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
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!

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Image credit: EVO

EVO EFFICIENCY VALUATION ORGANIZATION
International Performance Measurement and Verification Protocol

Concepts and Options for Determining Energy and Water Savings
Volume 1
Prepared by Efficiency Valuation Organization
www.evo-world.org
September 2010
EVO 10000 - 1:2010
Designing to the ZNE Target
Part 2: Design for Operations

Plug load performance – selecting energy efficient plug load equipment

Managing Your Office Equipment Plug Load

Guide to Energy Savings

Plug loads can be managed through low- and no-cost measures that are relatively straightforward to implement. This Guide shows how simple changes can cut costs and save energy in offices.
Operator & Occupant Engagement
Operator & Occupant Engagement

- Monitor energy consumption wirelessly.
- Control outlets and compare to others.
- Be rewarded for efficient energy habits.
- Set timers, powerdown min/max, set goals, chart progress, & compare with coworkers.
- 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

**Design**
- OPR + BoD
- HVAC Selection
- EMS Design + SoO
  - (Bid/Permit)

**Construction**
- Request Submittals + O&Ms
- Design Review + Cx Specs
  - Review Submittals
  - Prepare PFATs + FATs
  - Cx Kickoff Meeting
  - IT Installation

**Operations**
- Owner Training
- Cx Report
- Systems Manual
- Bldg. O+M Review
- HVAC Startup
- Implement PFATs
- EMS Wiring Check
- EMS Startup
- TAB
- Execute FATs

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Operating to the ZNE Design
Building Operation: Post Construction

- Tenants
- Operation
- Design

- Computers and Equipment
- Schedule
- Habits

- Staffing
- Controls
- Maintenance
- Commissioning

- Layout
- Integration
- Components
- Features
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.

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ENERGY MANAGEMENT PROCEDURES

TO: All Employees
FROM: Energy Management Team - Joe Hoffman, Gil Sanchez, Ismail Yunuff, 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: $8-11 million over 20 years
Capital Outlay: $80
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

- NBI Registry
  http://newbuildings.org/share

- Getting to Zero Database
  http://newbuildings.org/getting-to-zero-buildings-database
ZNE Technology Application Guides

LUMINAIRE LEVEL LIGHTING CONTROL

INDIRECT EVAPORATIVE COOLING

RADIANT HEATING AND COOLING + DEDICATED OUTDOOR AIR SYSTEMS

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

   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
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
Getting to Zero
National Forum 2016

Save the Date
October 12-14, 2016 | Denver, CO

gettingtozeroforum.org
Thank You!

Ralph DiNola
CEO, NBI
ralph@newbuildings.org