ZERO NET ENERGY

at

The County Of San Diego
WHY ARE WE DOING IT?

- **ROI - Healthier Budget**
  - Greatly reduced operating costs
  - Facility valuation stability

- **“Live Well San Diego” - Healthier People**
  - More comfortable, healthier work environments
  - Better productivity, reduced absenteeism

- **County Strategic Plan - Healthier Places**
  - Responsible development and economic vitality
  - Model and support healthy lifestyle choices
  - Protect our future environment and quality of life
Facility is investment
- Typical Building life: 50 years
- Typical Equipment life: 15 to 25 years

New construction ZNE by 2030
- Start now
- Budget established in 2012 (w/o ZNE)
- ZNE feasibility analysis
- ZNE requirement in Design/Build RFP
- PV budget supplementary
**FACILITY STATISTICS**

- **GSF:** 12,700 GSF
- **Operating hours:** 53/week
- **Climate zone:** 10

![Library Occupancy Schedules](image)
Building site was constrained
FACILITY STATISTICS

- **Insulation**
  - Code compliant
  - R-19 + R-5 walls, R-20 roof

- **LPD**
  - .62 w/sf avg.

- **HVAC**
  - Variable Refrigerant Flow

- **Hot water**
  - 90% solar thermal

- **Plug loads**
  - 1.4 w/sf avg.

- **PV**
  - 72 kW DC
  - 108,515 kWh/yr

- **Site EUI**
  - 29 kBtu/sf/yr
Energy model shows PV will produce 108% of annual energy use.

Source: Brummitt Energy Associates
WHAT MAKES IT EFFICIENT?

- LED lighting
- Low SHGC glazing
- VRF heating/cooling
- Controls automate processes
- Daylight autonomy in some areas
Model early and often

- Identify efficacy of design strategies
  - Insulation versus glazing
- Detect problem areas before set in stone
  - Modify design when it costs the least
- Evaluate “bang for buck” of measures
  - Tradeoff less effective and more expensive
- Calibrate assumptions throughout design
- Establish basis for M&V
- Balance EE with programmatic changes
  - There may be “compromises”
Model early and often

- Involve controls and modeling consultants early

Source: Brummitt Energy Associates
Maximize passive technologies

- Daylight, natural ventilation, orientation
- Maximize daylighting
  - Drive down lighting use and cost
  - Glare control and shading are critical

Daylight autonomy achieved at < 1/2 all occupied spaces

Lighting = 20% total energy use
Embrace your M&V plan

- Fine tune submetering
- Calibrate actual use with energy model
- Building users participate in performance

<table>
<thead>
<tr>
<th>End Use</th>
<th>% Energy Use</th>
<th>Submeters</th>
</tr>
</thead>
<tbody>
<tr>
<td>HVAC (heating, cooling, fans, DHW)</td>
<td>51%</td>
<td>1</td>
</tr>
<tr>
<td>Lighting (Interior &amp; Exterior)</td>
<td>23%</td>
<td>1</td>
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<tr>
<td>Receptacle (Plug) Loads</td>
<td>24%</td>
<td>5</td>
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<tr>
<td>Data/Server Room</td>
<td>4%</td>
<td>1</td>
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</tbody>
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Break down the big chunks
Plan to manage plug load
- Variable, hard to predict, hard to control
- Use controls and scheduling if possible
- 25% of efficient building
ZNE is not free

- Guidance from “yet another consultant”
- First costs (and PV) funded by capital - Savings go to operational
- Added attention to energy use
  - Submetering
  - M&V scrutiny
- Train staff to understand building
- Alpine Library cost ~5% additional for ZNE
QUESTIONS?