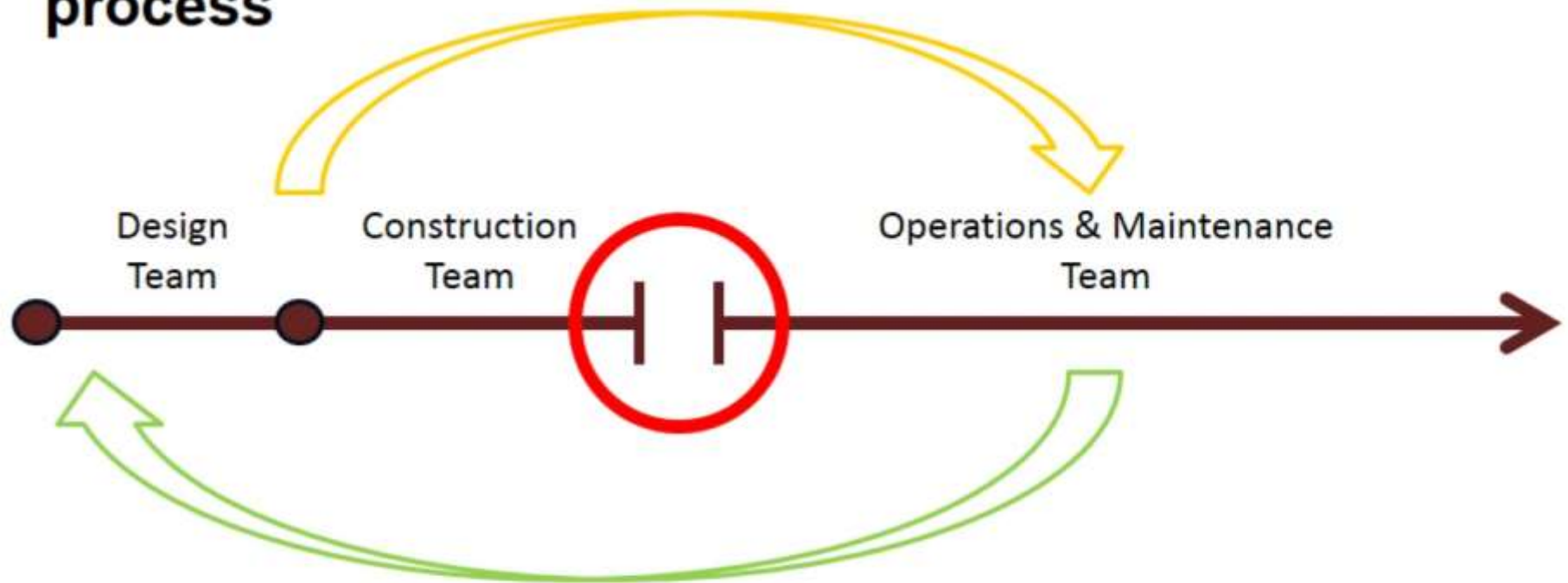


Designing to the ZNE Target Part 2: Design for Operations

Designing to the ZNE Target

Part 2: Design for Operations

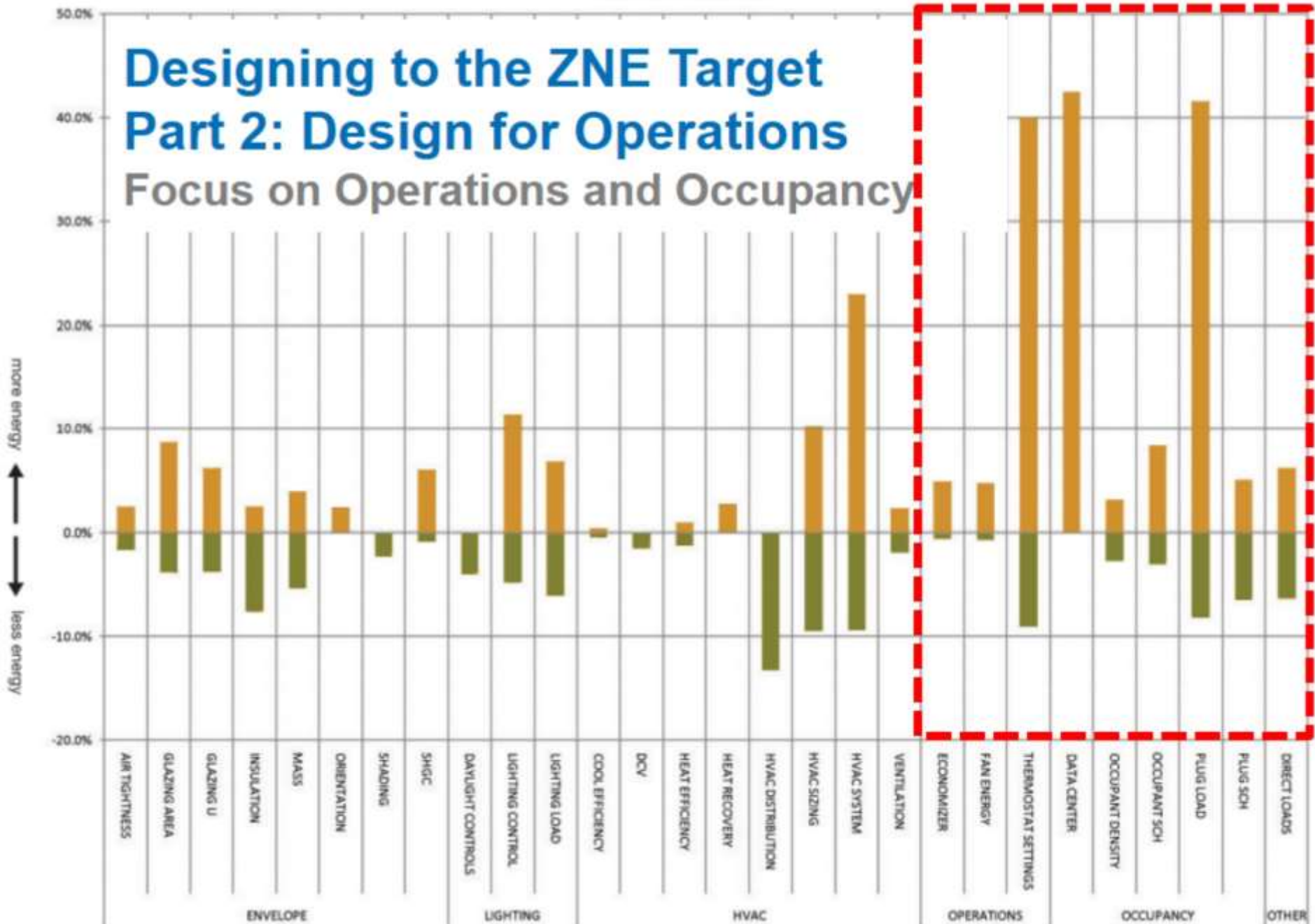
Integrating operations team into the design process



Designing to the ZNE Target

Part 2: Design for Operations

Focus on Operations and Occupancy



Designing to the ZNE Target

Part 2: Design for Operations

- **Developing a ZNE operations framework:**
- Select technologies appropriate to operators and occupants
- Provide tools and resources
- Develop facilities operations plans

Designing to the ZNE Target

Part 2: Design for Operations

- Building automation and controls integration
- **Making It All Work Together: Key Points**
- Plan for Measurement and Verification
- Beware of Value Engineering!
- Controls considered from design through operation
 - **Controls Integrator** contracted 1 year post occupancy
- Design controls for real-world use
 - Keep the **Operators** and **Occupants** in mind



OWS FUNGI

[Red circled whiteboard]

EMERGENCY

Controls

- User-friendly/intuitive
- Over-rides contribute to the confusion
- Consistent - across an institution if possible
- Organized

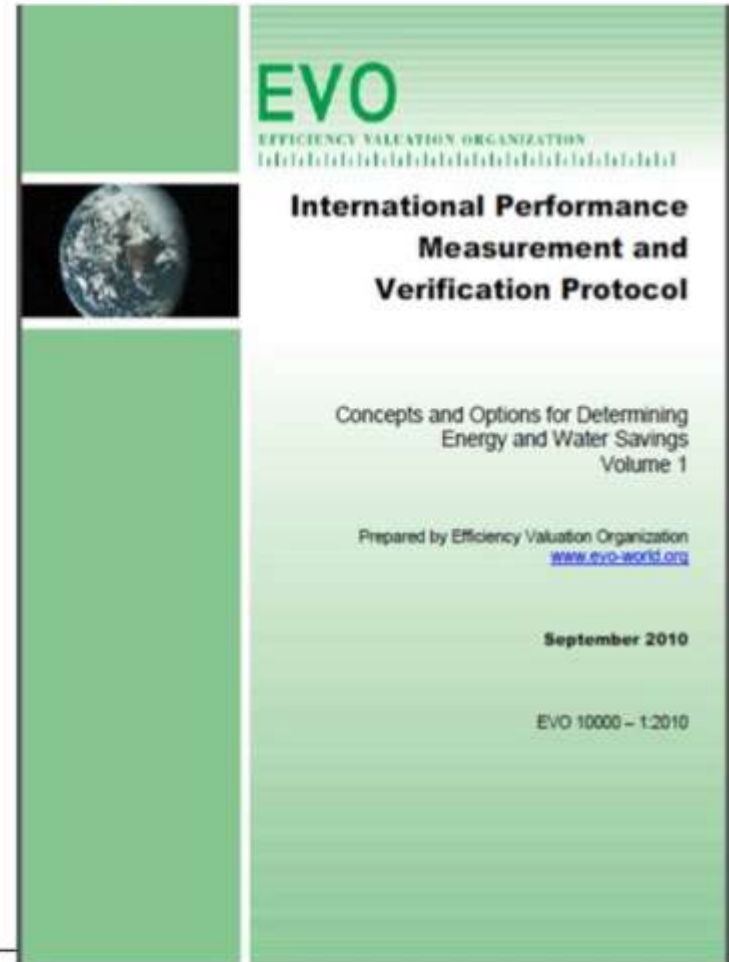


Designing to the ZNE Target

Part 2: Design for Operation

You can't improve what you don't measure

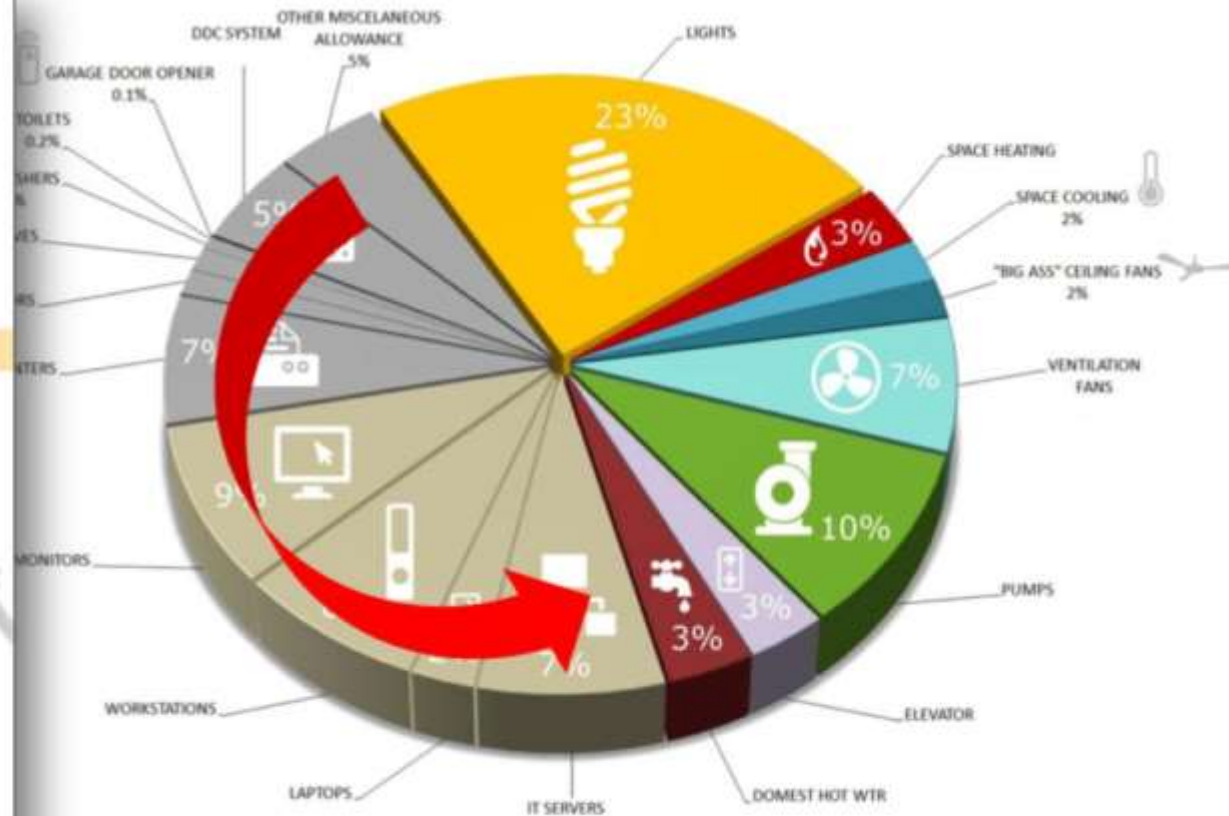
- **Measurement and verification of building performance**
- Standardized Protocol: IPMVP
- **Design for Measurability**
- Submetering & Electrical Circuits
- Controls: Data Trending
- Make sure you can *use* measured data to improve performance!



Designing to the ZNE Target

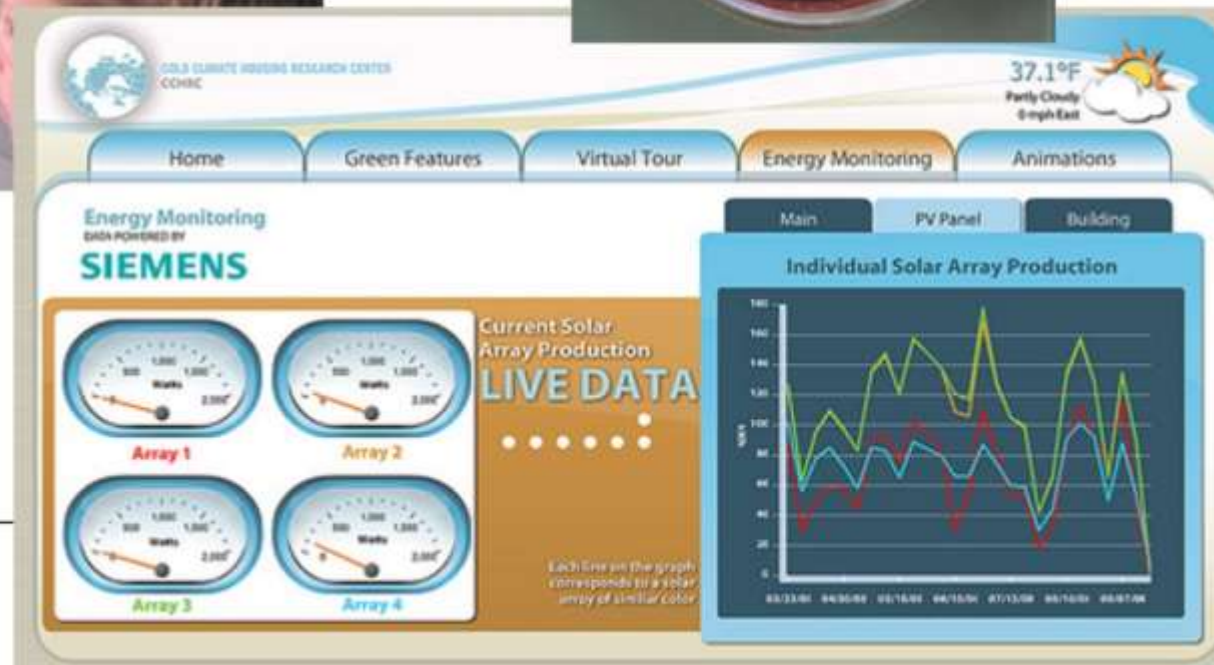
Part 2: Design for Operations

Plug load performance – selecting energy efficient plug load equipment



Courtesy of PAE Consulting Engineers

Operator & Occupant Engagement



Operator & Occupant Engagement



monitor energy consumption wirelessly.



be rewarded for efficient energy habits.



control outlets and compare to others.



eMetric by Jason Deperro

2016 Prop 39 ZNE School Retrofit Workshops

Building to the ZNE Design

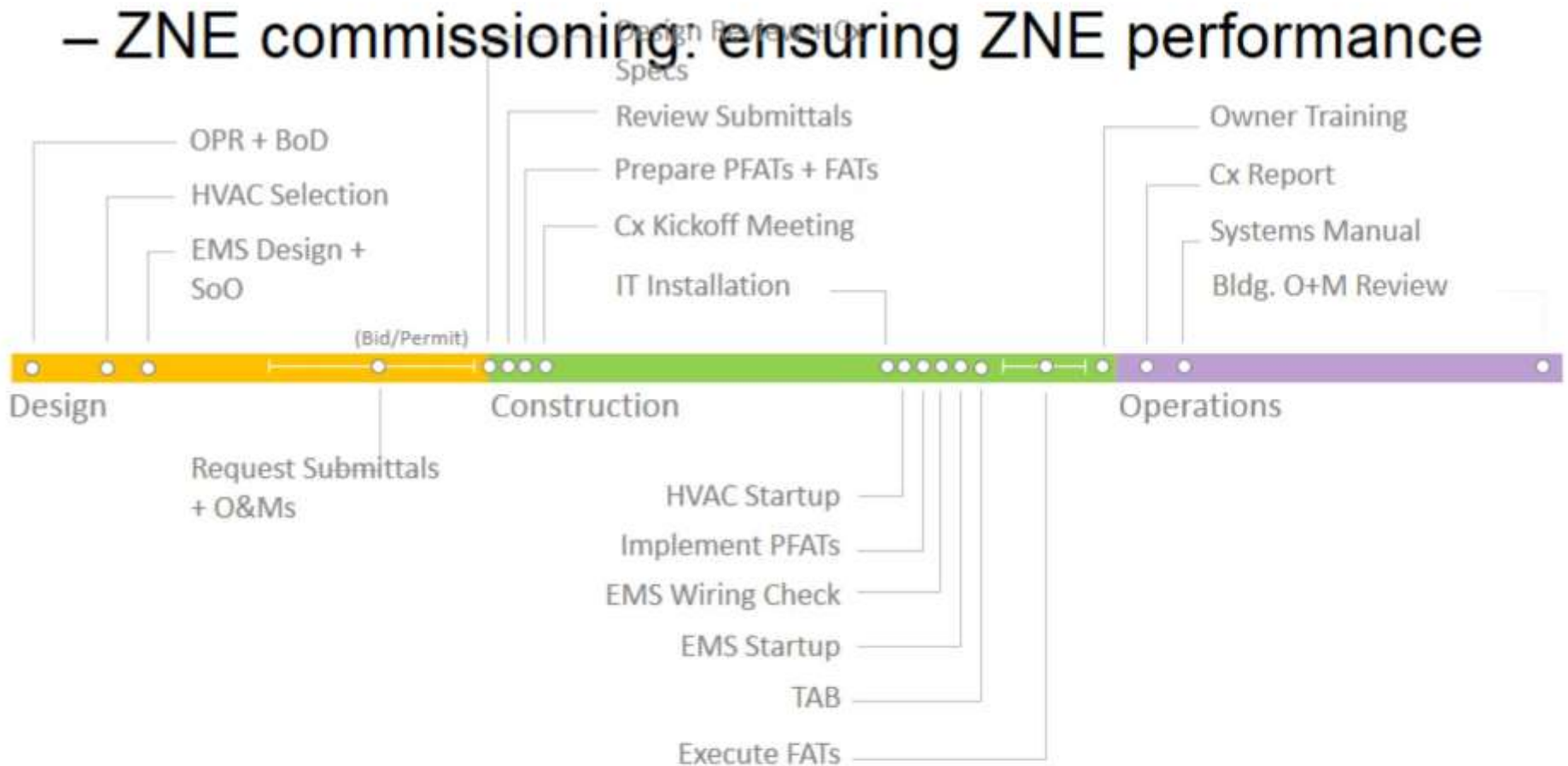
Construction delivery methods:

- Design – Bid – Build
- Design – Build
- Guaranteed Maximum Price
- Integrated Project Delivery
- Energy Savings Performance Contract (ESPC)



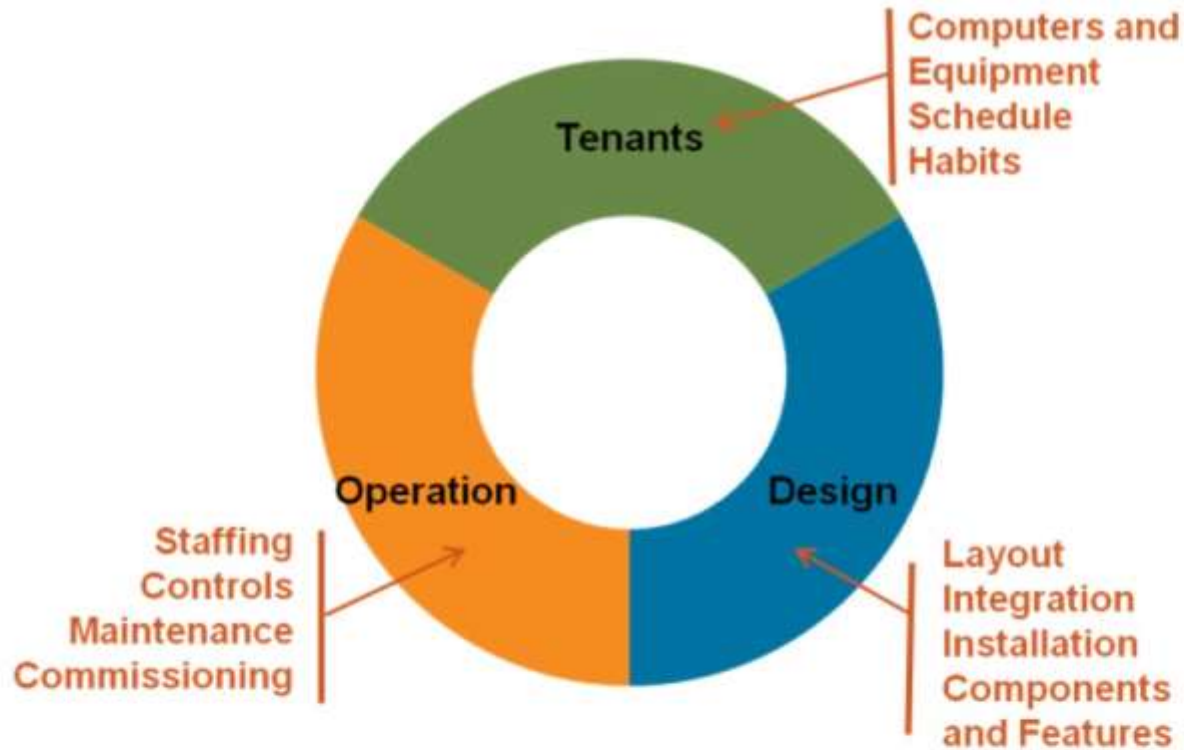
Building to the ZNE Design

– ZNE commissioning: ensuring ZNE performance



Operating to the ZNE Design

Building Operation: Post Construction



Jeffrey Trail Middle School & Irvine Unified School District

PEOPLE, POLICY & PROCESS

- Behavior - Energy Conservation/Management Protocols

IUSD set energy-wise guidelines to help make its heating, ventilation, and air conditioning systems (HVAC) more efficient. The District also issued conservation mandates for lighting, thermostat settings, classroom and office equipment, and a variety of other areas. These measures are intended to reduce district-wide electrical usage by 15 percent.



ENERGY MANAGEMENT PROCEDURES

TO: All Employees
FROM: Energy Management Team - Joe Hoffman, Gil Sanchez, Ismail Yusuff, Freddy Medina, Andy Moo, Mike Edman, Joe Garcia, Mindy Nugent, Greg Christison, Peggy Graham
SUBJECT: ENERGY CONSERVATION

It is district-wide target to reduce electrical usage as well as promote sustainability. Every individual can play a part in reducing electrical energy consumption by implementing green practices. Each school site will be provided with a month-by-month history of electrical usage to serve as a reference while implementing this Energy Reduction Program.

The following energy conservation measures are to be implemented effective immediately:

1. Turn off the lights if you are the last person to leave a room. Many rooms have occupancy sensors but everyone needs to get into the habit of turning off lights everywhere consistent with reasonable security considerations.
2. Keep doors closed when the air conditioning and heating systems are on.
3. Do not block air supply and return vents with furniture or displays.
4. Reduce lighting in areas not in use, and encourage others to be alert for lighting left on when no one is present.

Jeffrey Trail Middle School & Irvine Unified School District

DESIGN STRATEGIES & EFFICIENCY MEASURES

- Solar photovoltaics above parking canopies
- Daylighting
- Pyramid skylights
- Lighting controls
- Single building design for energy efficiency
- Whole Building Commissioning

Jeffrey Trail Middle School & Irvine Unified School District

PEOPLE, POLICY & PROCESS

- CHPS High Performance schools resolution
- Irvine pursued a district-wide approach to energy efficiency
- Bonded for solar on all schools
- Power Purchase Agreement (PPA) to fund solar
- Capital outlay=\$0



Irvine Unified School District saves money and enriches learning with solar

Located in Orange County, California, the Irvine Unified School District (IUSD) comprises a community of learners, committed to the highest quality educational experience. IUSD educates a diverse population of more than 30,000 K-12 students in 22 elementary schools, six middle schools, four comprehensive high schools and one continuation high school.

Project Profile: Irvine Unified School District

Industry: K-12 Education

Location: Irvine, California

Company: Irvine Unified School District

System Type: Roof and Canopy-Mounted Solar Panels

System Size: 6 MW over 27 Operational Projects

Savings: \$5-11 million over 20 years

Capital Outlay: \$0

Operating to the ZNE Target: Taking ZNE Design to ZNE Reality

- Initiation and Training to start building operation on the right track:
 - Owner Orientation
 - Operator Training
 - Metering and Feedback Plan
 - Equipment Purchase Standards for Fit-out
 - Occupant Training
 - Maintenance Plan

Operating to the ZNE Target: Taking ZNE Design to ZNE Reality

- Maintaining long-term building operation:
 - Resource Conservation Manager
 - Tenant engagement
 - Plug Load Management
 - Retro Commissioning Plan
 - Performance Data Review
 - Equipment purchase guidelines
 - On-going operator training/support
 - Disclosure
 - Operator feedback
 - Tenant feedback
 - Public feedback

Existing ZNE & Ultra-Low Energy Case Studies

- CPUC Case Study Briefs & NBI ZNE Case Studies
<http://newbuildings.org/case-studies-zne-projects>
- PG&E Case Studies
<http://energydesignresources.com/resources/publications/case-studies/case-studies-zne-non-residential-buildings.aspx>
- NBI Registry
<http://newbuildings.org/share>
- Getting to Zero Database
<http://newbuildings.org/getting-to-zero-buildings-database>



Zero Net Energy Project Profile
Small Office Retrofit

OVERVIEW

Site Details

Building Size: 4,500 SF
Location: San Diego, California
Construction Type: Retrofit
Construction Year: 1955, 2009
Building Type: Small Office
CA Climate Zone: 7

Measured Energy Stats

WILDCARD TOTAL EUI	RENEWABLE PRODUCTION EUI	BUILDING NET EUI
13	22	-9

Site Energy Use Index (EUI) kWh/ft²/year
The large positive site building energy use index for overall the project line up is the net energy of the building. Savings may be realized by net zero or net plus.

BACON STREET OFFICES

The Bacon Street Office project is a 4,500 SF retrofit of a single-story, 1950s-era auto repair shop into a high performance office for the firm ARCHITECTS HERRICK GIBBLE SWILL. Through creative design strategies, renewable energy generation and with support from local utilities, including the Savings by Design program, the project has achieved zero net energy goals. In fact, this project is so energy efficient it returns power to the grid.

Planning & Design Approach

The project demonstrates the difference between typical projects and ZNE projects. The following steps were critical to success:

- Start early and use an integrated design process
- Outline goals and benefits
- Structure fees to provide more research and design iterations
- Stay flexible and iterative with the design process

Energy Efficiency Strategies and Features

Daylighting: A wall of windows, along the public street side of the building provided daylight and views of a new landscaped parking court with native vegetation and canopy trees. This light is balanced with toplighting from diffuse skylights at the back of the space. Illumination with ceiling and tasklights.

ZNE Technology Application Guides

Zero Net Energy
Technology Application Guide



LUMINAIRE LEVEL LIGHTING CONTROL

Zero Net Energy
Technology Application Guide



INDIRECT EVAPORATIVE COOLING



zeronetenergy

energy
upgrade[®]
CALIFORNIA

SavingsByDesign

Zero Net Energy
Technology Application Guide



**RADIANT HEATING AND COOLING +
DEDICATED OUTDOOR AIR SYSTEMS**

<http://newbuildings.org/zero-energy>

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5 GREAT NEW TOOLS FOR ZNE BUILDINGS

1 ZNE Message Platform

Key messages for target audiences on the what and why of ZNE.

2 "Intro to ZNE" Presentation

Customizable powerpoint presentation provides an overview of California's goals and policies for ZNE, key strategies, and case study examples.

3 ZNE Companion Guide/Fact Sheets

Collection of FAQs, resources, design strategies, and key messages for designers, commercial building owners, policymakers, and decisionmakers of schools and public buildings.

4 Case Studies: ZNE & Ultra-Low Energy Buildings

Read about ZNE and ultra-low energy building examples, including design strategies, costs, and lessons learned.

5 ZNE Action Bulletin

Sign up for our quarterly e-newsletter for updates on ZNE news, events, trainings, case studies, planning, policy, and research. To sign up, or to get more info about the toolkit, email heather@newbuilding.org.

zero net energy

ZNE Communications Toolkit



www.newbuildings.org/zne-communications-toolkit

George V. Leyva Middle School Administration Building

"The business case for making the building net zero energy is that it will not just lower our energy bill, but it also will allow us to put those savings straight back to the top line of our operations budget for maintaining programs for kids." — Assistant Superintendent Kathy Gomez



Bertsch/ School Science Wing Seattle, WA | Photo: KMD Architects

GETTING TO **zero** NATIONAL FORUM 2016

Save the Date

October 12-14, 2016 | Denver, CO

gettingtozeroforum.org

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Thank You!

Ralph DiNola

CEO, NBI

ralph@newbuildings.org

343 Second Street

David and Lucille Packard Foundation Building
Courtesy: EHDD