

I Challenge You ...

- Think Creatively
- Look for possibilities
- Take Action



Apollo 8
Dec 24, 1968

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Bacon Street Offices Zero Net Energy Building Analysis



Conditioned Area	4,471 ft ²
Climate Zone	7
Cooling	Natural Ventilation
Heating	Mini-split system with 2 electric heat pumps
Domestic Hot Water	Solar hot water with electric backup
Lighting	Daylighting and photocell-controlled lamps
Onsite Generation	16 kW PV Array

ZNE Buildings – A Balancing Act

ZNE Buildings – easy to understand An art in making it a reality

- *Market acceptance of ZNE Goals*
- *Professional Design Community*
- *Utility Support – Modeling, \$, Support*
- *Public Policy Makers, CPUC, CEC*
- *Statewide Strategic Plan*



Challenges

- How to capture natural ventilation in simulation models
- Project Budgets \$\$
- Heat or no heat?
- Daylighting analysis and modeling
- Enough PV on the roof for ZNE?



Daylighting

Diffuse skylight system
at back of space

Photo controlled overhead lights.
Lights off 97% of the year.

Roller shades for
glare control

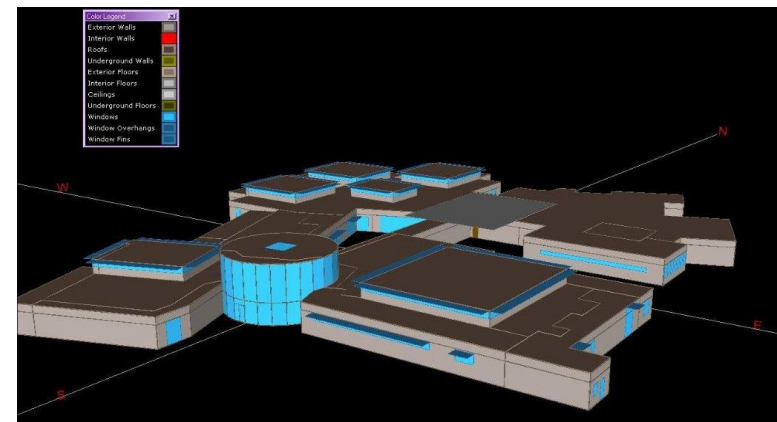


DAYLIGHTING



Lessons Learned

- Energy Modeling ... is the key!
- Employee comfort is important
- Budget Issues
- Costs for program certifications (LEED)
- Solar Hot Water – no room at the inn





Building Performance to Date

- Bacon Street Offices are a ZNE building by any method.
- PV system was oversized – a concern for future propagation of small commercial ZNE buildings – system could have been reduced by 18-21% and still achieved ZNE.

	Existing PV	Measured TDV ZNE	Measured Site ZNE	Modeled Site ZNE
Array Size [kW]	16	9.9	11.5	12.7
Reduction	0%	21%	18%	20%

- PV oversizing could have come from inaccurate model, behavioral and equipment changes after construction, or desire to fully utilize available rooftop area.
- Modeling should be updated as frequently as possible to reflect changes and realities of construction. Rigorous commissioning and co-ordination between parties will increase agreement between models reality.
- The Bacon Street Offices are a prime showcase for ZNE agencies and utilities, including the New Buildings Institute and SDG&E.

Utility Support for ZNE

- Extensive Design Assist
- SBD Incentives of offset incremental costs
- Energy Modeling support/expertise
- Natural ventilation studies, guidelines
- Daylighting resources



Utility Resources for ZNE

- Savings By Design

- Utility Program Advisors



Bob Nacke, P.E.
New Construction Supervisor – Engineers and Program Management

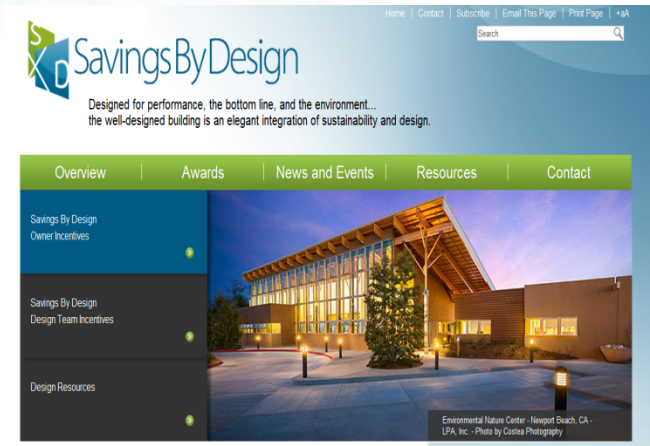
New Construction

Since joining SDG&E's Savings By Design team in 1992, Bob has performed energy simulations on hundreds of commercial and residential buildings. His recommendations are based on more than 25 years of experience in the heating, ventilating, and air conditioning (HVAC) profession, including HVAC design and consulting on energy issues. Nacke spent four years as a military design engineer before joining the private sector to perform studies on government facilities. He also spent several years as an in-house engineer at a local computer manufacturing facility. Nacke is a licensed mechanical engineer in the state of California and a member of the American Society of Heating, Refrigerating and Air-Conditioning Engineers.

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- Other utilities



Conclusion

