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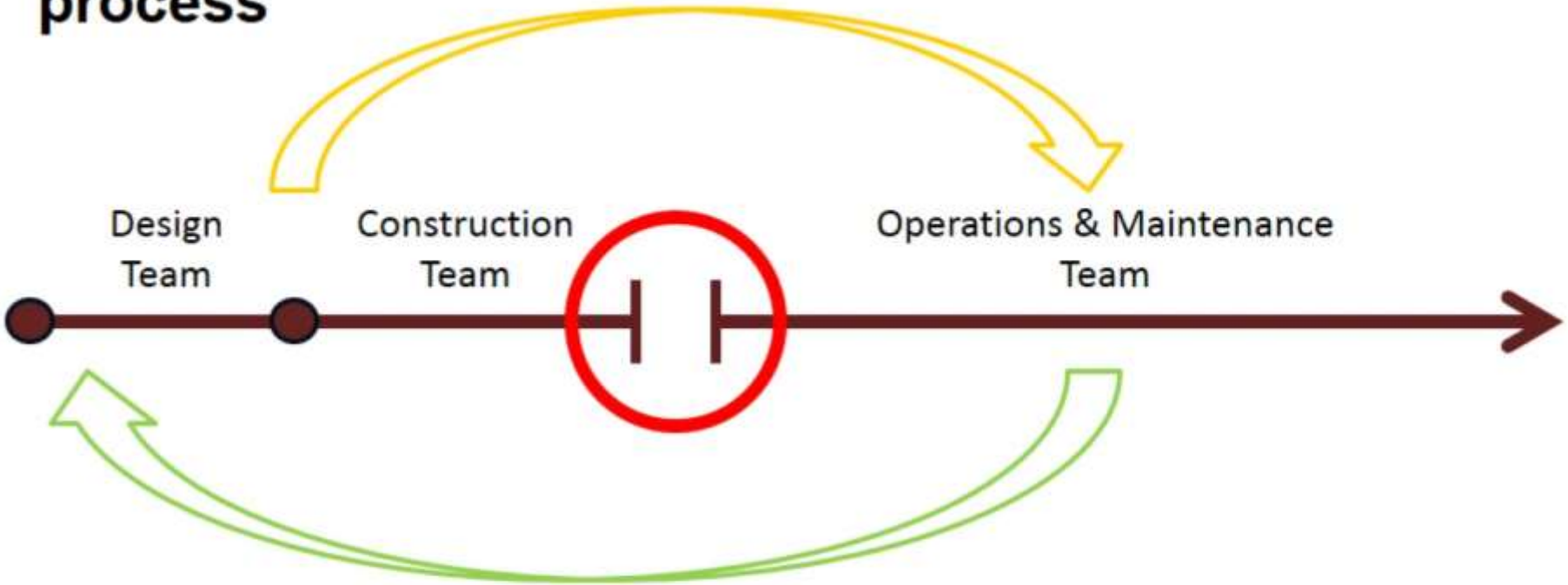
Designing to the ZNE Target
Part 2: Design for Operations

Designing to the ZNE Target
Part 2: Design for Operations

Integrating operations team into the design process



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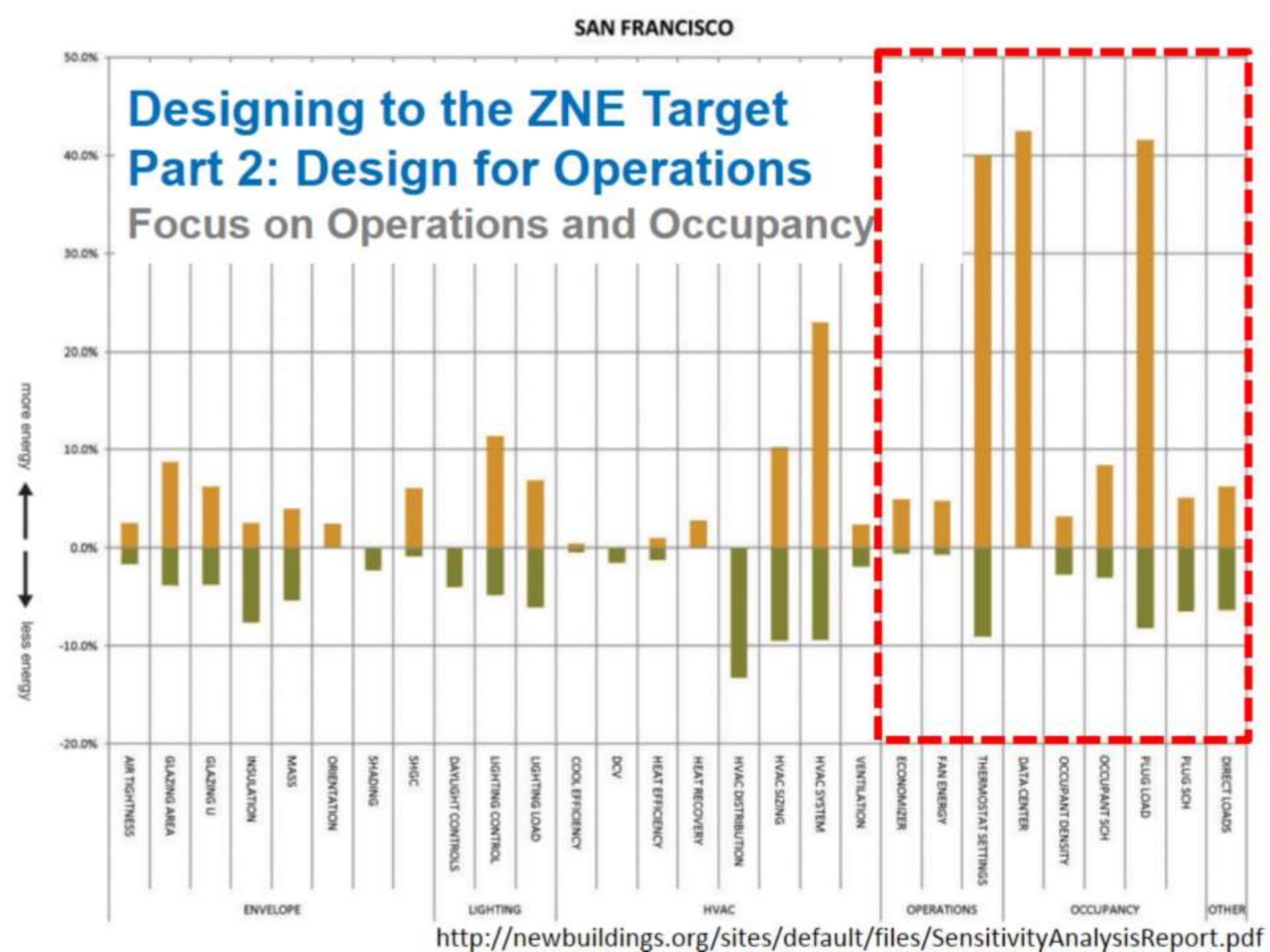

http://newbuildings.org/sites/default/files/SensitivityAnalysisReport.pdf

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

Controls

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

http://energytrust.org/library/forms/Synergy_Human_Impact_Net_Zero_Presentation.pdf

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!

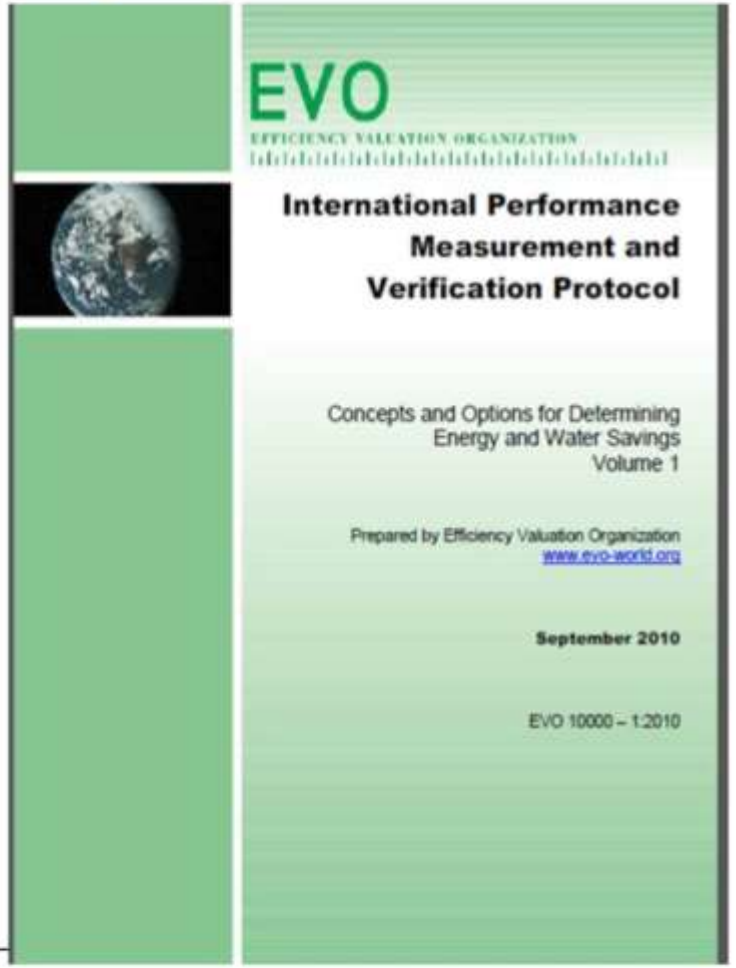

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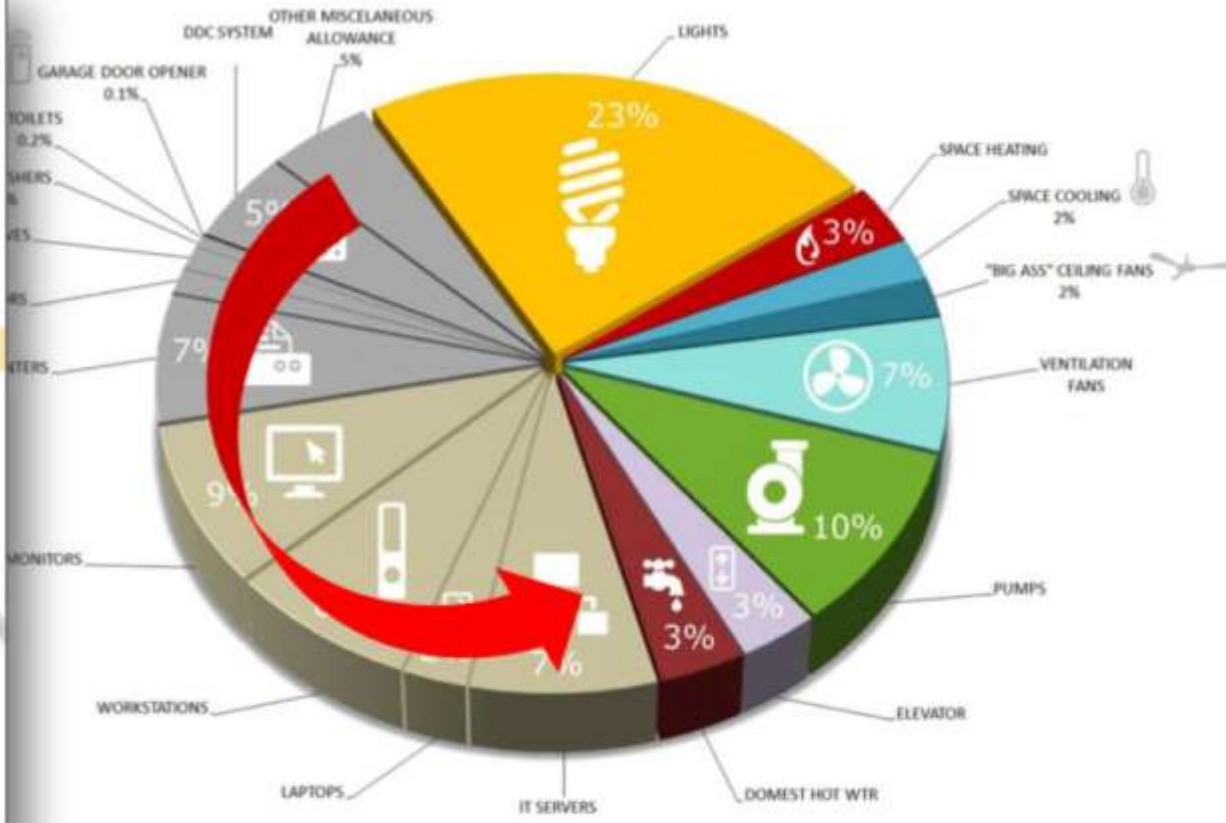
Image credit: EVO

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

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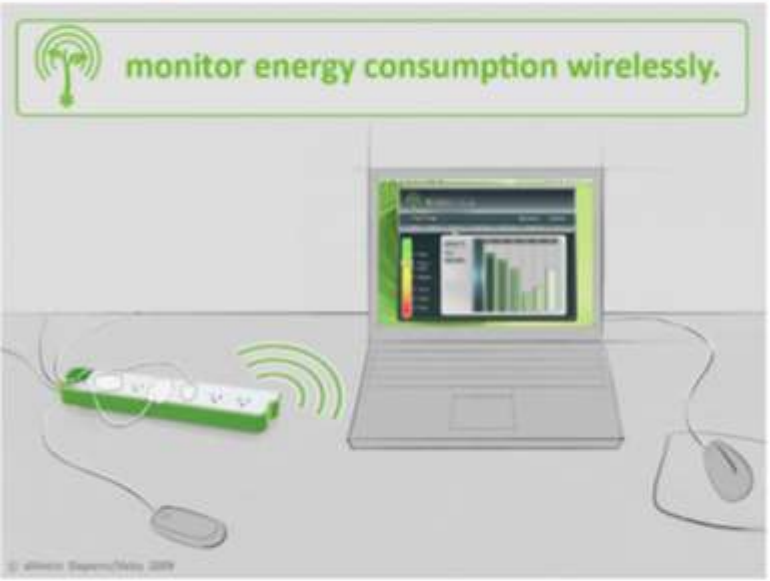
Operator & Occupant Engagement



eMetric by Jason Deperro

Building to the ZNE Design

Construction delivery methods:

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

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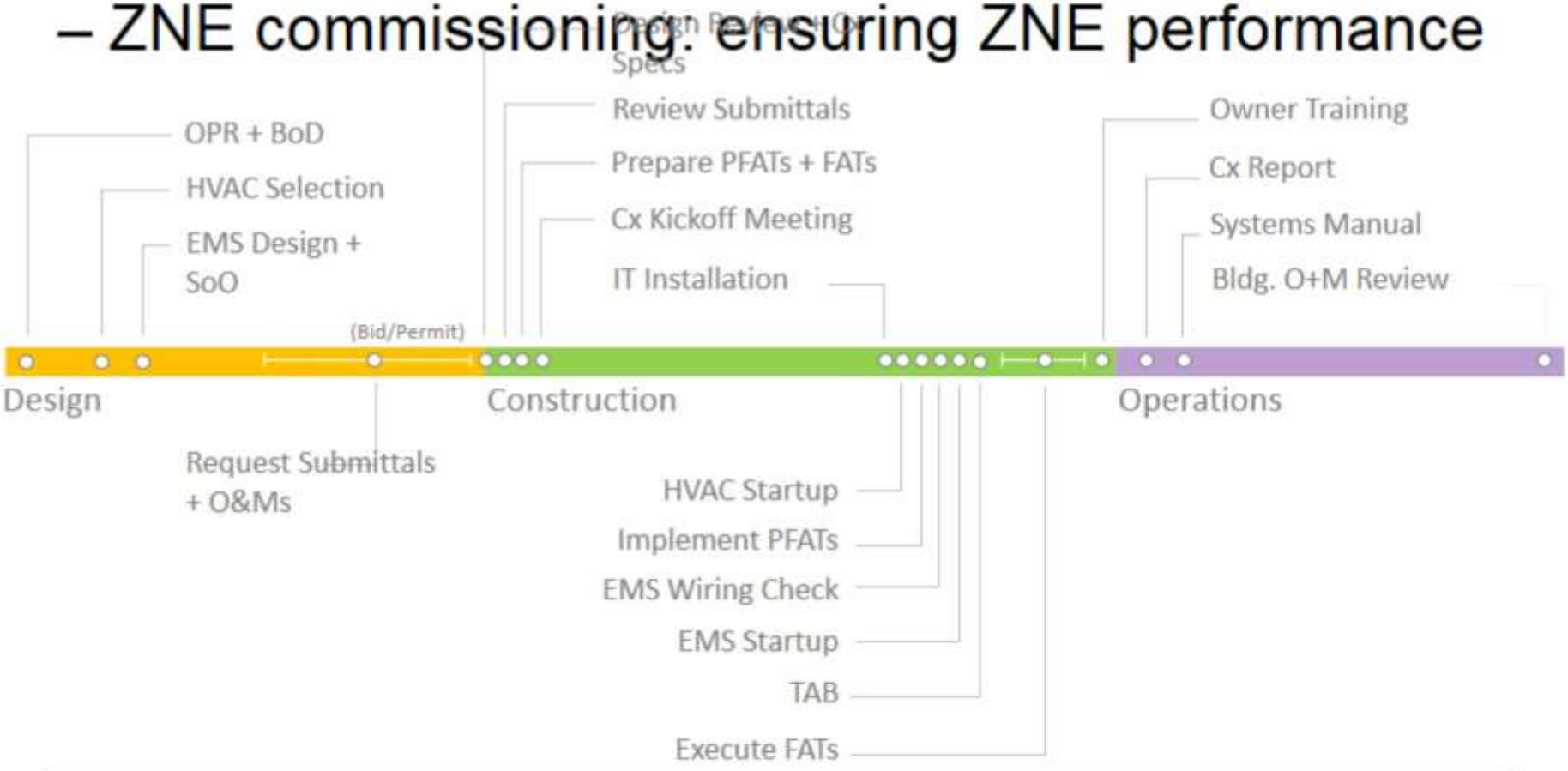
Building to the ZNE Design

– ZNE commissioning: ensuring ZNE performance



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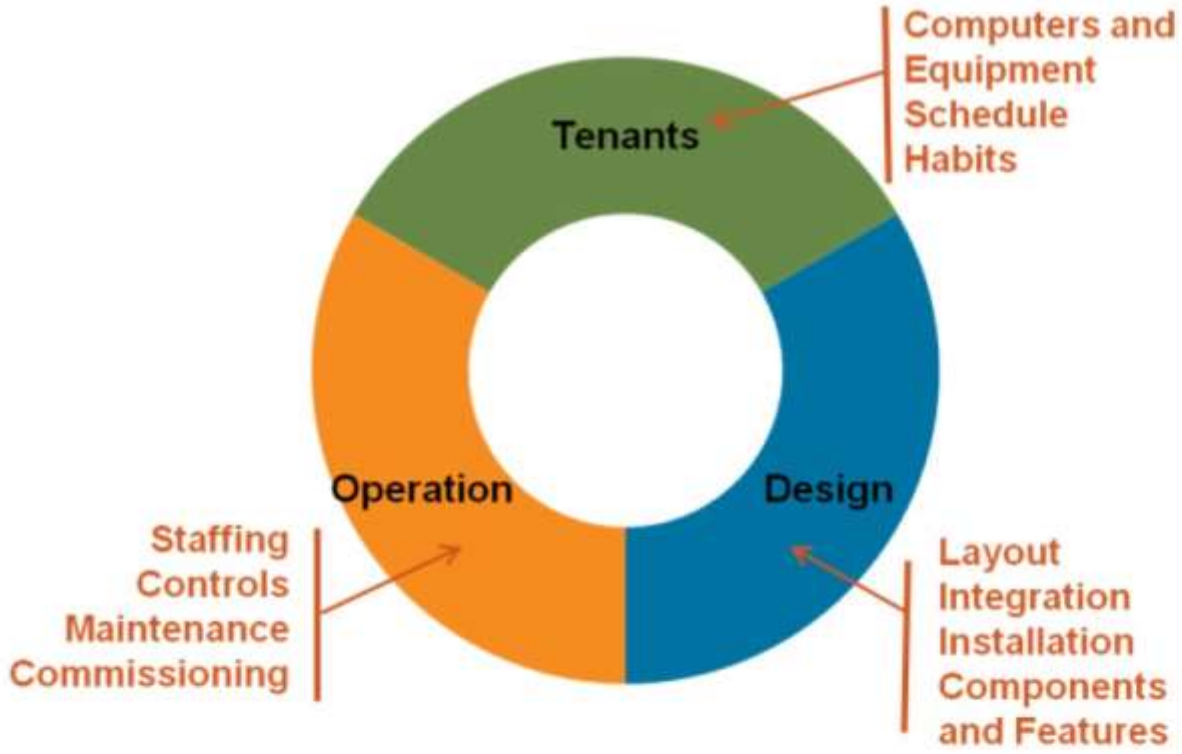
Operating to the ZNE Design

Building Operation: Post Construction



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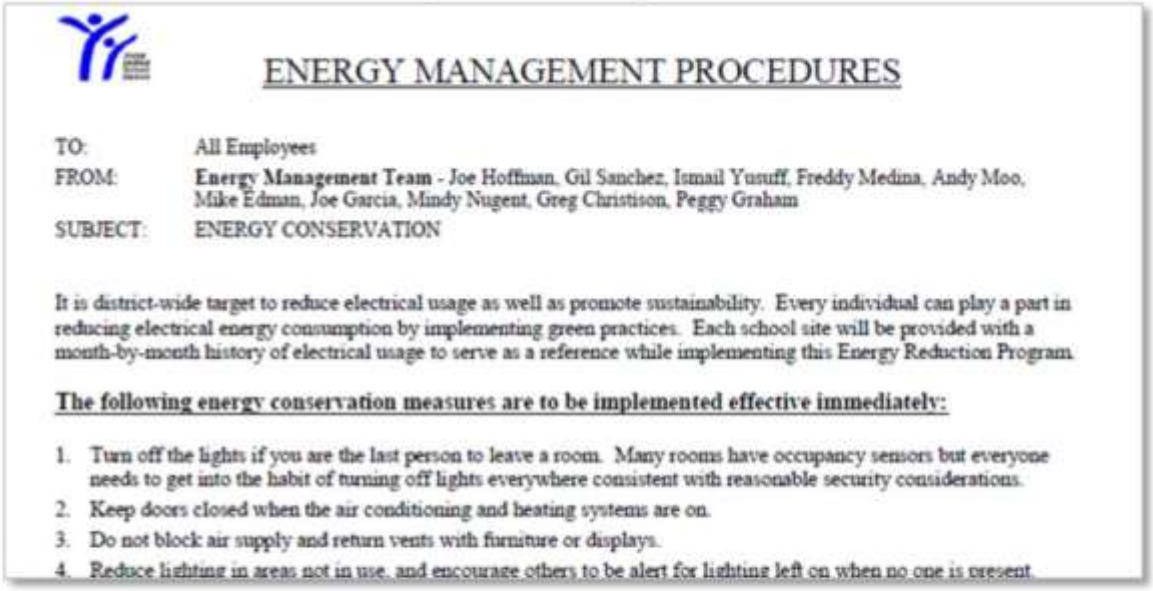
Jeffrey Trail Middle School & Irvine Unified School District

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.

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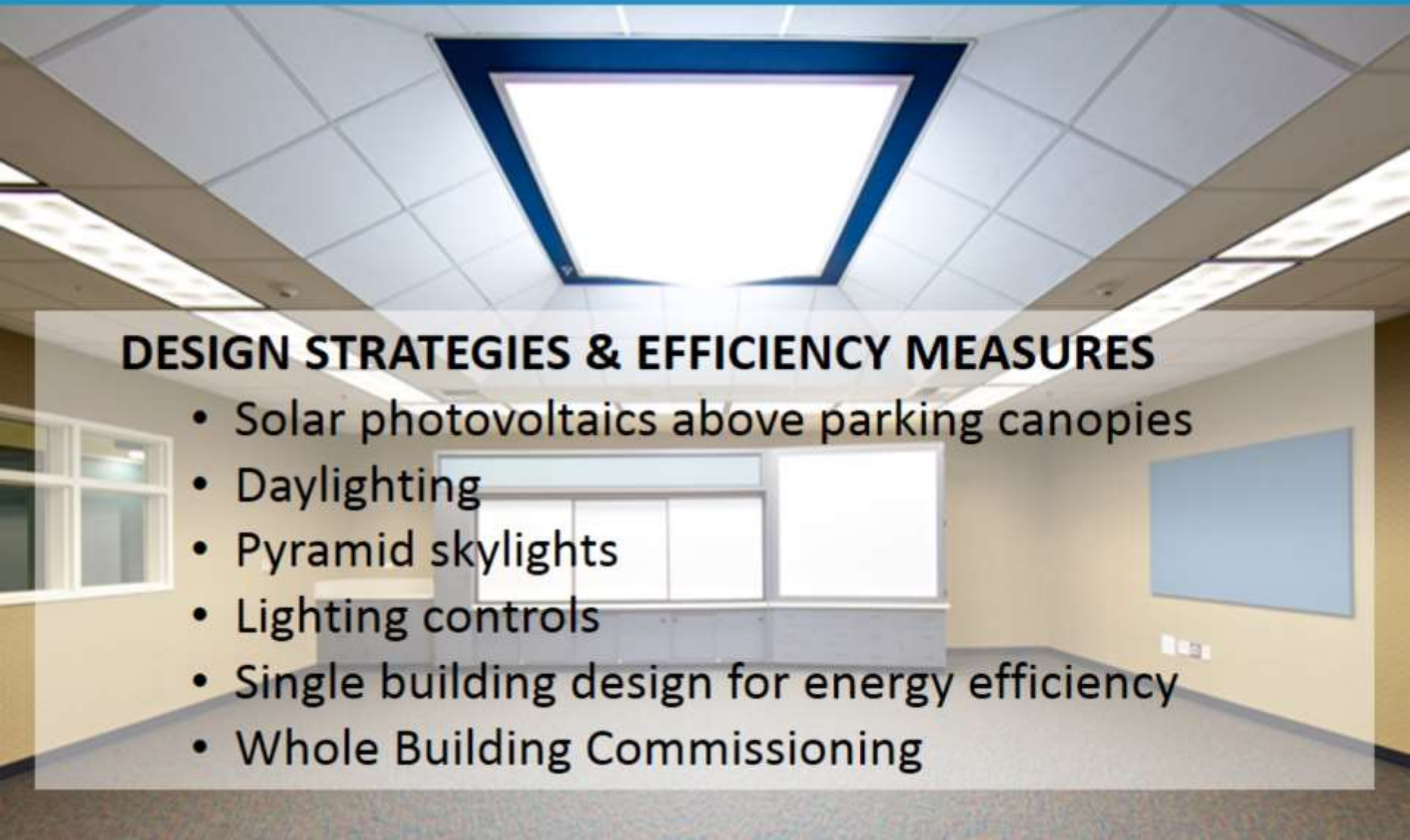
Jeffrey Trail Middle School & Irvine Unified School District



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

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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	System Type: Roof and Canopy-Mounted Solar Panels
Industry: K-12 Education	System Size: 9 MW over 27 Operational Projects
Location: Irvine, California	Savings: $8-11 million over 20 years
Company: Irvine Unified School District	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

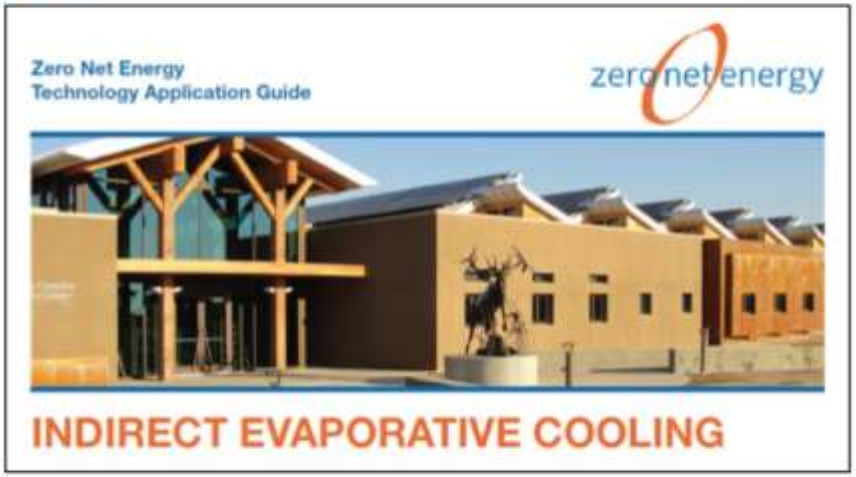
Operating to the ZNE Target: Taking ZNE Design to ZNE Reality

- 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

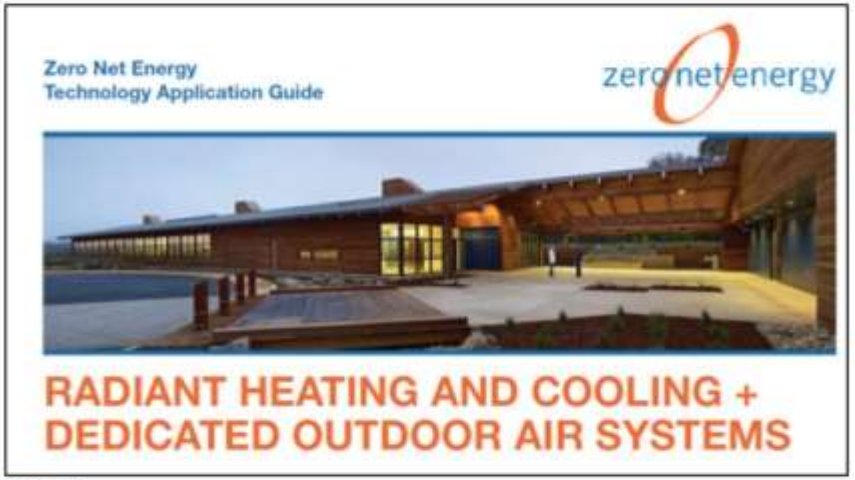
- CPUC Case Study Briefs & NBI ZNE Case Studies
  http://newbuildings.org/case-studies-zne-projects
- PG&E Case Studies
  http://energydesignresources.com/resources/publications/case-studies/case-studies-zne-non-residential-buildings.aspx
- NBI Registry
  http://newbuildings.org/share
- Getting to Zero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

ZNE Technology Application Guides



energy upgrade® CALIFORNIA

SavingsByDesign



http://newbuildings.org/zero-energy

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5 GREAT NEW TOOLS FOR ZNE BUILDINGS

zero net energy

ZNE Communications Toolkit

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.

www.newbuildings.org/zne-communications-toolkit

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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*

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Thank You!
Ralph DiNola
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343 Second Street
David and Lucille Packard Foundation Building
Courtesy: EHDD