Word On Windows

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Efficient Windows Mitigate Power Cost Spikes when Temperatures Rise

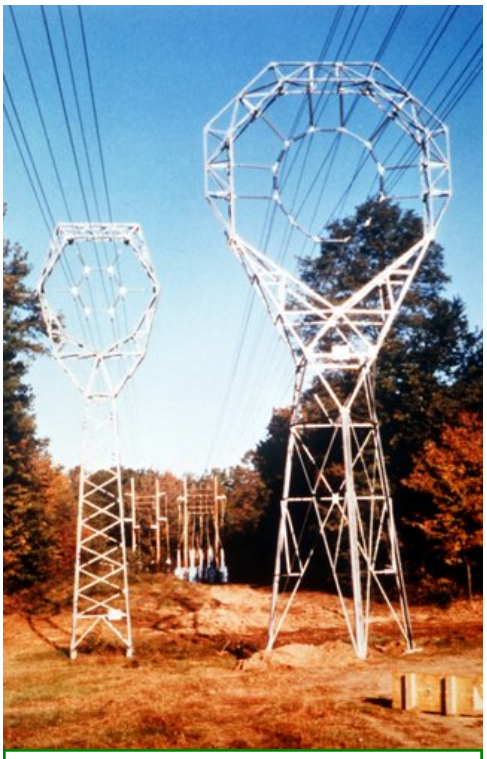
In the summer of 2011, persistent heat led to record electric peak demand in more than 10 states due to high cooling loads. Peak demand from cooling also broke some states' records in 2010. These demand spikes have a high cost, as additional capacity is expensive to supply. The key driver of these spikes is cooling. As a result, the performance of building elements that allow heat to enter, like windows and roofs, is vital to managing demand and controlling cost.

The High Cost of Peak Demand Example: Texas

A good example of a state where efficient windows and cool roofs can help mitigate electricity cost spikes is Texas. It was one of the states hit hardest by the 2011 heat wave, where wholesale electricity prices reached 60 times their average in the early weeks of August. Citing 40 consecutive days of temperatures reaching 100°F or higher, Texans endured one of the hottest, most costly summers on record.

Due to the extreme temperatures, building occupants cranked up air conditioners and avoided the outdoors. The 2011 summer heat wave resulted in the highest peak demand in Texas history: a whopping 68,294 MW in the Electric Reliability Council of Texas (ERCOT) service area. Compared to the previous all-time high of 65,776 MW in 2010, this year's peak capacity represents a 3.8% increase and produced some of the highest spot electricity prices ever recorded in Texas.

While peak capacity in the ERCOT region is approximately 73,000 MW, broken-down plants brought much of the state dangerously close to enduring rolling blackouts. This would have put high-risk customers – like the elderly and children – in a vulnerable position with the excessive heat.



Source: NREL Photographic Information eXchange

On several occasions in early August, wholesale electricity was priced at the $3,000 per MWh cap (approximately 60 times the norm). Base-load electricity is provided by plants that are relatively efficient, large and seldom shut down. However, when demand spikes – especially during peak consumption hours – smaller, less efficient, load-following plants are started up to fill the need.

The main concern for utilities is that these plants are far more expensive to operate, and while the most efficient of these plants are geared up first, the least efficient are called into service on days when demand is at its peak.

High demand for electricity also tests the transmission capacity of the local energy

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Façade Design Resources Facilitate Efficiency Choices

Façade design begins in the early concept phase, making it difficult to conduct detailed engineering analysis of the impacts on heating, cooling and lighting systems. Nonetheless, even rough early assessments of façade options can significantly help designers take the first important steps toward balancing daylighting, thermal performance and comfort considerations. To facilitate such early assessments, Lawrence Berkeley National Laboratory (LBNL) and the University of Minnesota have developed online and software resources for designers to quickly identify promising façade designs and quantify the energy and comfort impacts. These resources include the online Façade Design Tool and the COMFEN fenestration energy simulation software.

The Façade Design Tool is available on the recently improved website *Windows for High-performance Commercial Buildings* (www.commercialwindows.org).

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I N S I D E

School Retrofits Save Money, Create Jobs, and Inspire Students

According to the US Secretary of Education, school administrators across America face $270 billion of backlogged maintenance. From crumbling walls to drafty windows, managers are struggling to address a dilapidating learning environment, while facing tight budgets. These challenges are hindering the ability of students to learn and are eating away at already strained O&M budgets - placing administrators in an unfavorable position. Oftentimes, however, maintenance and retrofit opportunities can be found that provide a more comfortable learning environment, while actually helping the school budget through energy savings.

Window repairs, retrofits, and replacements can have an especially significant impact on the learning environment. Efficient windows enhance thermal comfort, which in turn can help improve students' concentration and performance. Efficient and airtight windows also have better sound-insulating properties. This creates a quieter learning environment, which is particularly relevant to students in urban settings. In some classrooms, skylights and tubular daylighting devices can be retrofitted to introduce more natural lighting to the classroom, creating a more stimulating learning environment and an opportunity to lower electric lighting use. Thus, window retrofits and other energy efficiency measures can benefit student performance while reducing school energy demand.

A number of different options exist to improve the performance of existing school windows, which vary in impact depending on climate. For example, installing solar control films onto existing windows is a manageable cost that has a particularly high impact on schools in the South. In contrast, schools where reducing heat cost is a priority secondary glazing, such as storm windows, can be installed to improve insulating performance.

The importance of school infrastructure has not been overlooked by governmental decision makers. In addition to the impact that building envelope upgrades have on schools themselves, these investments are also an opportunity to put Americans back to work. As outlined by President Obama in the American Jobs Act of 2011, $25 billion would potentially be dedicated to elementary and secondary school infrastructure – including funds for greening and energy efficiency upgrades. These funds would target schools demonstrating the most need, and would help to upgrade at least 35,000 rural and low income facilities with some of the highest energy costs in the country.

Striving for Efficient Schools

There are a number of resources available to guide energy performance improvements in school design and operation. The Collaborative for High Performance Schools, for instance, provides best practice manuals with guidance from planning and design to benchmarking and energy management. ASHRAE has developed design guides for high performance schools, aiming for beyond-code energy performance. Specific guidance for efficient windows and how they can impact the learning environment in schools is given by the Efficient Windows Collaborative document *Tools for Schools.*

Naturally, investment in energy efficiency measures can face budget constraints. But state and utility programs may offer financial assistance, and some projects are implemented without any upfront costs from cash strapped school districts. Energy savings performance contracts offer administrators the opportunity to make needed infrastructure upgrades, with guarantees from the service provider that the savings will meet or exceed the annual loan payments to pay for those services. This creative financing method can ensure that efficiency upgrades fit into any budget. Roslyn School District in Long Island, New York has taken to this trend and is striving to be an example for surrounding districts. Here, contractors and school administrators engaged in a performance contract which included envelope improvements, boiler replacements and lighting fixture upgrades. The aggregate cost over the contract period is estimated to be $3,813,745 and savings are expected to surpass $5,200,000.

Energy efficiency projects in schools can

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New Tools and Support for Valuing Efficient Homes

While home appraisals incorporate the value of granite countertops, multi-car garages and hardwood floors, they have always left out the added value of green building features. But all of that is about to change. Last month, the Appraisal Institute – one of the nation's largest associations for real estate appraisers - released a three page form that offers homeowners a resource for recording and exhibiting the value of energy efficiency upgrades in home appraisals. Including sections on everything from water efficiency to building envelope performance, the Residential Green and Energy Efficient Addendum is designed to valuate energy related investments in a way that truly represents their worth.

This form will encourage additional investment from homeowners who were once reluctant - thinking that the significance of their upgrades would be overlooked when the house was to be resold. Once completed, this addendum will allow appraisers to compare the efficiency features of the home to other appraisals in the area, and begin to paint a picture of how these features impact the value of the home.

Two of the first sections within this form focus on windows and day lighting.

Within the windows portion of the form, ENERGY STAR® qualification, low-E glazings, solar shading, and double pane categories are some of the highlights. The day lighting section includes boxes for skylights, solar tubes, and ENERGY STAR light fixtures. Beyond the component analysis, this form also includes holistic metrics, such as utility costs, HERS ratings, and LEED certification. A few metrics that are, however, left off the form include U-factor and SHGC – two extremely important factors when determining the efficiency of windows. While this addendum will not guarantee that appraisers incorporate the full value of investments, it does offer a tool that will facilitate the assessment of the value in these upgrades.

One of the most significant goals of this initiative is to encourage major lenders to factor monthly utility savings into the refinancing process. While the form has just been released, the Appraisal Institute and experts in the field are already working to convince federal lenders Fannie Mae and Freddie Mac to encourage or require the use of this form in appraisals. This could help borrowers to receive adequate funds to make efficiency investments in their homes, and assure homeowners that the efficiency value of those investments will be reflected in appraisals.

Windows Features that can be Checked in Addendum:

–ENERGY STAR	–Double Pane
–Low-E	–Triple Pane
–High Impact	–Tinted
–Storm	–Solar Shades

Support for Counting Efficiency from Lawmakers

On October 19, 2011, Senators Bennet (D-Co.) and Isakson (R-Ga.) introduced The Sensible Accounting to Value Energy (SAVE) Act, S. 1737. This bill would direct the Department of Housing and Urban Development (HUD) to update its underwriting and appraisal guidelines to account for home energy costs in any home loan backed by Fannie Mae, Freddie Mac, the FHA or any other federal agency. Currently, lenders add together principle on the mortgage, interest on the mortgage, property taxes, and insurance costs to determine a "debt-to-income" ratio that paints a picture of how much a borrower can feasibly pay back. This formula does not, however, account for energy efficiency, which can save the average homeowner more than $700 per year if they were to increase efficiency by 30%.

Considering the large portion of home mortgages guaranteed by Fannie and Freddie (about 90%), this could have a major impact, not only on homeowners, but also in creating demand for domestic services that put America back to work. ■

View the addendum at: http://www.appraisalinstitute.org/education/downloads/AI_82003_ReslGreenEnergyEffAddendum.pdf

School Retrofits (*cont.*)

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engage and educate students on intelligent energy use. The Green Schools Program at The Alliance to Save Energy offers students an opportunity to apply science, math, engineering, and technology in the growing field of energy efficiency. Recently, the Alliance has brought its proven method to the Memphis City School District. Working with the local energy provider, Memphis Light Gas and Water, and funded by the Tennessee Valley Authority, the Alliance has reached all 183 schools, achieving savings through both building improvements and student awareness. Schools that participate in the Green Schools program achieve reductions in energy use averaging between 5% and 15% - and most of these savings require no further cost than investing in the awareness, technical skills and ingenuity of the students.

Whether low-cost fixes, retro-commissioning or substantial retrofits are the goal, taking the first steps toward school energy efficiency measures is challenging in the face of multiple pressing priorities. Fortunately, decision makers can look to a growing number of professional services, financing options and best practice guides to direct their planning. This variety of school energy management tools can address several pressing needs at once, offering administrators an economical means of integrated management.

To find more information on efficient windows and schools, visit the Tools for Schools section in the "publications" portion of the EWC website at:

http://efficientwindows.org ■

Efficient Windows Mitigate Power Cost Spikes (continued)

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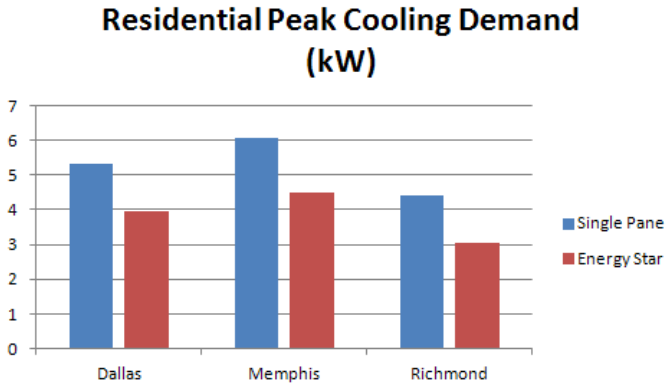
grid. In well-connected energy systems, managers can purchase additional capacity from surrounding suppliers to fill demand. The Texas grid, however, only has a few small connections to its neighboring systems, meaning it has little to rely on in terms of imported capacity.

Expanded Capacity vs. Reducing Peak Demand

Texas is not alone in its struggle to supply adequate amounts of energy during the hottest parts of the summer. Power providers in Virginia, New Jersey, Tennessee and other states all set new records for peak energy consumption between July and August of 2011. While most of these states are well connected to their supply through regional transmission organizations like the Tennessee Valley Authority and the PJM Interconnection, blackouts and other capacity related issues still exist.



Based on LBNL Technical Analysis, 2008, windows.lbl.gov/EStar2008
*Residential peak cooling demand for windows in 2150 square foot homes in Texas, Tennessee, and Virginia

One obvious way to address supply crunches due to peak demand is to increase generation capacity. This can be expensive and may also require investment in new transmission. Another option is to reduce peak demand through energy efficiency. Depending on the untapped efficiency potential, this may be a low-hanging fruit.

To expand supply for Texas cost-effectively, ERCOT would need to raise prices, for example by doubling the electricity price cap to $6,000 per MWh. While this would incentivize the construction and expansion of generating facilities to help ensure ample supply, it is capital intensive and will raise the cost of living in Texas.

One alternative to expanded capacity is the reduction of demand through demand response programs or energy efficiency. Demand response kicks in when demand nears capacity and allows utilities to reduce customers' consumption during short periods in return for incentives. The shortfall to demand response programs is that they are only temporary fixes and may be inconvenient to participants. Energy efficiency, on the other hand, can bring long-term benefits in terms of peak demand, energy cost and comfort. Peak electricity demand is typically related to air conditioning on summer afternoons. Some options that lower air conditioning demand – such as cool roofs and efficient windows – add the benefit of a more comfortable interior during times of high heat and relentless sunshine.

Keep Cool with Efficient Windows

A large portion of most buildings' summer afternoon heat gain is due to solar radiation entering through windows – particularly through those facing west. Since west-facing windows are harder to shade, the windows' contribution to peak cooling demand usually comes down to glazing performance. Windows that qualify for ENERGY STAR in the Southern or South-Central zone come with low-solar-gain low-E glass that can substantially reduce cooling demand compared to conventional glass – oftentimes enough to slash a ton off the needed air conditioner size.

ENERGY STAR and recent versions of the International Energy Conservation Code limit the solar heat gain coefficient (SHGC) of windows in the Southern United States at 0.30, 0.27 or even 0.25, depending on the climate zone and code version. Once Texas adopts the 2012 IECC with its 0.25 SHGC limit, the average peak cooling demand of new homes will be 0.6 to 1.4 kW lower than in homes built before the adoption of SHGC limits, according to simulations by Lawrence Berkeley National Laboratory (LBNL). In existing homes, where single pane windows and less efficient cooling systems are still common, retrofitting ENERGY STAR windows may on average slash peak cooling demand by anywhere between 0.7 and 2.4 kW. Such a cooling demand reduction saves energy and allows homeowners to opt for smaller, more economical air conditioning equipment. But the bigger picture is that it can truly help avoid the need for expensive expansion of electricity supply.

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Sizing HVAC Systems

Correctly sizing HVAC systems is an important factor in realizing the full benefits of efficient windows. Oversized air conditioning components take less time to cool to the desired temperature, and have shorter on-off cycles. These "short cycles" are less energy efficient, abbreviate the lifespan of HVAC components, and are less effective at dehumidifying the air. This can cause rooms to be muggy, prone to mold and generally less comfortable. Manual J, Manual D and Manual S are all tools available to ensure HVAC systems are appropriately sized and selected. These calculation worksheets, published by the Air Conditioning Contractors of America (ACCA), offer a detailed analysis of a building's HVAC demands.

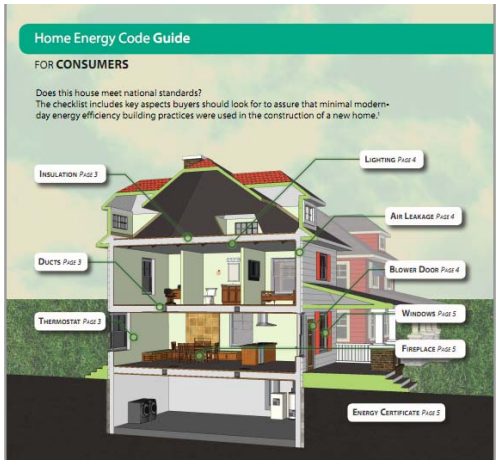
Guides Help Homeowners to Understand Building Energy Codes

A collection of new, user-friendly resources are now available to help consumers understand how building codes can make their homes more energy efficient. These interactive guides and downloadable publications are designed to educate homeowners on energy codes, and how they help save money by improving energy performance.

The resources - a product of the Building Codes Assistance Project (BCAP) and Consumers Union - are extremely valuable for homeowners, as the average household will spend about $2,175 on home energy costs this year. An energy-efficient home that complies with the 2009 International Energy Conservation Code can save homeowners $235 or more annually compared to a home that does not meet the 2009 code.

Consumer Demand for Efficiency Codes
A 2011 Consumers Union survey found that 86% of homeowners want to know a home's energy operating costs before they buy or rent; 82% of homeowners believe they have a right to homes that meet national standards; and 77% of homeowners think that homebuilders should not construct less efficient homes at the consumer's expense.

The goal of these resources is to empower consumers to shop assertively for energy efficiency when they buy or renovate a home. These tools will provide consumers with detailed knowledge on what to look for and what questions to ask when building, buying or renovating a home.



Resources Available on the BCAP Website:

–Energy Code Guides-
Learn how to increase home energy performance through in-depth guides.

–Energy Code Printable Checklists-
The checklists help determine if a new home meets national energy code standards, and teach consumers how to read the Energy Code Certificate that builders post in new or substantially renovated homes.

–Energy Codes Location Guide-
This step-by-step guide provides building energy codes based on location and information on whether or not the code is being effectively enforced.

–Documents That Explain What Energy Codes Are-
Fact sheets and a PowerPoint presentation provide basic information about building energy codes and explain why they are important.

–Select State Guides and Checklists-
BCAP has partnered with state energy offices in Alabama, Kentucky, Missouri and Nebraska to create customized energy code resources for consumers in each state.

These interactive tools and downloadable publications can be found at:

www.bcap-ocean.org/Consumers-Take-Action

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Power Cost Spikes (*cont.*)

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A quick thought-experiment on this: If 10% of the 22 million ERCOT customers were to upgrade their windows to ENERGY STAR and, say, avoid 1.4 kW peak cooling load each, peak demand in Texas would be reduced by more than 3,000 MW. This would make a significant dent. This year's expensive demand spike was less than 3,000 MW higher than last year's much more affordable peak demand situation. As a result, such window upgrades would not only improve comfort, reduce electricity consumption and allow for AC downsizing, it would also keep power prices from spiking by helping to avoid a scramble for supply.

Though air conditioning is an absolute necessity for many during the summer, upgrades in building envelopes – like efficient windows – can reduce the cost of supplying the needed electricity. These upgrades have such a significant impact on peak demand, many utility providers offer incentives that can lower consumer energy bills and contribute to a more reliable system. ■

Source: NREL Photographic Information eXchange

Façade Design Resources Facilitate Efficiency Choices (*Cont.*)

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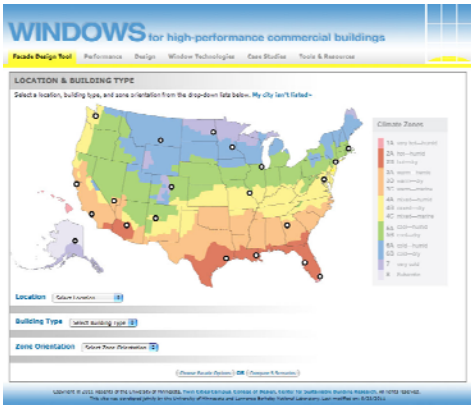
This website is a comprehensive resource for introductory and intermediate information on energy-efficient commercial window design. The Façade Design Tool gives designers the means to quickly compare glazing and shading options without the need for detailed inputs. Annual energy use, peak demand, daylight illuminance, glare, and thermal comfort impacts are shown based on pre-simulated performance data specific to the climate, façade orientation and glazing area. While this pre-simulated data allows only a rough assessment given that it isn't based on the building's specific characteristics, it nonetheless allows designers to narrow down their options to the more promising ones and to take note of likely impacts on lighting and HVAC design. To supplement the simulated data of the Façade Design Tool with qualitative background information, the website further discusses relevant performance considerations, codes and standards, as well as case studies of integrated design solutions.



The pre-simulated data of the Façade Design Tool has been generated with the Commercial Fenestration (COMFEN) early schematic design tool which is available for free download on the LBNL website. COMFEN is more versatile and provides more in-depth data than the Façade Design Tool and thus supplements the quick insights that designers can gain by starting their analysis with the online tool. It enables the architect or designer to do quick what-if scenarios on specific façade, lighting and shading designs with the powerful EnergyPlus simulation engine under the hood. Nonetheless, COMFEN requires only limited input and allows its users to focus on the energy and comfort impact of fenestration options without having to model entire buildings. COMFEN also offers glazing contractors a straightforward tool for comm-unicating the impact of glazing choices to their customers and to their partners in the design process.

The Façade Design Tool and COMFEN offer designers and decision-makers tools of different depths to help them integrate window and daylighting choices and their energy and occupant considerations early in the design process – from the get-go. ■

Download COMFEN at: http://windows.lbl.gov/software/comfen/comfen.html

Session on Key Tools for Commercial Window Design

On December 6th at the Ecobuild America conference in Washington DC, you can learn about key tools for designing and specifying energy-efficient commercial windows. In this 1.5 hour session, starting at 1:15 PM, the Alliance to Save Energy, the National Fenestration Rating Council and Traco will present overviews of the EWC Façade Design Tool, COMFEN and the NFRC Component Modeling Approach. We hope to see you there!

Ecobuild America covers the entire spectrum of strategies and technologies to build faster, smarter and more sustainably. The conference will run from Monday December 5th through Friday December 9th 2011. Co-located events include the buildingSMART alliance™ Conference, the Building Enclosure Technologies & Environmental Council Symposium and FEDCon® 11.

See the conference schedule at www.aececobuild.com

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Do You Have News You'd Like to Share?

We're always interested in reporting on new developments in the residential and commercial fenestration markets. If you have something you would like to share with us, please contact Nils Petermann at ewc@ase.org.