Windows to Net-Zero Energy

Global Green: Energy & Design, Sustainable Approaches to Climate Protection

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Opsis Architecture, Portland
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5. In commercial buildings, electric lighting produces +/- 30% of source energy carbon.
The Impacts of Global Warming on the Energy Efficiency of Building in the United States

Office of Technology Assessment, United States Congress with the Goddard Institute for Space Studies and the National Center for Atmospheric Research, 1988

Joel Loveland, UoWA
GZ Brown, UoFOR
Annual cooling loads will increase at a much greater rate than heating loads will decrease;
The timing, magnitude and duration of short term changes, peaks, is as large a concern as the sheer magnitude of the large annual changes in demand due to Global Warming;
New methods of “resource acquisition” will have to be implemented to respond to the new energy resource demands *(highest priority must be given to otherwise lost-opportunity resources at the building envelope)*:
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- Develop a new set of incremental measures for design teams, or efficiency strategies & targets, to support new lost-opportunity resources
“Research and demonstration of regional, building unit area weighted, zero-energy growth, demand targets should be developed.”
Pacific Northwest

- $.03 - .07/ kWh (.10-.20 nationally!!)
- Rainy (snowy) winters & dry summers
- Peak demand in the winter (heating) with peak resources rain-driven hydro.
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- Peak demand in the winter (heating) with peak resources rain-driven hydro.
- *Warming scenario, peak shifts to summer (cooling)*
- Summer power resources are stored hydroelectric in snowpack and dam, water reservoirs.
Global Green: Windows to Net-Zero Energy
660,000 watts/tower

~ 7 Peak Watt Hours/Sq. Ft.
(1 tower =~ 100,000 SF of PV)
The Building Skin as Resource Generation
Skylights & Windows Telling the Story of the Light

Seattle City Hall
Bohlin Cywinski Jackson

Global Green: Windows to Net-Zero Energy
Daylight as the Primary Source of Illumination

Kitsap County Administration Building
The Miller Hull Partnership
Daylight as the Primary Source of Illumination

Northeast Branch Library, Seattle
The Miller Hull Partnership
Daylight as the Primary Source of Illumination

Ash Creek Middle School, Independence, OR
BOORA Architects
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3. The investigation of regional building design alternatives should focus on the careful design and use of building windows as sunlight protecting and daylight admitting apertures, where the use of daylight is fully integrated with the design of the most efficient and highest quality electric lighting.
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2. The design of the building envelope and interiors should focus on the investigation of regional differences in the energy demand patterns.

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4. Research and demonstration of design technologies that target building zero-energy growth should be of the highest priority.
A systems approach, that we call **integrated design**, has the potential to create buildings with **lower first costs**, **better comfort conditions** and the **needed energy savings for net-zero**.

![Graph](chart.png)
integrated design lab

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Meeting the 2030 Challenge