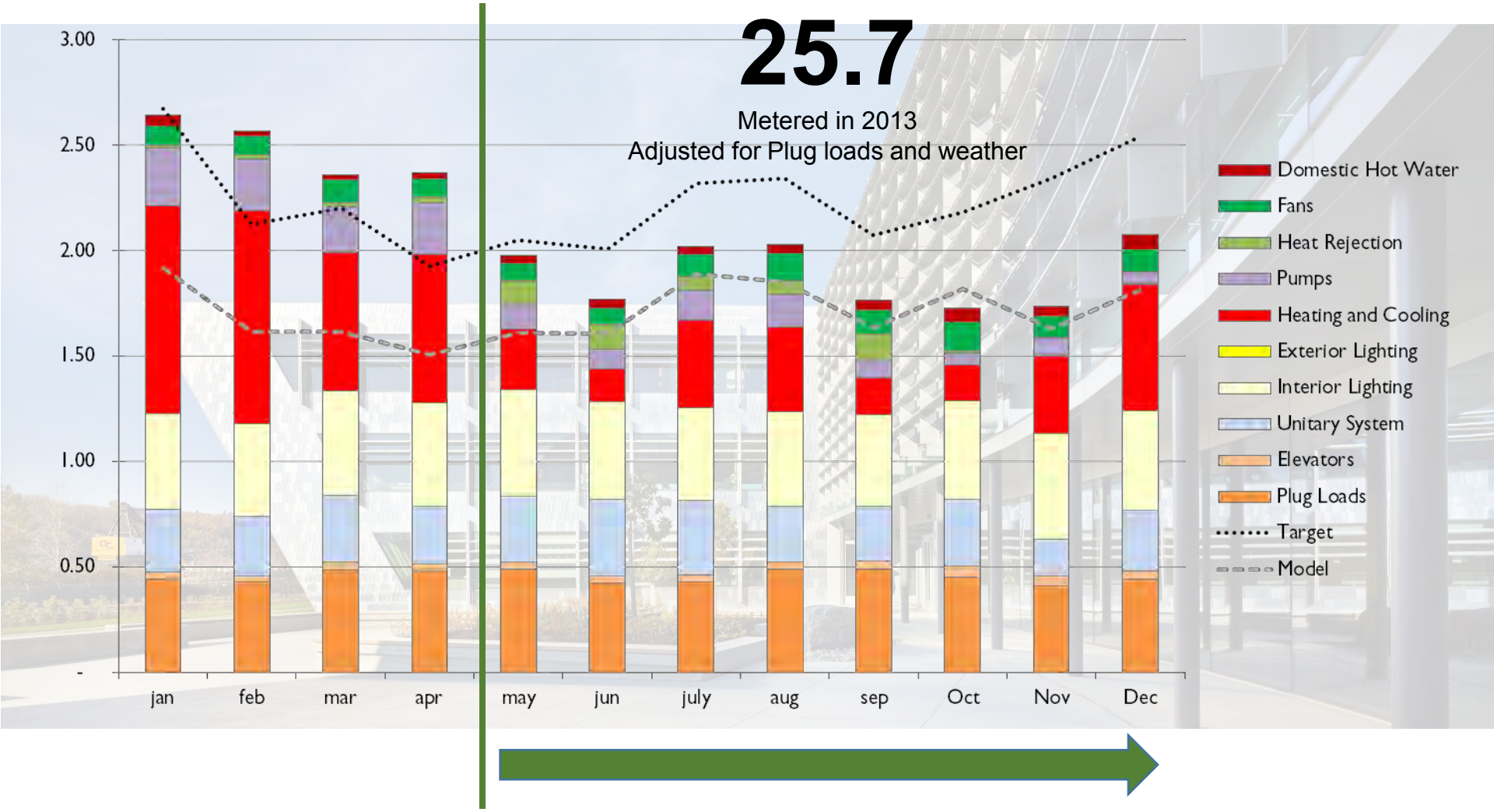
Tracking EUI Performance



- Detailed Analysis of Meter Data
- Plug load much greater than model
- Lighting energy is about right
- Heating and cooling energy is much greater than model
- Pump energy is much greater than model

Normalized Performance for 2013

ZGF
ZIMMER GUNSUL FRASCA ARCHITECTS LLP

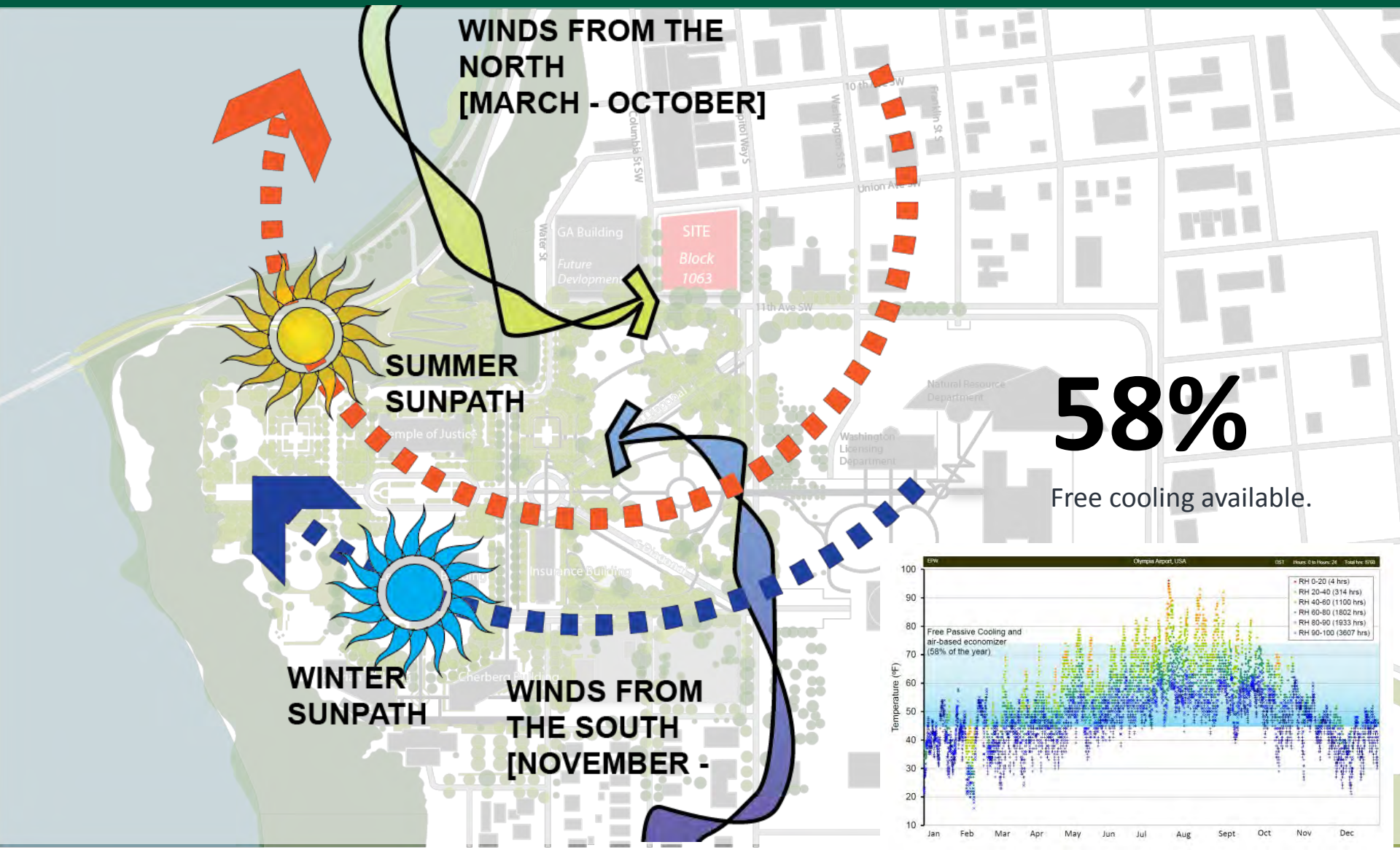


Mostly on track with model after April

1063 BLOCK REPLACEMENT

Site Context

ZGF
ZIMMER GUNSUL FRASCA ARCHITECTS LLP



Program

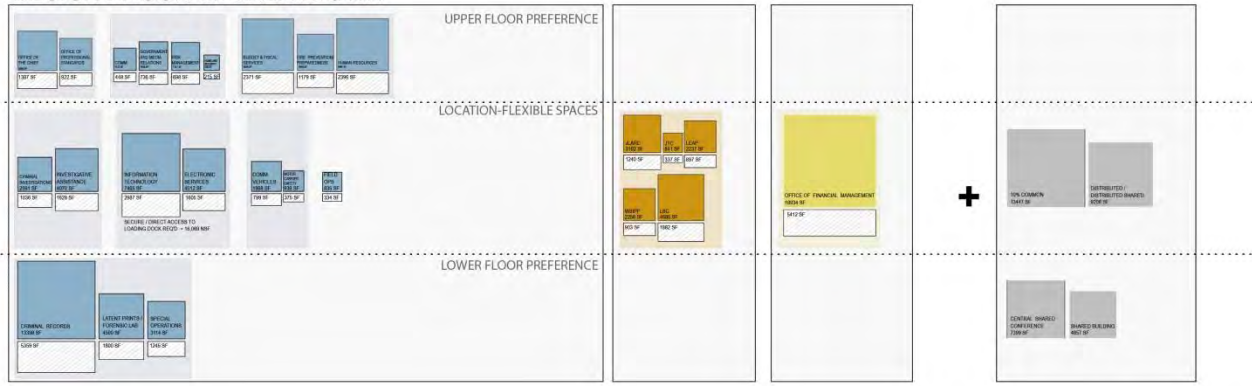
ZGF
ZIMMER GUNSUL FRASCA ARCHITECTS LLP

Contract:

- $420K (Approx $2/ft^2)
- **5** Year M&V
- Percentage released annually pending compliance
- Document assumptions thoroughly

	WASHINGTON STATE PATROL	LEGISLATIVE AGENCIES	OFFICE OF FINANCIAL MANAGEMENT	+	SHARED BUILDING
	97,980 SF* 60%	16,638 SF* 9%	19,040 SF* 11%		34,834 SF 20%
	*includes x1.4 department grossing factor				
x1.25 GROSSING FACTOR	24,495 SF	4,159 SF	4,760SF		8,727 SF
	122,475 GSF	20,797 GSF	23,800GSF		43,542 GSF = 210,063 GSF

DESIGN PROGRAM BREAKDOWN

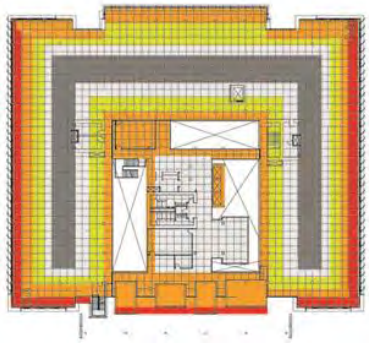


48% open program spaces

52% enclosed rooms

Program – Need for Daylight

ZGF
ZIMMER GUNSUL FRASCA ARCHITECTS LLP

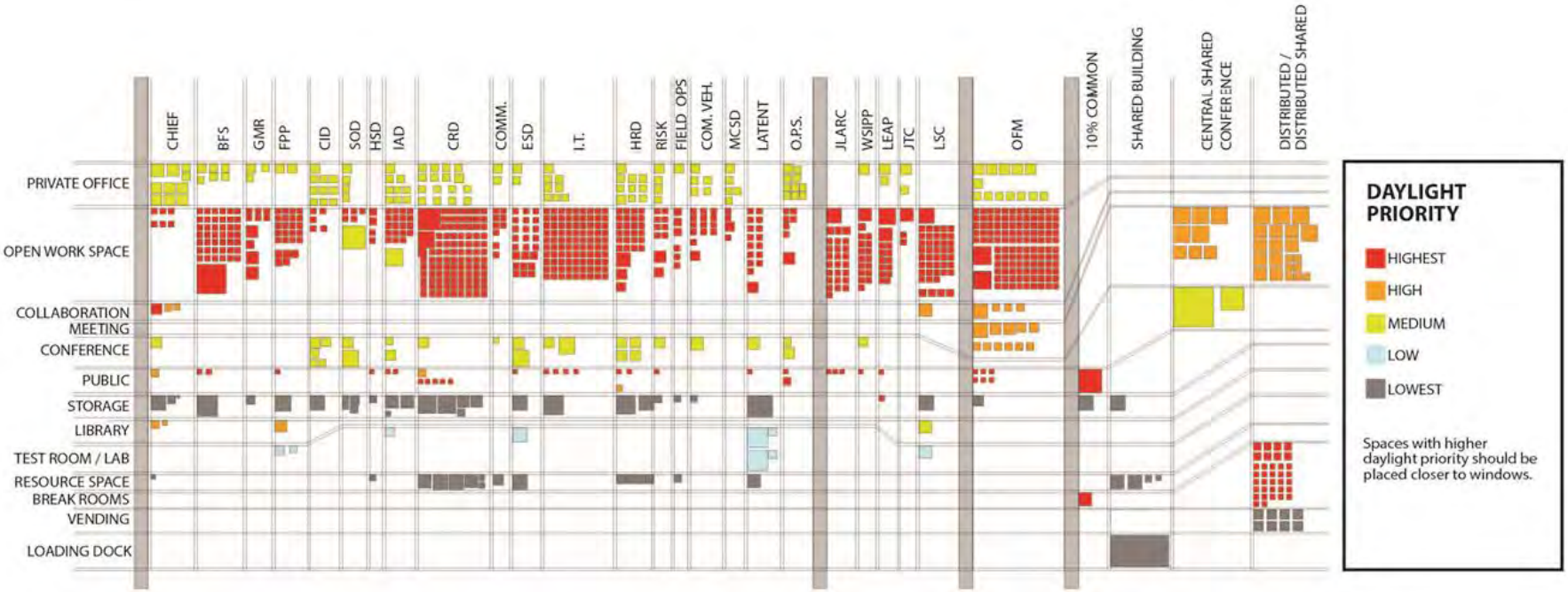


68%

of floor plate has daylight autonomy over 50% of the year

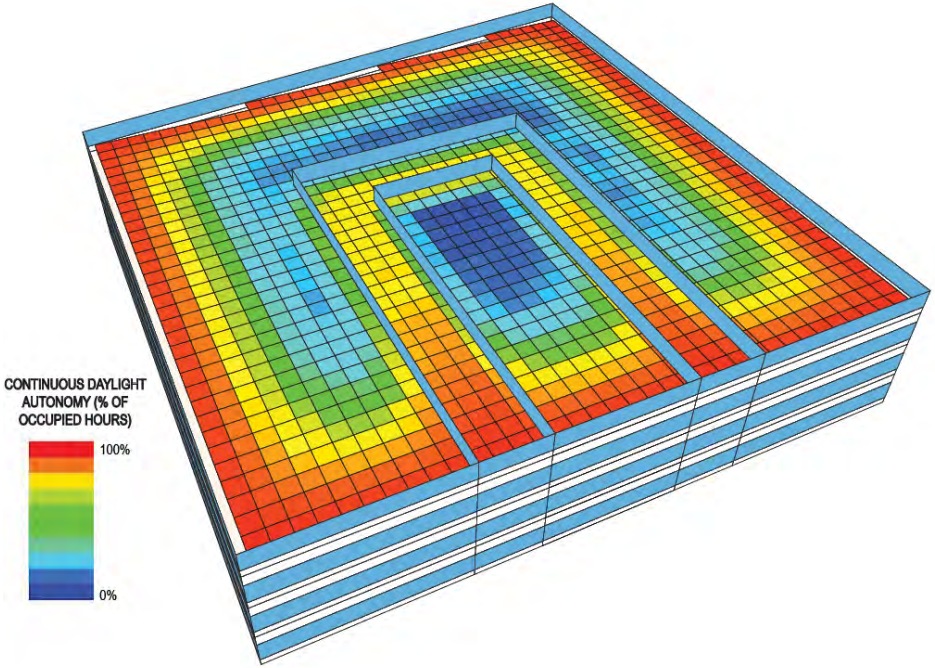
70%

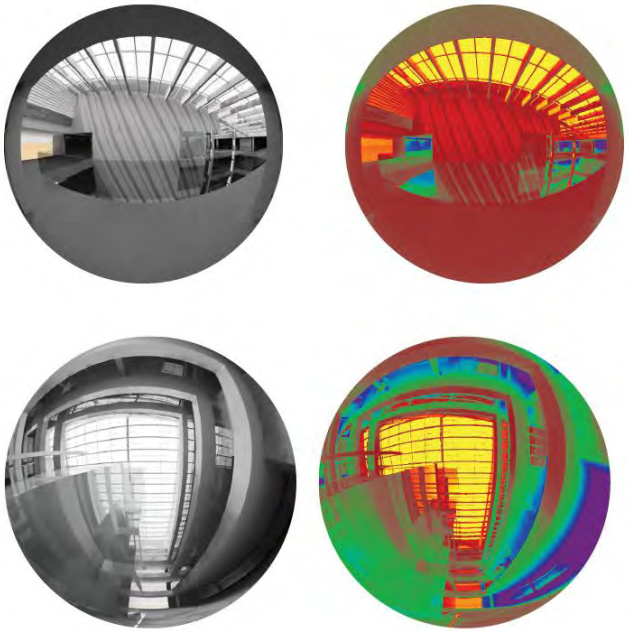
of program has need for daylight

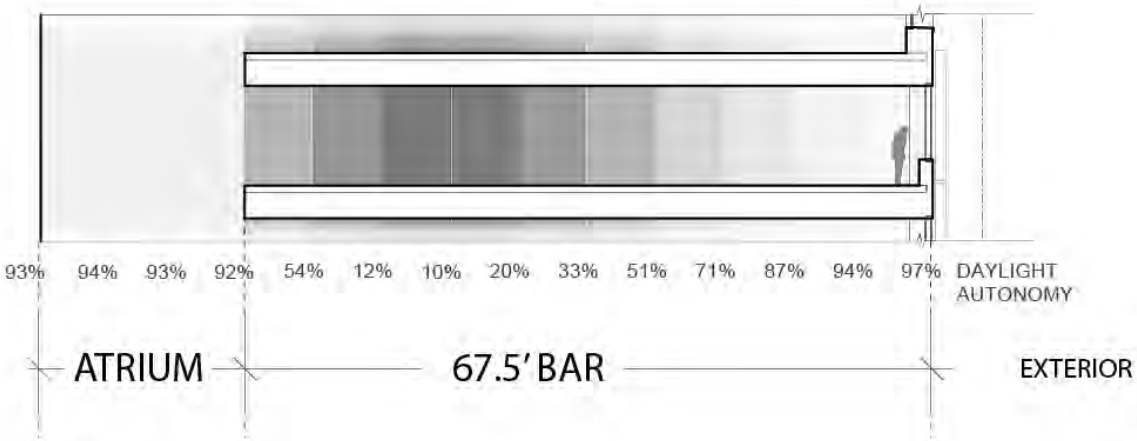


Daylight Optimization

ZGF
ZIMMER GUNSUL FRASCA ARCHITECTS LLP



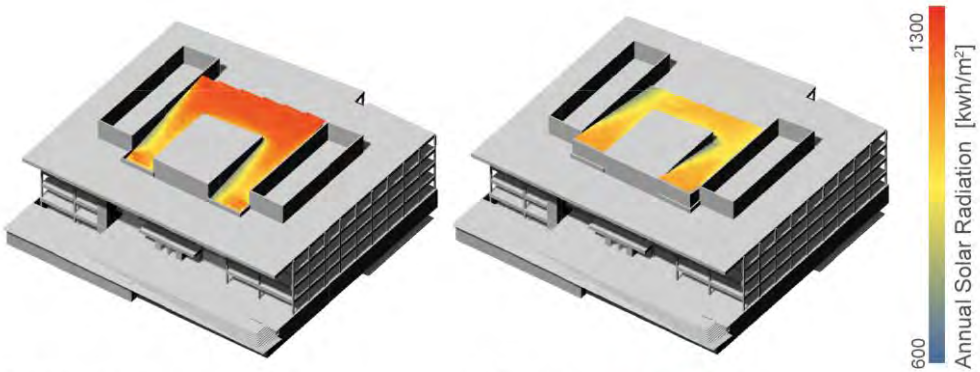




68%

Access to daylight from atrium and exterior walls.

Façade Optimization

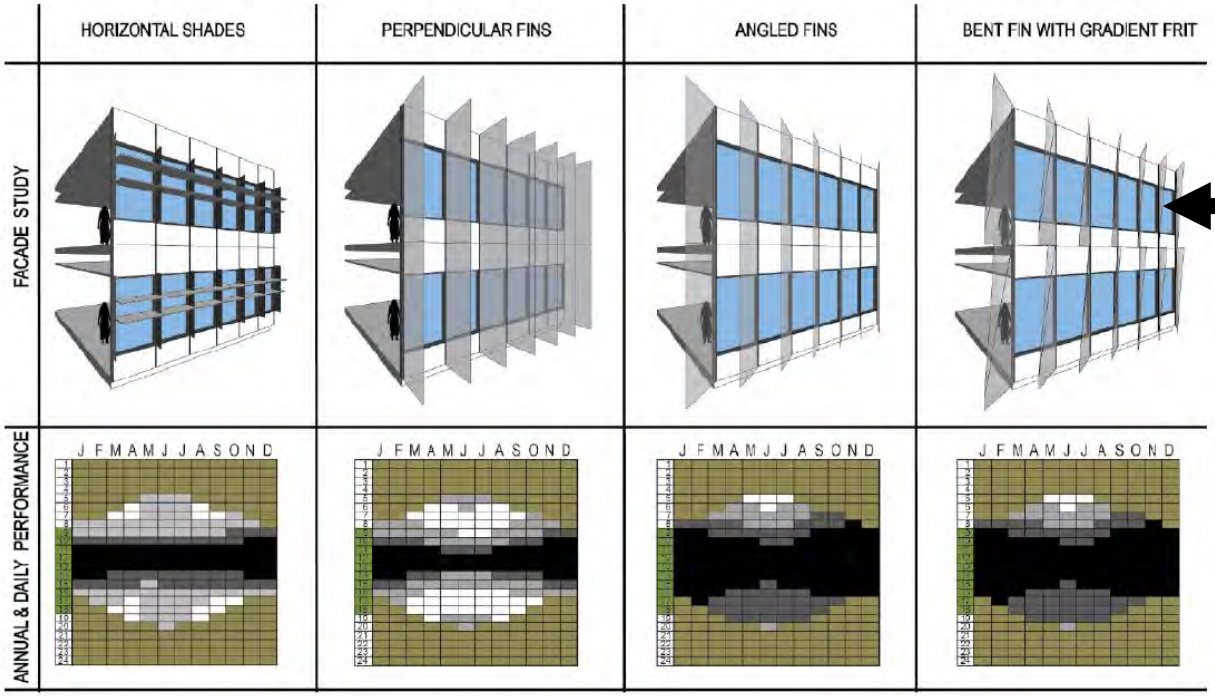


1085 [kwh/m²] avg

951 [kwh/m²] avg (-12%)

12%

Reduction in solar load



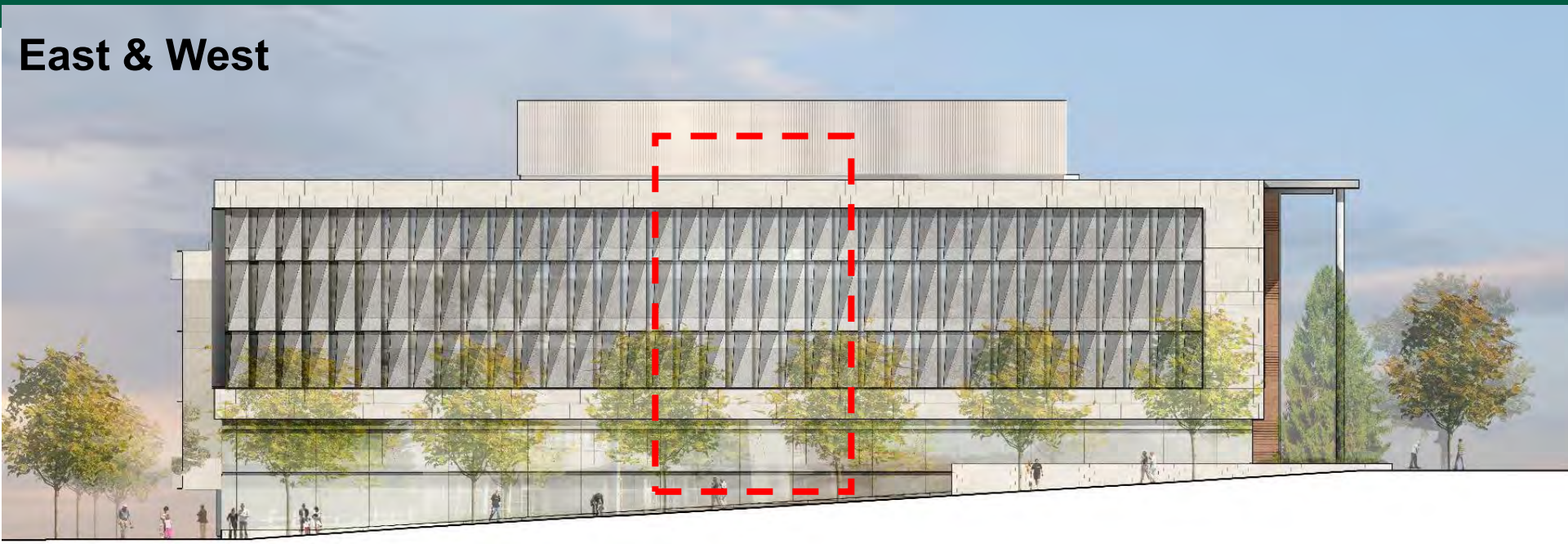
66%

Reduction in solar load

Façade Optmization

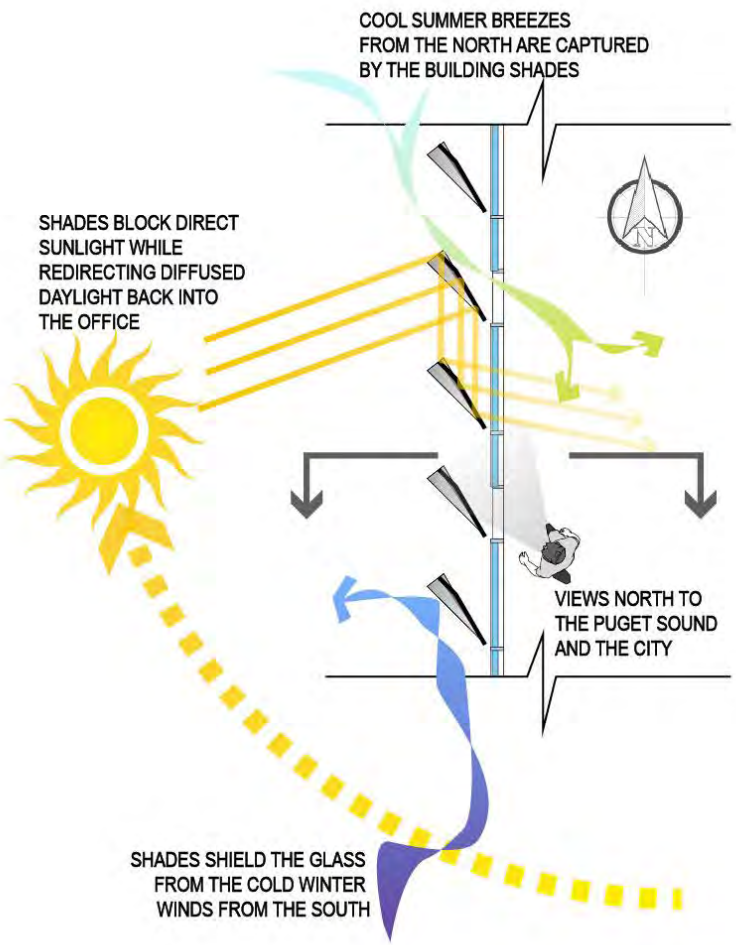
ZGF
ZIMMER GUNSUL FRASCA ARCHITECTS LLP

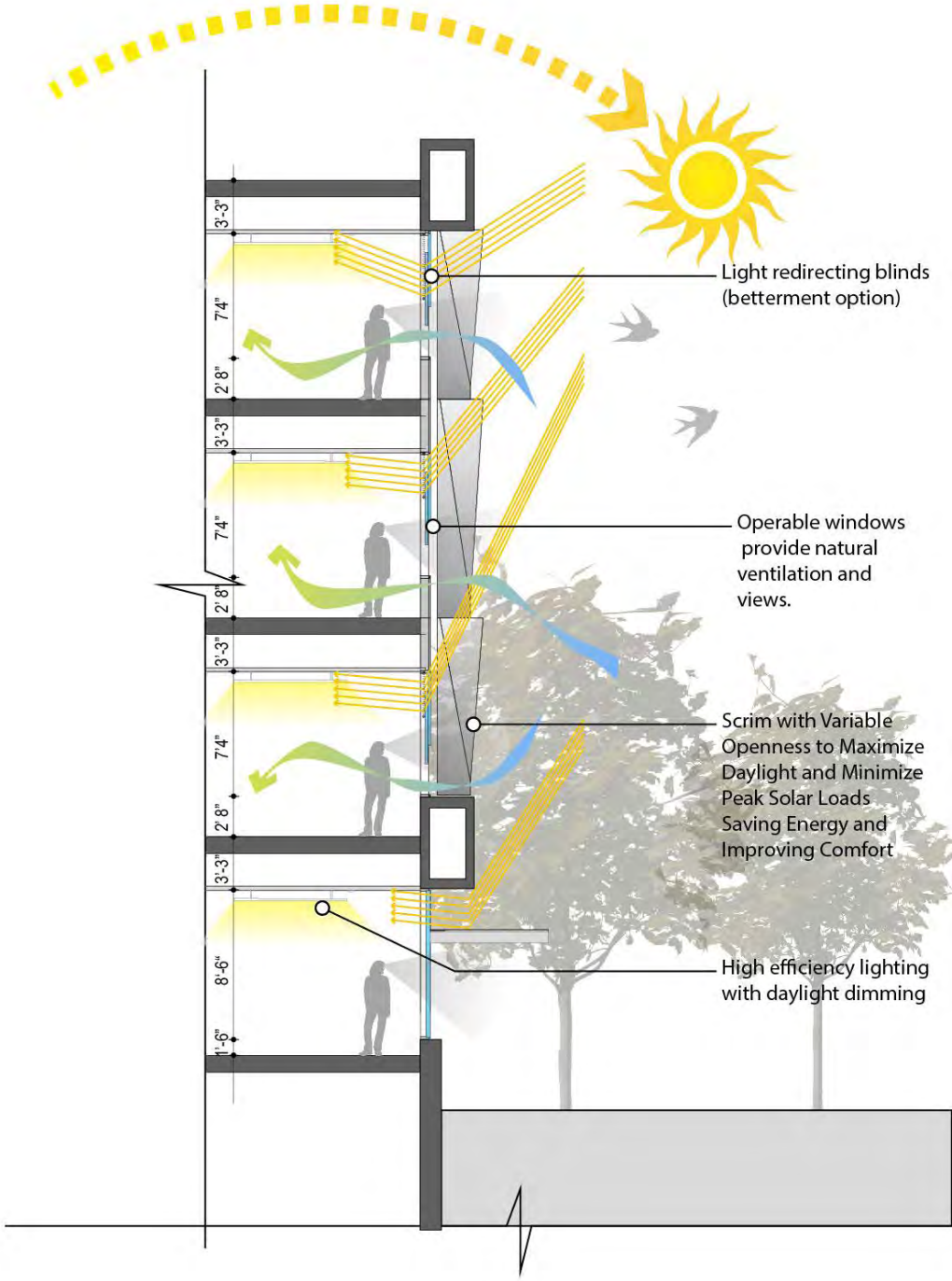
East & West



South

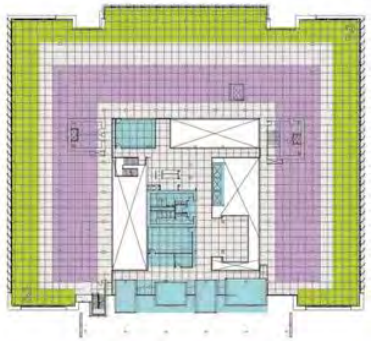
Façade Optimized





Access to Operable Windows

ZGF
ZIMMER GUNSUL FRASCA ARCHITECTS LLP

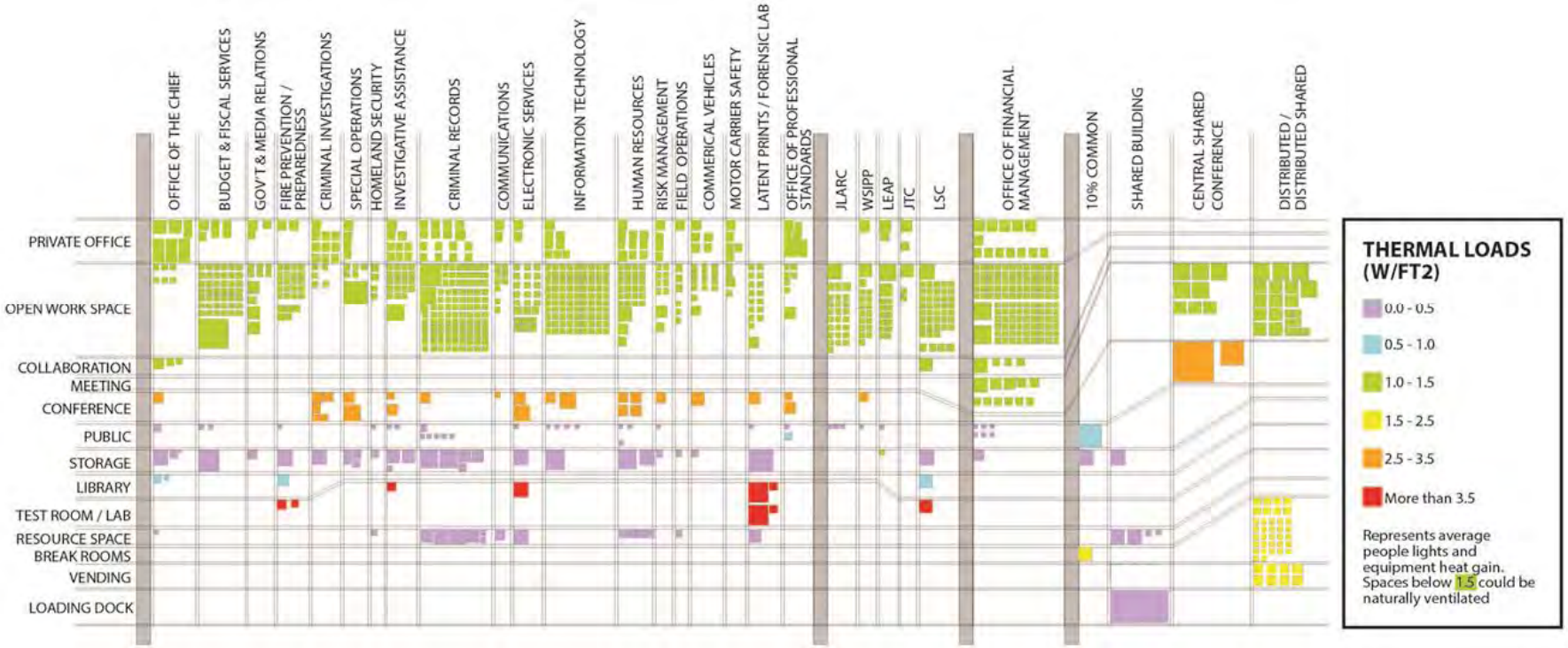


45%

of floor plate within 25 feet of an operable window

58%

program within green zone

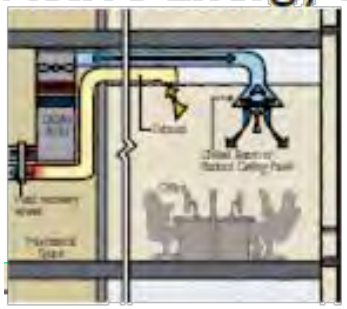


Occupant Enabled Mechanical Systems

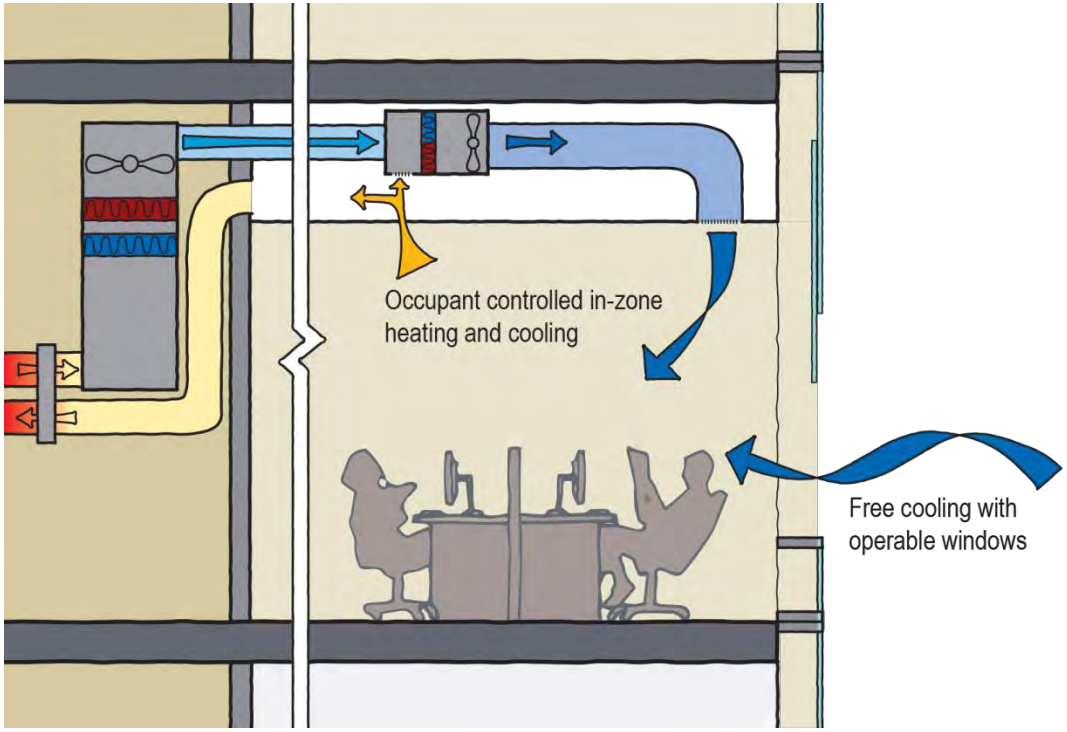
ZGF
ZIMMER GUNSUL FRASCA ARCHITECTS LLP

Baseline System

Active Energy Saver

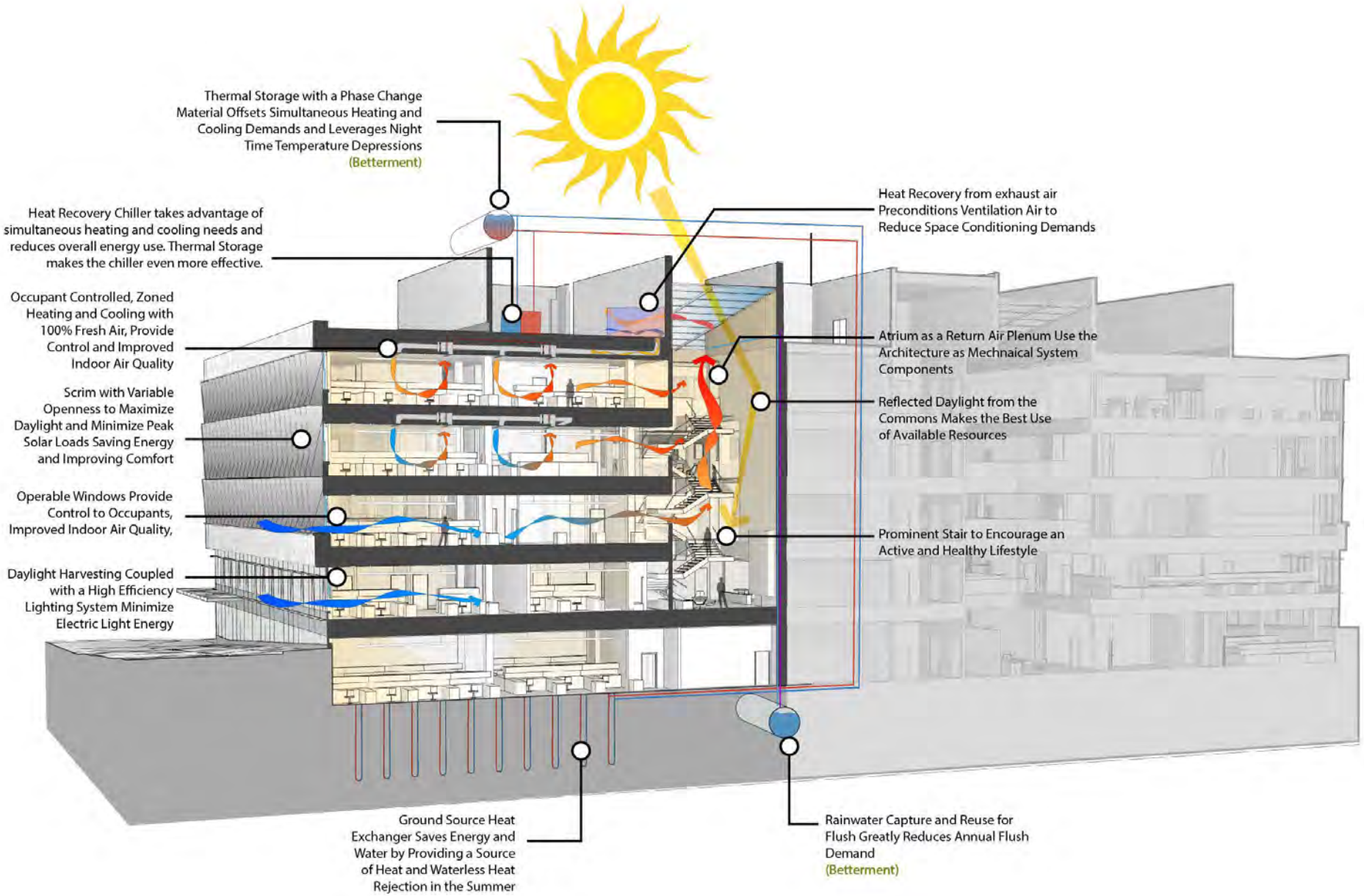


Occupant Enabled System



Integrated Design Approach

ZGF



Getting to the Target EUI

ZGF
ZIMMER GUNSUL FRASCA ARCHITECTS LLP

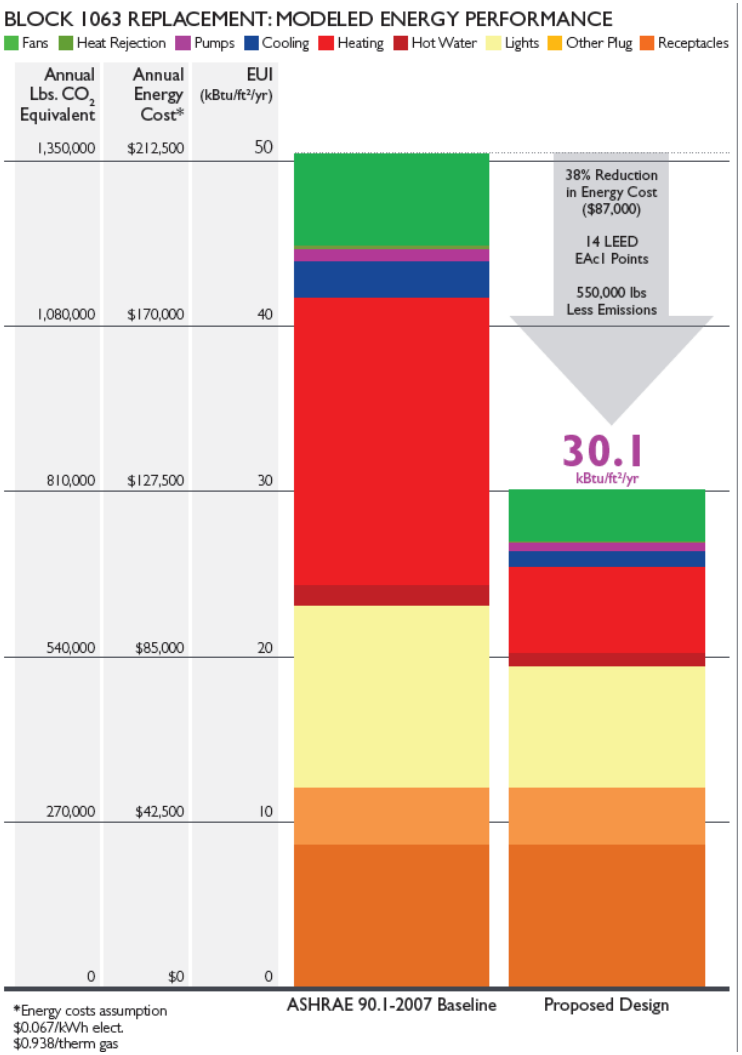
1. Reduce loads with Passive Systems

- Shading
- Daylight
- *Additionally, users can use operable windows to get to below **30.1 EUI**

2. Efficient Active Systems

- Decoupled HVAC approach
- Occupant enabled Cooling
- Geothermal
- Heat recovery chiller
- Energy Recovery Ventilation
- LED Lighting

3. On-Site Renewable Energy Generation [Betterment]



Words to the Wise

ZGF
ZIMMER GUNSUL FRASCA ARCHITECTS LLP

- 4-6 Months Break in Period for Controls and Diagnostics
- 1 year contract is too short
- Submetering is important.
- Change management is critical

- It takes a village.
- Trust
- Let ideas marinate
- Communication – with team and client.
- Establish Value Chain.

Sticks v/s Carrots

ZGF
ZIMMER GUNSUL FRASCA ARCHITECTS LLP

Vikram Sami
LEED BD+C, BEMP
Vikram.sami@zgf.com

ZGF
ZIMMER GUNSUL FRASCA ARCHITECTS LLP
www.zgf.com

Governor George Deukmejian Courthouse

Performance Based Infrastructure

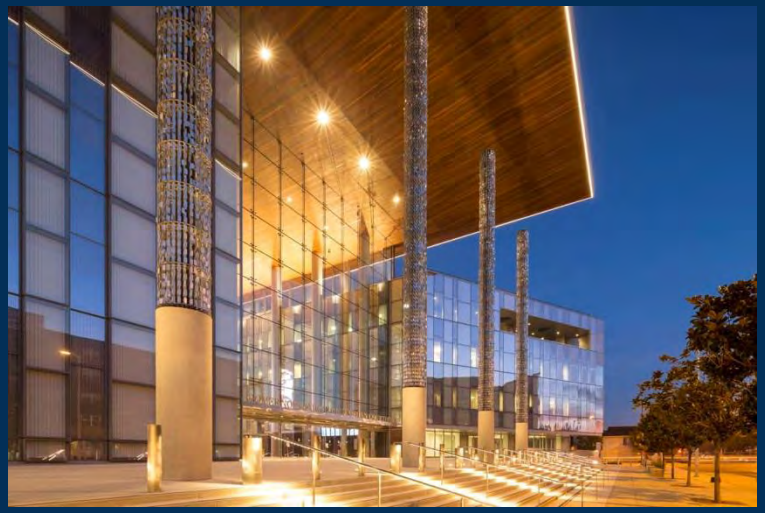
July 30, 2014

National Institute of Building Sciences
Outcome Based Performance

Governor George Deukmejian Courthouse

Project Overview

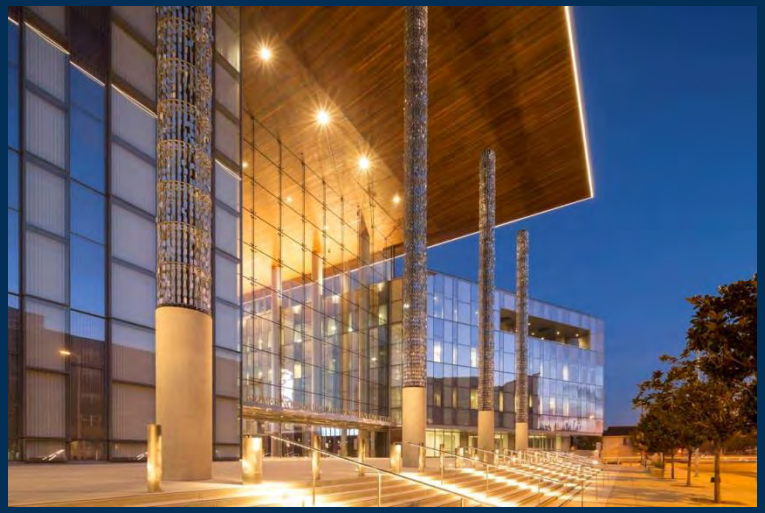
- Design, Build, Finance, Operate & Maintain
- 35 year Agreement
- Complete Services
- Payments Depend on Performance & Availability
- Strong Public Counterparties
  - Judicial Council of California
  - County of Los Angeles



ADMINISTRATIVE OFFICE OF THE COURTS

Project Overview

- Courtrooms: 31
- Overall Bldg: 531,000 GSF
- Court Space: 416,000 GSF
- County/Commercial: 105,000 GSF
- Construction Cost: $339,000,000 (approx.)
- Design Build Start: January 2011
- Occupancy September 2013



ADMINISTRATIVE OFFICE
OF THE COURTS

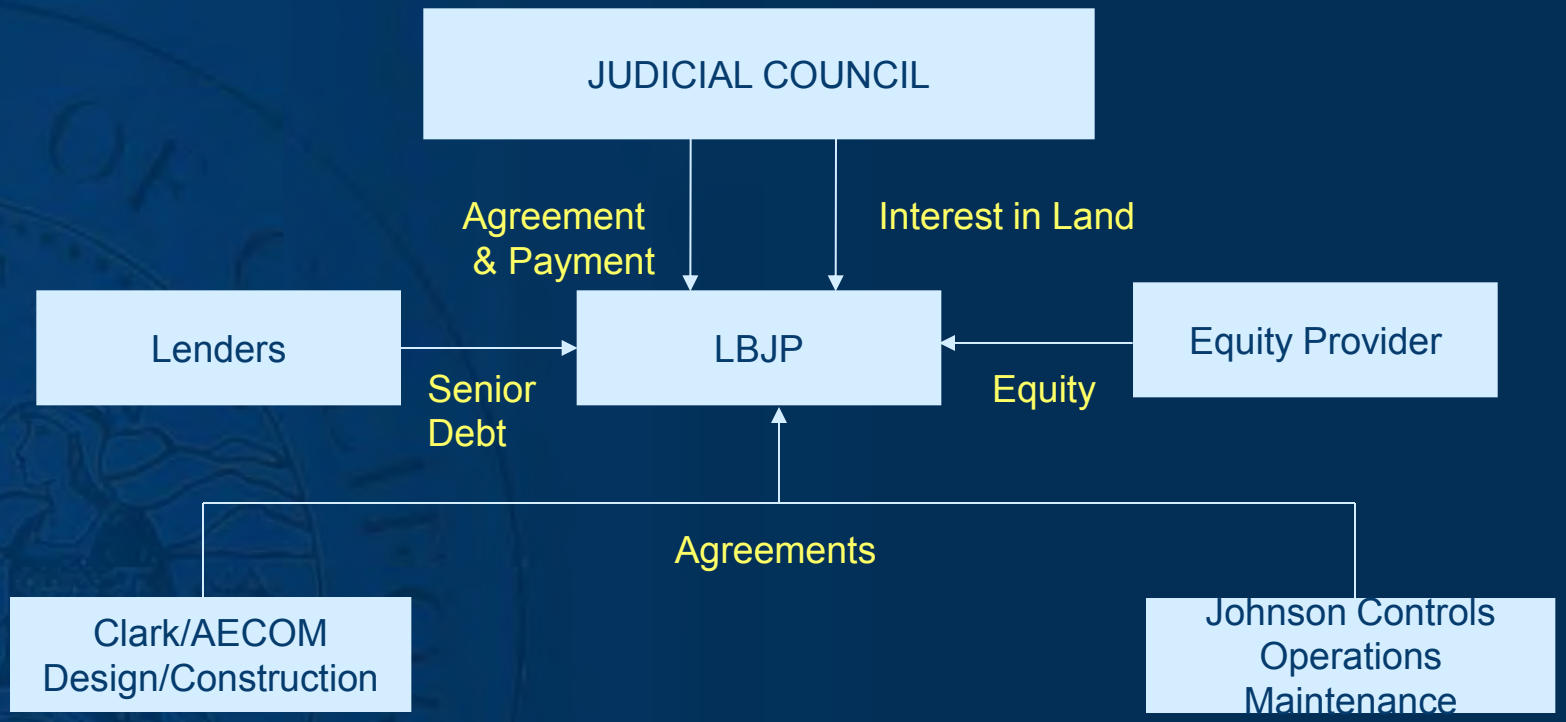
Project Development

- RFQ, RFP, Proposal/Competition
- 11 Consortiums submitted Qualifications
- Five teams shortlisted for Interview, three selected for final D/B/F/M competition
- Six Month Competition w/ Multiple Proprietary mtgs.
- Official Announcement of Selection of Long Beach Judicial Partners in June 2010
- Design, Build, Finance, Operate, and Maintain Proposals Submitted December 2009
- Selection of Long Beach Judicial Partners June 2010
- Financial Close Occurred December 20, 2010

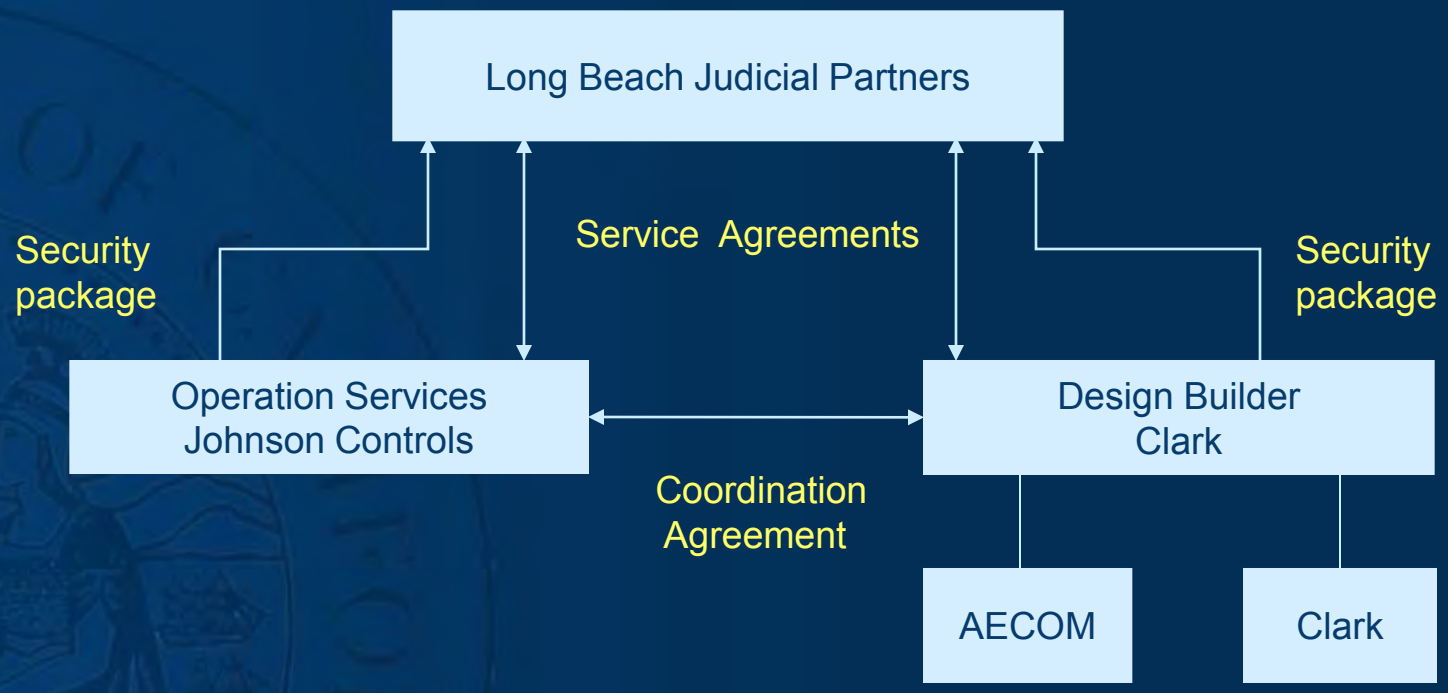
Project Development

- RFQ, RFP, Proposal/Competition
- 11 Consortiums submitted Qualifications
- Five teams shortlisted for Interview, three selected for final D/B/F/M competition
- Six Month Competition w/ Multiple Proprietary mtgs.
- Official Announcement of Selection of Long Beach Judicial Partners in June 2010
- Design, Build, Finance, Operate, and Maintain Proposals Submitted December 2009
- Selection of Long Beach Judicial Partners June 2010
- Financial Close Occurred December 20, 2010

Long Beach Court – PBI Project Contract Structure



Long Beach Court - DBFOM Contract Structure



ADMINISTRATIVE OFFICE OF THE COURTS

Design, Build, Finance, Operate & Maintain

- Meridiam Infrastructure: Developer & Investor
  - Long Beach Judicial Partners

- Clark Construction: Design Builder
  - AECOM: Architects

- Johnson Controls : Operator & Design Assist

Risks Transferred

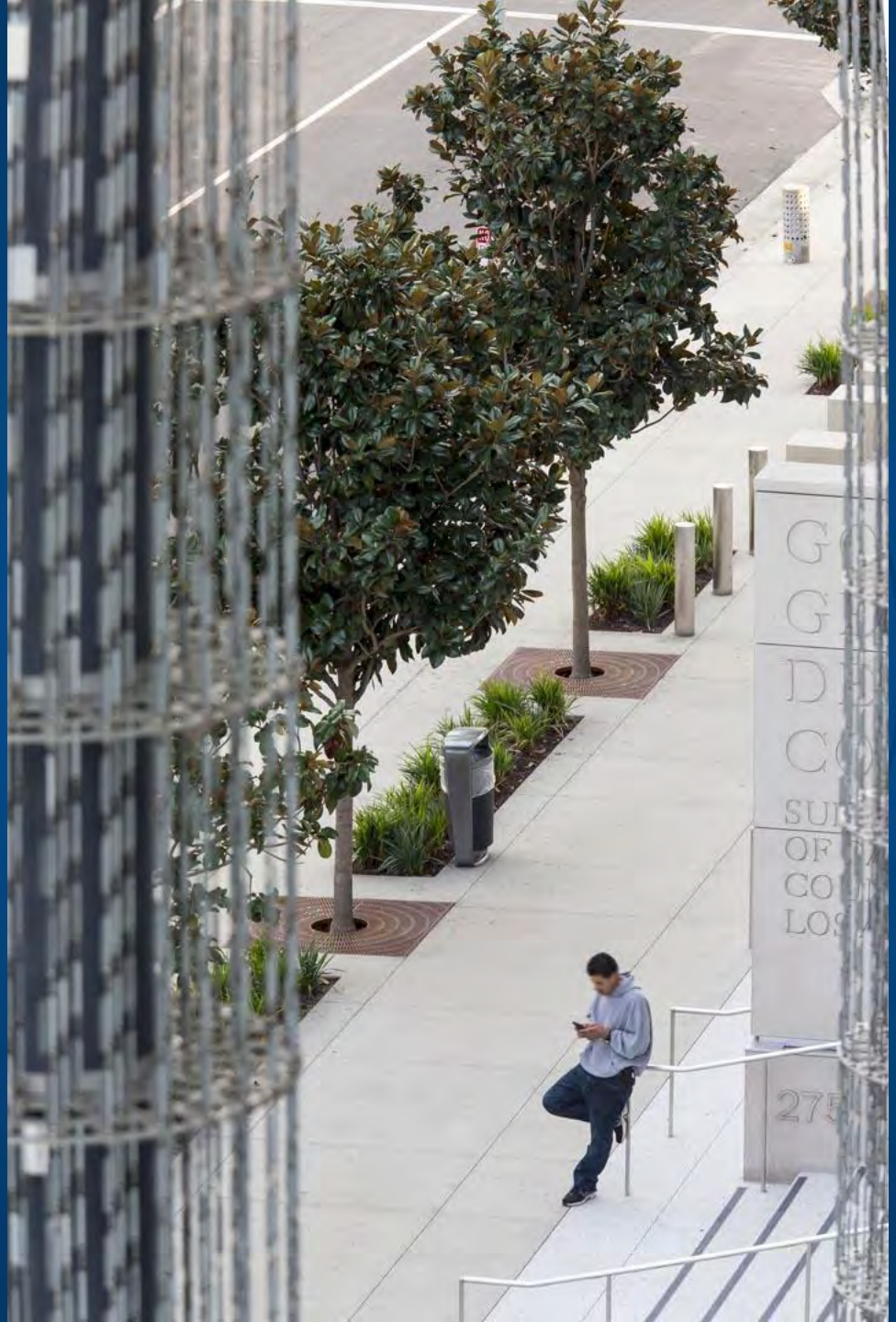
- Design and Construction Risks / Liability
- Entitlements and Utilities
- Completion Risk (Delay and Efficacy)
- Construction Cost Overruns
- Disputes Between Designer, Builder and Operator
- Landlord Risks & Rental Income Shortfalls

Risks Transferred

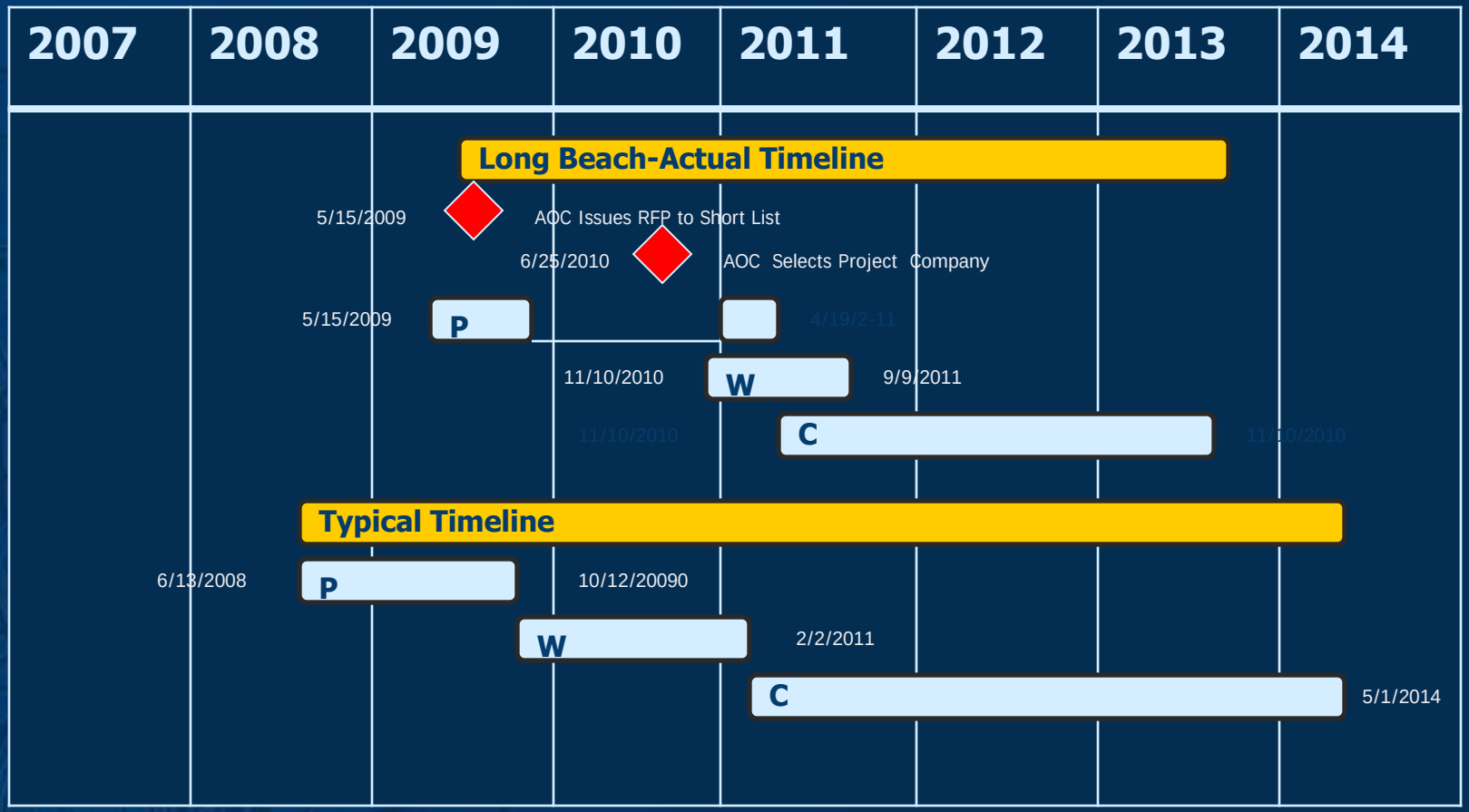
- Operation and Maintenance Risks
- O&M Cost Overruns
- Regulatory Compliance
- Capital Maintenance
- Technological Obsolescence
- Excess Energy Consumption

Risks Retained

- Owner's Risk Under Any Delivery Method
- Changes In Law
- Uninsurable Force Majeure Events
- Pre-existing Site Environmental Conditions
- Such Uncontrollable = "Relief Events"
- Inflation (Service Fee 30 % Index-Linked)


G
G
D
C
SUP
OF
CO
LOS
275

Time Line Schedule



ADMINISTRATIVE OFFICE
OF THE COURTS

Service Payment Deductions

Availability Concept

- Facility Maintained in Required tolerances
- Linked Functional Units

periods unavailable	2	(2 hr period)	
floors affected	4	floors	
Functional Unit	**# of Units / floor**	**Unit Deduction**	**Total Deduction**
Courtrooms	2	$384	$6,144
Holding Cells	7	$96	$5,376
Interview Rooms	2	$96	$1,536
Attorney/Client Room	4	$96	$3,072
Elevator Unavailability Penalty			$5,000
Total			**$ 21,128**

Key Performance Indicators

- Calls Responded in 15 minutes
- % of Scheduled PMs Completed
- Asset Value maintained above threshold

ADMINISTRATIVE OFFICE OF THE COURTS

Deduction Example

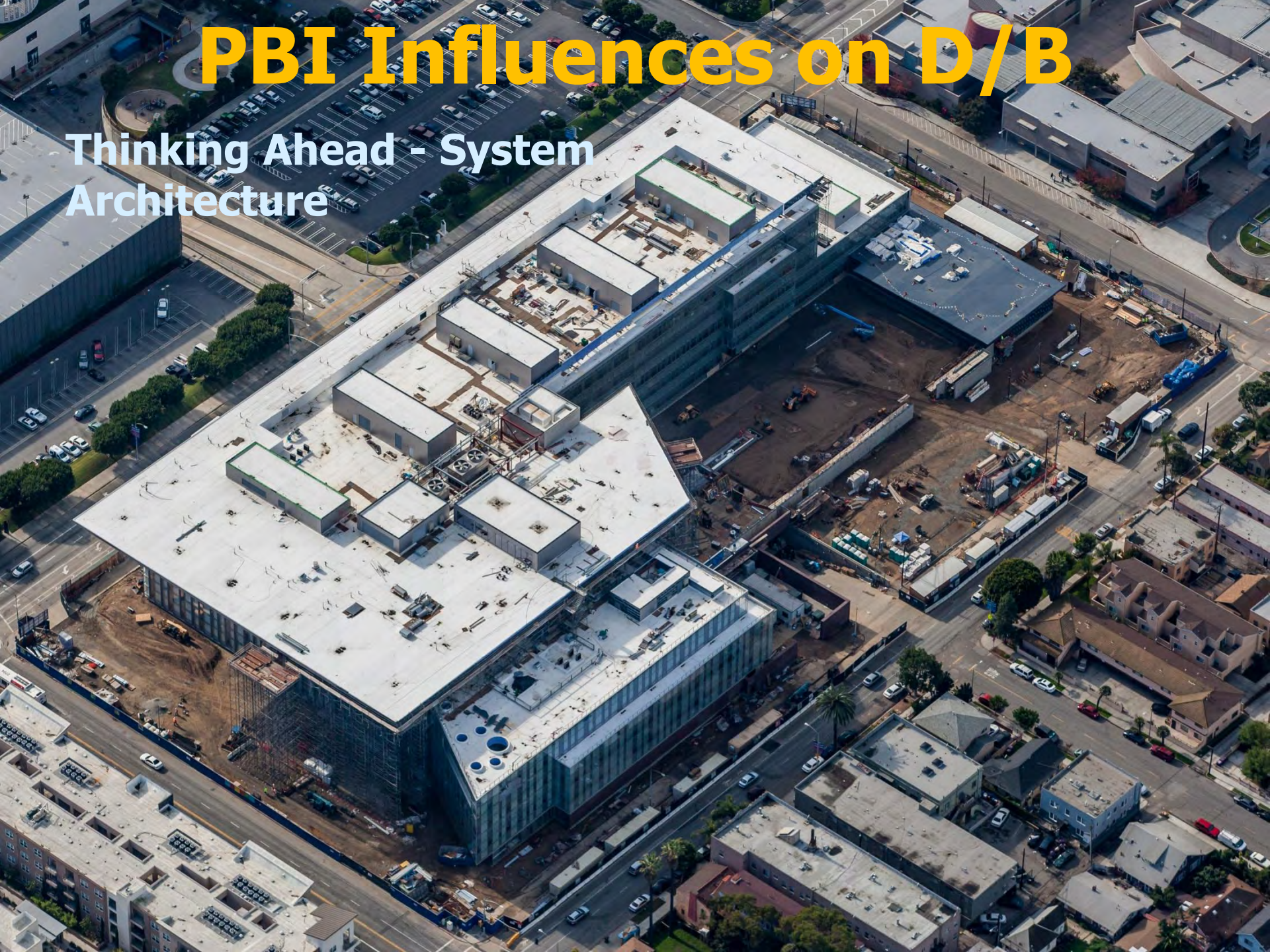
- Prisoner Elevator is Down
- Elevator serves Holding Cells between Courtrooms
- 4 Floors are Affected
- Space Unavailable for 5 Hours
- Holding Cells & Linked spaces All Deemed Unavailable.

periods unavailable	2	(2 hr period)	
floors affected	4	floors	
Functional Unit	**# of Units / floor**	**Unit Deduction**	**Total Deduction**
Courtrooms	2	$384	$6,144
Holding Cells	7	$96	$5,376
Interview Rooms	2	$96	$1,536
Attorney/Client Room	4	$96	$3,072
Elevator Unavailability Penalty			$5,000
Total			**$ 21,128**

ADMINISTRATIVE OFFICE OF THE COURTS

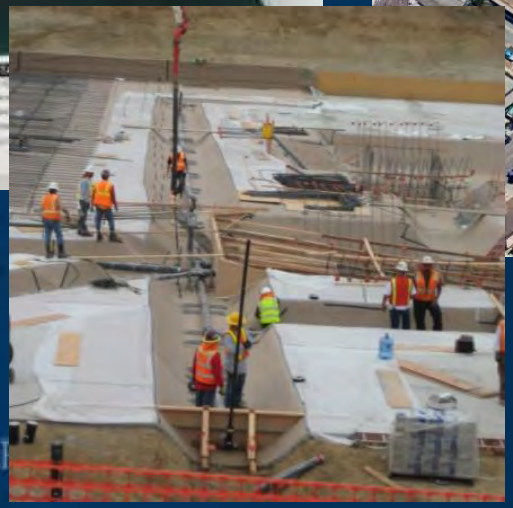
PBI Influences on D/B

Thinking Ahead - System Architecture



PBI Influence on D/B

Availability Risk - Product Selections



PBI Influence on D/B

Light Fixtures O&M / Life Cycle Risks - Frequency & Access

ADMINISTRATIVE OFFICE
OF THE COURTS

What Made Us Successful

- Design Build tied to Building Performance
- Integrated Delivery – DBFOM
- RFP allowed Creativity – Outcome Focused
- Quality Management & Monitoring
- Discipline of 35 Yr Performance with Availability Penalties

ADMINISTR
OF THE CO

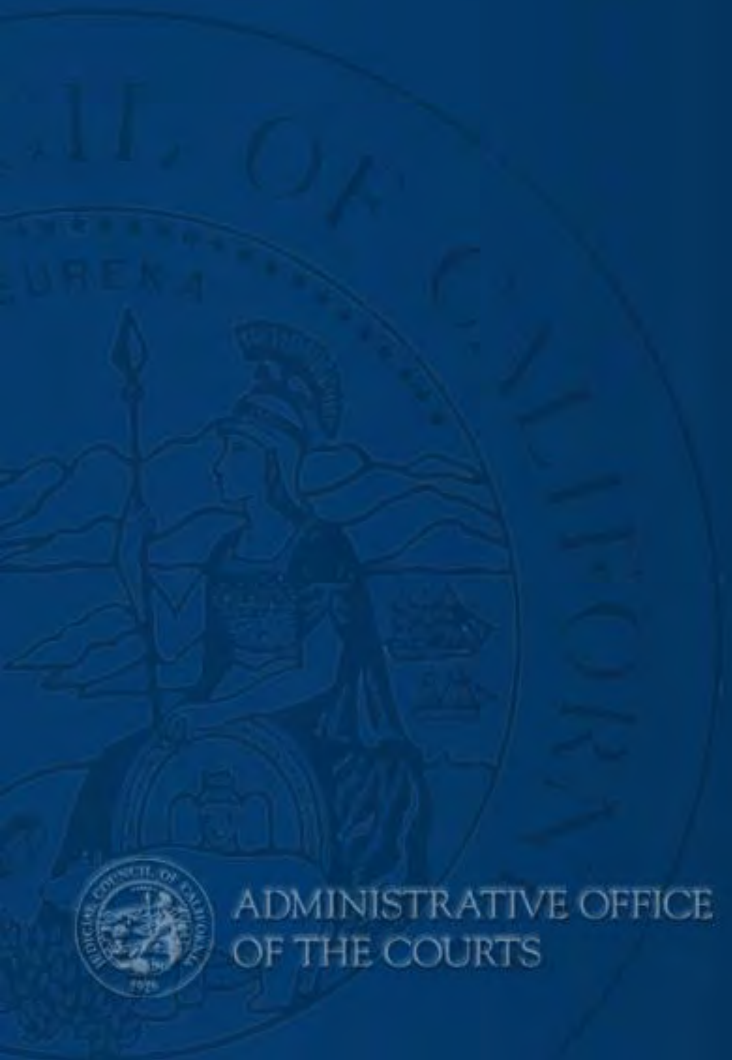
Lessons We Learned

- External Communications Important & Challenging
- Bring Operator on Early before Finishing
- Close-out Planning 6 months before finishing
- Occupational Training of Court staff on Equipment & Systems

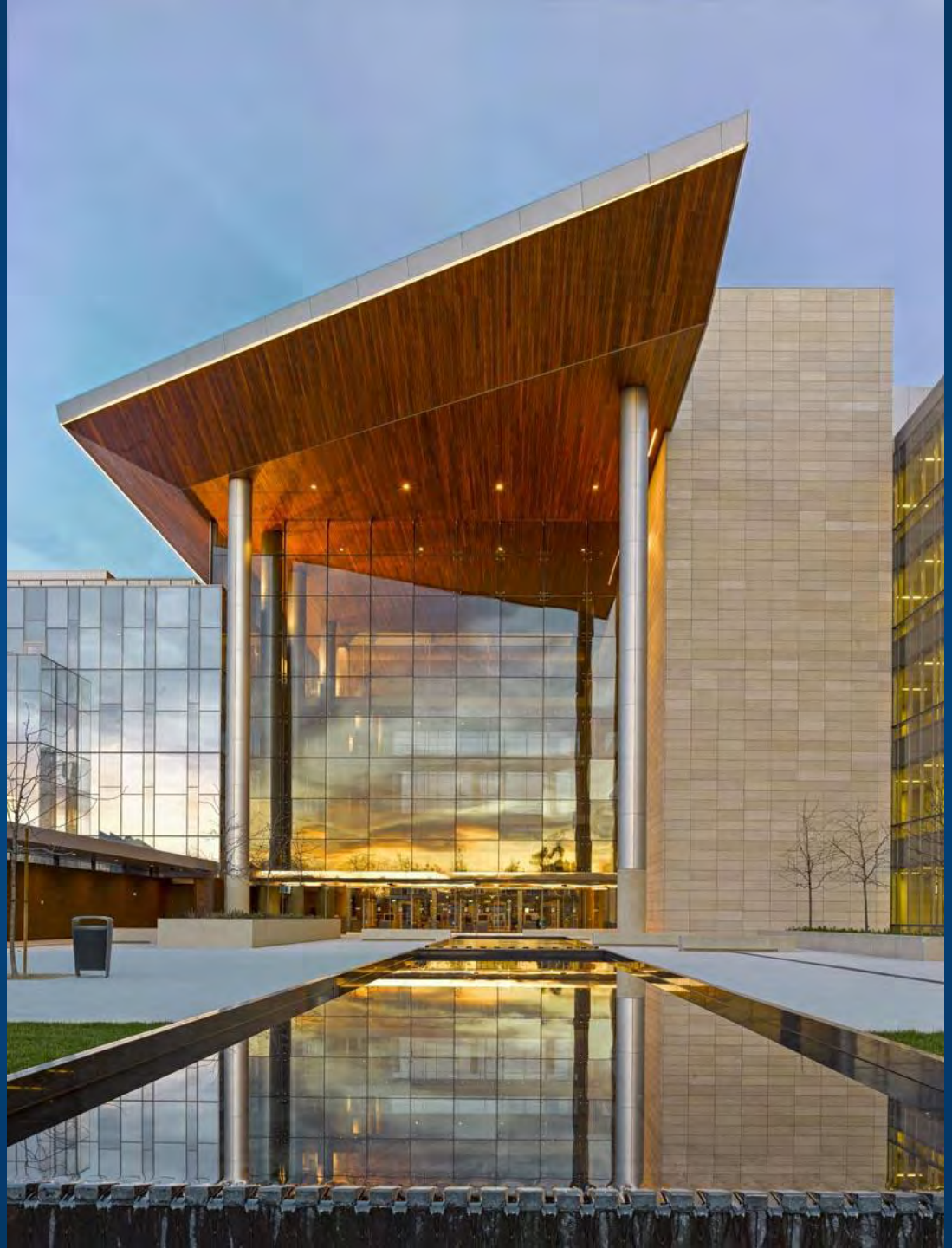
Governor George Deukmejian Courthouse

Performance Based Infrastructure

Freddy Rayes – Long Beach Judicial Partners
Chip Hastie – Clark Construction
Sean Maher – Johnson Controls
Clifford Ham – Judicial Council of California

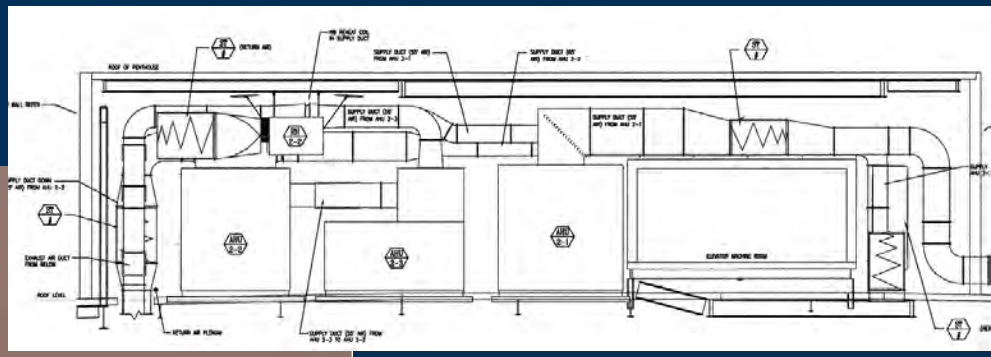


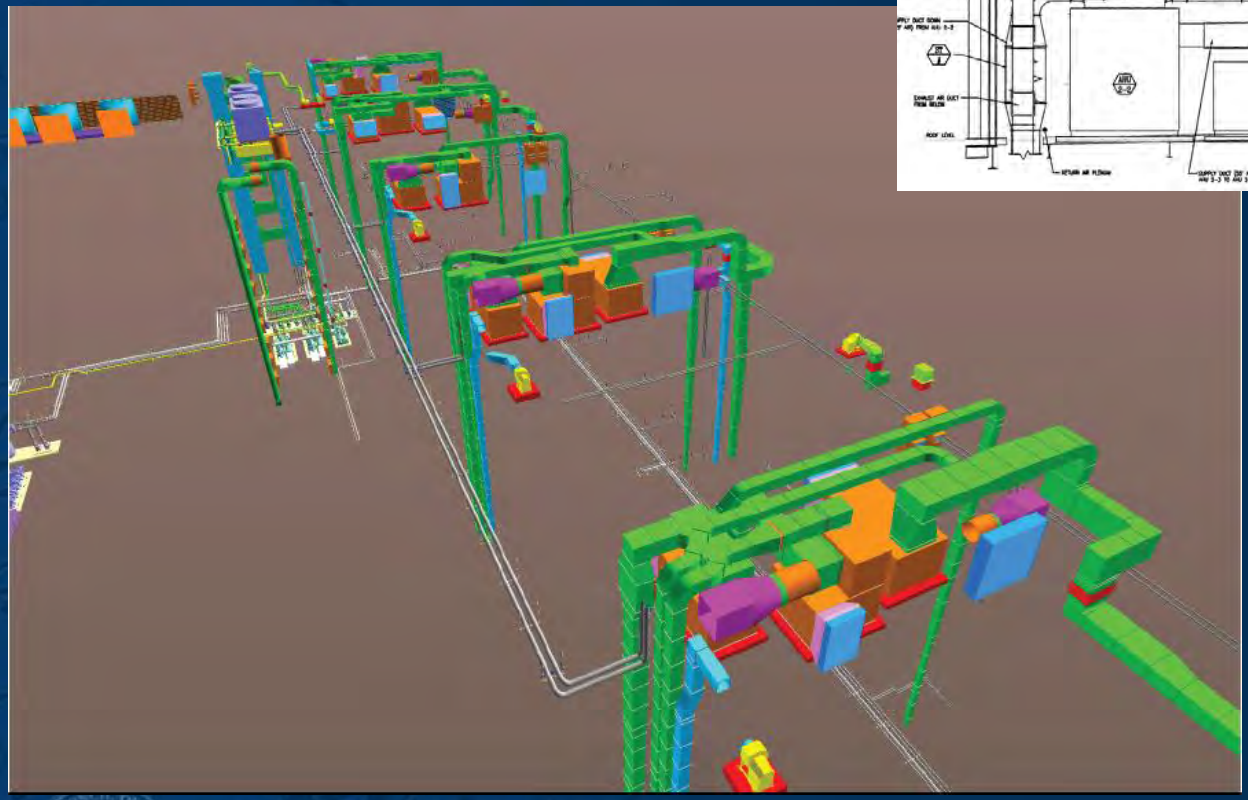
ADMINISTRATIVE OFFICE
OF THE COURTS



PBI Influence on D/B

Mechanical Systems





Seattle
From OBC to TPP

DUANE JONLIN

SEATTLE DEPARTMENT OF PLANNING AND DEVELOPMENT

City of Seattle & Preservation Green Lab

- Energy code doesn't always work for historic buildings
- Energy code doesn't always ensure energy performance

"Outcome-based" pilot project

- City agrees to relax code requirements
- Owner agrees to operated below an EUI target
- PGL agrees to facilitate process

- Predict it with energy model
- Prove it with utility bills

Three pilot projects

- Supply Laundry
- 1510 Melrose
- Anhalt Apartments

- Wasn't easy to recruit!

Regulatory Framework

- Commercial buildings converted to residential: full energy code compliance
- Historic buildings get special consideration
- “Pilot project” status also allows leeway

Supply Laundry

- Industrial windows
- Brick walls

Supply Laundry

- Shell work completed
- Just leased to a little local tech company
- Try for 60% below CBECS
- Obligated for 50% below CBECS

1510 Melrose

- Set energy target with energy modeling
- Permit drawings match energy modeling inputs

1510 Melrose

Anhalt Apartments

- Combined new and existing buildings for energy code
- Audit & retro-commissioning required if they don't meet target
- Agreement recorded on property title at County
- $50,000 performance bond posted

Anhalt Apartments

- Preserved historic windows and entry features
- Addition went beyond code

Is an OBC possible? Four problems to solve:

1. Selection of target EUIs
    1. With modifications and exceptions
2. Virtual code compliance methodology
3. Actual energy use tracking methodology
4. Consequences for non-performance

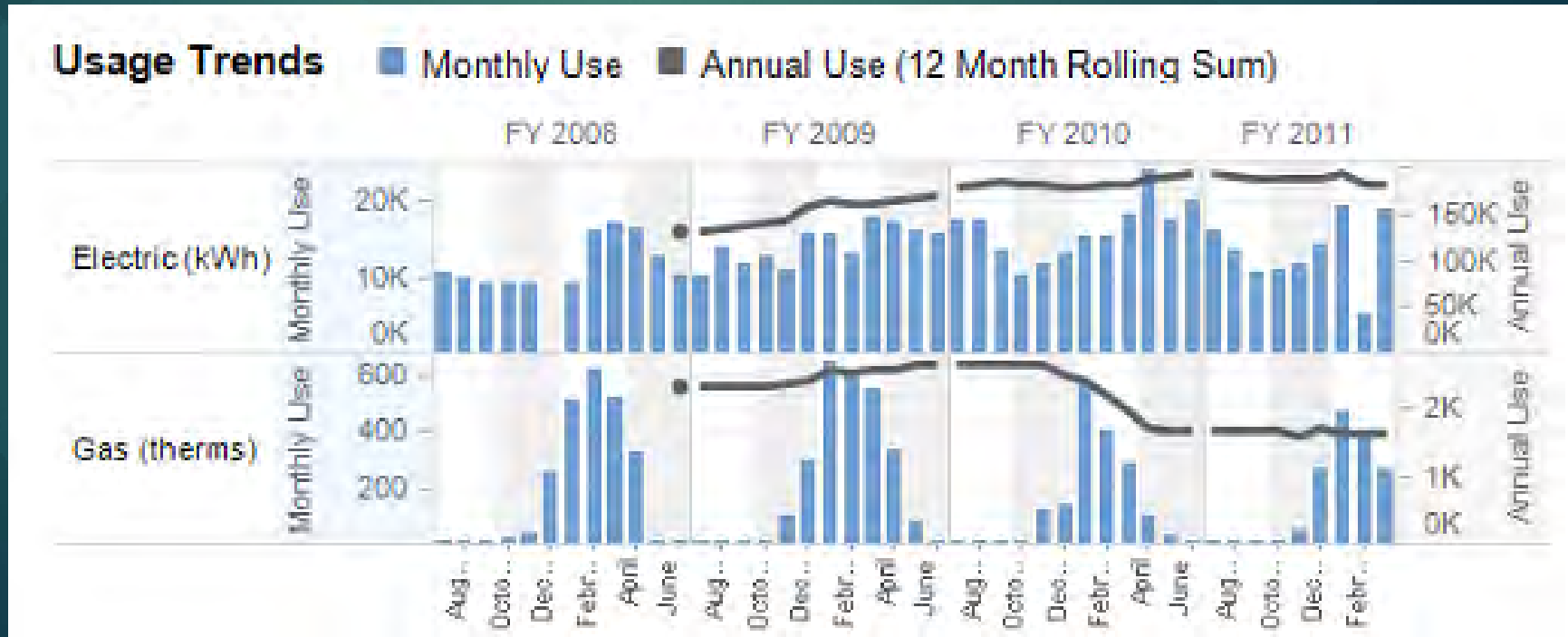
1. How to select target EUIs

2. Virtual compliance methodology

- Standard "Total Building Performance" from code
- …but only model the "proposed" case
- Energy modeling no longer theoretical

3. Tracking energy use

- Use Seattle Benchmarking procedure
- Forward utility data to building department
- The bell rings when they hit 12-month EUI target



4. Consequences

What if they go over their energy use target?

- Penalty big enough to make them pay attention…
- …but small enough to not scare them away
- Max $4 / SF for 30% over target
- (If mandatory code, penalties could be bigger)
- Using "pledge and fine" instead of bond

What if they gave a code and nobody came?

- Almost everybody *loved* the concept of this code
- …but almost nobody is actually *using* this code

Issues for project teams:

- Avoiding uncertainty
- Minimizing risk
- Defining an end point

Thank you!

Mark Frankel
mark@newbuildings.org

Ryan Colker
rcolker@nibs.org