New Construction Done Right: Strategies to Improve Efficiency in Buildings

Today’s panel:

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New Buildings Institute

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Program Outreach Lead
Willdan

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Project Manager, Energy and Sustainability Division
County of San Diego

Pauline Souza
Partner & Director of Sustainability
WRNS STUDIO

David Kaneda
Principal & Thought Leader
IDEAs Consulting
Agenda

- Introductions
- CEDA Introduction
- Key Energy Efficiency Measures
- Case Studies
- CEDA Program Overview
- Q&A

Learning Objectives

- Understand core program structure and eligibility requirements
- Become familiar with major opportunity areas for savings beyond CA code and current practices
- See how some real project teams have tapped into similar programs over the years and learn from their experience
- Position yourself to take advantage of CEDA!
Polling Question #1

- What is your typical project role?
  - Owner
  - Architect/Engineer
  - Energy Consultant
  - Utility
  - Other

California Energy Design Assistance (CEDA) Program Introduction
What is CEDA?

California Energy Design Assistance (CEDA) provides a free analysis of different energy efficiency options and lays out their potential energy savings, then provides incentives based on energy savings in new construction or major alteration projects.

What Building Projects Can Tap Into CEDA?

- Publicly owned
- Commercial
- High-rise Multifamily
- Industrial
- Agricultural Projects
- PG&E, SCE, SoCalGas, or SDG&E customers*

*Most rate structures eligible
Why Participate in CEDA?

- Receive complimentary custom energy modeling
- Get help identifying and evaluating energy-saving opportunities
- Gain analysis of energy costs and paybacks
- Receive financial incentives to help offset the costs of energy saving measures for qualified projects

Key Energy Efficiency Measures
Building Envelope

- Limit thermal bridging
- Air sealing
- Insulation
  - Cavity
  - Continuous
- Fenestration
  - Windows
  - Doors
- Orientation & Shading

Heating and Cooling Equipment

- Radiant Heating/Cooling, esp. with Dedicated Outside Air System (DOAS)
- Air/Ground Source Heat Pumps
- Heat Pump Water Heaters
Energy Recovery & Thermal Energy Storage

- Heat Recovery Ventilators
- Heat Recovery Chillers
- Thermal Energy Storage

Controls

- Integration: HVAC, Lighting, Other
- Smart Grid Connectivity (OpenADR2.0b), Rates, Programs
- Individualized controls
  - Luminaire Level Lighting Control
  - Zonal HVAC
Polling Question #2

• Which of these technologies/strategies do you expect to optimize in an upcoming project?
  • Envelope
  • HVAC & WH Equipment
  • Energy Recovery
  • Thermal Energy Storage
  • Controls

Case Study 1: County of San Diego
**County of San Diego**

- Committed to energy efficient design
  - Zero Net Energy and all-electric since 2014
  - LEED Gold since 2016
  - Savings by Design since 2010

**Incentive Program provided:**
- Subject matter expertise
- Design overview
- Financial incentives

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**ZNE Inventory**

- **20% better than code**
  - Deep energy efficiency
  - “Automatic” LEED Gold
  - Lower cost PV

- **Reduced carbon emissions**
EE Essentials

• Start with energy model
  ▪ Estimate end uses
  ▪ Discover energy reduction opportunities

Design and build for 50 years of operational savings

Source: Energy model by stok

EE Essentials

• Use advanced technologies

LED lighting
VRF HVAC
Daylight harvesting
Solar PV
Solar thermal
• **Benefits of incentive program**
  
  ▪ Design assistance
    • OJT for inexperienced AE consultants
  
  ▪ Energy modeling
    • As mentioned – essential for 50 year lifetime
  
  ▪ Engineering evaluations keep with project schedule
  
  ▪ Array of energy models for whole building assessment
    • Align with AE tools

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**Case Study 2: Atherton Civic Center**
Atherton Civic Center

Pauline Souza, Partner, Director of Sustainability, WRNS Studio
David Kaneda, Partner, IDeas
January 26, 2022 NBI

How do you do this? – Sustainable Design at neutral cost impact

<table>
<thead>
<tr>
<th>CLIENT</th>
<th>TEAM SELECTION IS CRITICAL</th>
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<th>ENGINEER</th>
<th>ASK QUESTIONS, LISTEN FOR DETAILS, CONSIDER THE BIG PICTURE</th>
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<td>ITERATIVE PROCESS</td>
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<tr>
<th>ALL</th>
<th>MEETING THE GOALS TAKES TENACITY AND CREATIVITY</th>
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</table>
Atherton Civic Center

A community center that showcases the most innovative technologies and environmentally responsible strategies

To the client: translate and stay the course

Atherton Civic Center mission:
A community center that showcases the most innovative technologies and environmentally responsible strategies

All electric
Highly efficient and comfortable
Net Zero Energy
Microgrid ready
Site water handled on site
Everything to educate the community
**INGREDIENTS:** program, climate, context

<table>
<thead>
<tr>
<th>Site Size</th>
<th>Gross Building Size (New)</th>
<th>Programs:</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 acres</td>
<td>219,425 ft²</td>
<td>City Hall Administrative services</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Community Development, Police Department</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Police Ancillary Building, Council Chamber</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Corp Yard</td>
</tr>
</tbody>
</table>

**Library Collections:**
- Young-Adult
- Library Collections
- Heritage Room
- Maker Space
- Future Play Garden

*renovated*
Mature trees

Limited infrastructure

Train noise

Existing building

To the architect:

Design + Construction as a relay race
To the architect:
• Open the conversation up early
• Understand your targets **EARLY**
City Hall

- Plaster wall, metal stud, R-19 batt+ rigid insulation; R 14.1 overall, U = 0.071
- Glazing: solarban 72 (SHGC 0.30, VLT 70%, U = 0.083)
- Roof: R-30 insulation, R = 31.25 overall

### Table 2: EER Comparison of Model Durations

<table>
<thead>
<tr>
<th>Component</th>
<th>Proposed</th>
<th>Improved 50%</th>
<th>Improved 10%</th>
<th>Improved 5%</th>
<th>All Site Heat Recovery</th>
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<tbody>
<tr>
<td>Interior Lighting</td>
<td>5.7</td>
<td>5.7</td>
<td>5.7</td>
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<tr>
<td>Cooling</td>
<td>3.2</td>
<td>3.2</td>
<td>3.2</td>
<td>3.2</td>
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<tr>
<td>Heating</td>
<td>4.5</td>
<td>4.5</td>
<td>4.5</td>
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<td>4.5</td>
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<tr>
<td>FME</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
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<tr>
<td>Water</td>
<td>2.0</td>
<td>2.0</td>
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<td>2.0</td>
<td>2.0</td>
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<tr>
<td>Heat Rejection</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Parking</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Exterior Lighting</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
</tr>
<tr>
<td>Trees</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Total</td>
<td>19.0</td>
<td>18.0</td>
<td>18.1</td>
<td>18.8</td>
<td>18.3</td>
</tr>
</tbody>
</table>

Library

- Plaster wall, metal stud, R-19 batt+ rigid insulation; R = 31.4 overall, U = 0.071
- Glazing: solarban 72 (SHGC 0.30, VLT 70%, U = 0.083)
- Roof: R-30 insulation, R = 31.25 overall
Integrating into the site

Where to collect water
Where to collect sun
Where to take advantage of shade/mitigate heat gain

1 - Library
2 - City Hall
3 - Courtyard and City Hall

• Campus central chilled and hot water plant
• Heat pump chiller provides heat and cooling from one unit, allowing it to operate at peak efficiency regardless of load

<table>
<thead>
<tr>
<th></th>
<th>Library</th>
<th>Civic Center</th>
<th>Town Hall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Consumption (kBTU)</td>
<td>283,725.3</td>
<td>885,207.0</td>
<td>40,187.0</td>
</tr>
<tr>
<td>EUI (kBTU/5,000 SF)</td>
<td>28.6</td>
<td>33.2</td>
<td>21.9</td>
</tr>
</tbody>
</table>

engineers: help translate opportunities
engineers: help think in phases and stories

When VE and cost cutting is required...
Identifying PV Opportunities

Identifying Net Zero for specific program: Library
Identifying Net Zero for specific program: Police/Town Hall

Identifying Net Zero for specific program: Existing Town Hall
ATHERTON TOWN CENTER  environmental strategies

Benchmarking System: None

Library designed to NZE with future PV array

Energy Use Intensity: 28.3 kBTU/ft²/yr Campus
28.6 kBTU/ft²/yr Library
32.2 kBTU/ft²/yr City Hall
21.9 kBTU/ft²/yr Town Hall

Lighting Power Density: 0.65 watt/sqft

Water Use Intensity: N/A gal/ft²/yr

Ceiling fans provided in both private and shared spaces

Embodied Carbon: 650 tons CO₂

Stormwater: 25,596 cu. ft. Detention
2661 cu. ft. Retention
7,925 cu. ft. Retention

Figure 2: End Use Comparison
## Conclusion – Sustainable Design at neutral cost impact

**CLIENT**

- TEAM SELECTION IS CRITICAL – some experience makes a BIG difference

**ARCHITECT**

- SET GOALS tied TO THE MISSION AT THE BEGINNING – engage the team with the specifics
- START WITH HOW YOU CAN DO BETTER THAN (code, standards, baseline) – establish clear percentages
- INVOLVE THE ENTIRE DESIGN TEAM – set early team discussions; multi-disciplinary benefits = savings
- USE PASSIVE STRATEGIES – Look at Cost Benefit through the energy model
- KNOW THAT EVERY BUDGET CAN INCLUDE SUSTAINABLE OPTIONS – be open; dig into the details

**ENGINEER**

- ASK QUESTIONS /CONSIDER THE BIG PICTURE– create a set of questions for discussion; make sure it works for every team member
- ITERATIVE PROCESS – be ready for iterations

**ALL**

- MEETING THE GOALS TAKES TENACITY AND CREATIVITY – check in on options throughout the phases

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Questions?

Pauline Souza, Partner, Director of Sustainability, WRNS Studio, psouza@wrnsstudio.com
David Kaneda, Principal, Thought Leader, IDeas, dkaneda@ideas-c.com
CEDA Program Eligibility

• New construction projects and/or major alterations
• Projects in design phase
• Exceed standard practice, code, and current design
• Owner pays/will pay the Public Purpose Program surcharge on the account where the Energy Efficiency (EE) measures are installed
CEDA Program Eligibility: Major Alterations

- Change in space function – OR
- Substantial changes (≥ 30%) in design occupancy (sf/pp) – OR
- Increase (≥ 10%) in conditioned floor area – OR
- Expansion of substantial process or conditioning load to an existing facility

Two Paths- All Electric or Mixed Fuel

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Two Paths: All-Electric or Mixed-Fuel

- All-electric path offers substantially higher cash incentives
- Mixed Fuel path must optimize fossil gas and process heating systems to reduce carbon emissions
- Both paths encourage integration with:
  - Renewable energy generation
  - Electric vehicle charging
  - Battery storage
Incentive Summary

- Based on discounted net\(^1\) life-cycle savings beyond standard practice baseline\(^2\)
  - Measure effective useful life ranges from 8-20 years
  - Incentive rates for kWh, peak kW, and therms saved on a sliding scale
- Designated low-income housing projects get a 40% increased incentive
- Incentives cannot reduce payback below 2 years
- Incentives are capped at the lesser of 100% of incremental measure costs or 50% of full measure costs
- Incentives may be capped for buildings with onsite generation exceeding usage (generally, not residential or small commercial)

\(^1\)Net savings are based on CPUC determined net-to-gross ratio to account for free-ridership and program influence

\(^2\)The All-electric program's standard practice baseline is mixed fuel for buildings with fossil gas available nearby
CEDA Incentivizes All-Electric Buildings

• Electrification dramatically reduces carbon emissions
• All-electric projects often lower-first-cost: no gas hookup fee
• Grid gets cleaner over time… while fossil gas combustion remains high-carbon-emitting through equipment life
• All-Electric projects get much higher incentives – around double the rate per kWh, peak kW, and therm!
• Mixed-fuel (fossil gas heat) baseline for electrification projects
• Over 50 jurisdictions in CA require or encourage all-electric new construction already!

CEDA Lite

• Design teams can use their own energy consultant. If so:
  • Complete all program documentation requirements
  • Adhere to program modeling protocol
  • Calculate energy savings using CPUC Standard Practice Baseline (this is not CEC Title 24 modeling)
  • Receive approval for modeling approach and software tool

• May receive technical assistance stipend
  • Half paid at Project Feasibility Study acceptance
  • Half at Verification
Polling Question #3

• What types of additional information do you need to participate in the CEDA program?
  • Program eligibility and rules
  • Energy modeling approach, methodology, and tools
  • How to integrate CEDA energy modeling into project workflow
  • Incentive calculation approach
  • Other topics

Questions and Answers
Thank you!

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CEDA@willdan.com

Survey Questions

• How would you rate today’s webinar content and presenters? (1-10)
• How many projects do you expect to bring into the CEDA program in 2022?
• Would you like to have a CEDA representative follow up with you directly to answer questions?