

Efficient 'can' lights open opportunities for energy savings

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It turns out that the most popular form of residential lighting is generally the most inefficient. So inefficient, in fact, that new building codes in California will effectively limit new installation of incandescent recessed fixtures, commonly referred to as "can" lights or "downlights".

The Department of Energy is working to improve the efficiency of can lighting through its Pacific Northwest National Laboratory. PNNL estimates that at least 400 million downlights currently are installed in U.S. homes.

These fixtures are energy hogs because most use inefficient, incandescent bulbs. But that's only part of the problem. They also indirectly lead to energy use by heating the room, which adds to air conditioning loads. And, since many are not airtight, recessed downlight fixtures can also allow heated or cooled air to escape into attic spaces.

"The widespread use of recessed cans and their inefficiency means there is a huge opportunity to reduce energy use and operating costs by using efficient compact fluorescent lamps and redesigning fixtures," said Jeff McCullough, senior research engineer at PNNL.

"Use of CFLs alone could cut the number of watts each fixture uses by two-thirds," said McCullough. "In addition to efficient lamps, we're going to need more efficient fixtures in the market to meet California and other residential building code requirements for hard-wired, pin-based CFLs." Pin-based CFLs plug into a fixture, meaning screw-in incandescent bulbs are not an option. The California code takes effect in

October 2005.

Compact fluorescent replacement lamps are cooler and much more energy efficient and airtight fixtures stop the air from escaping to the attic. Both sound like simple fixes, but combining the two creates a technical challenge. Airtight fixtures installed in an insulated ceiling cause heat build-up, which can impair lamp performance and lifespan.

Researchers at PNNL are working with manufacturers to 1) improve performance of reflector-type CFL replacement lamps and 2) redesign fixtures that are hard-wired for CFLs. PNNL's efforts also aim to increase the availability of these products and reduce the cost in the marketplace.

The lab acts as a matchmaker between manufacturers whose products meet certain requirements, and potential large volume buyers. This process, speeds new high quality products to market and allows them to be introduced at more competitive prices. To date, three CFL Reflector lamps have passed PNNL's stringent 6,000 hour elevated temperature life testing procedure. More information on the specific models, produced by Phillips and Feit, can be found at www.pnl.gov/rlamps/ .

"We are just entering the second phase of lamp testing in order to find more reflector lamps which can stand up to the high heat environment of airtight can fixtures" said Linda Sandahl, PNNL's Program Manager for the R-CFL effort.

For the can fixtures themselves, PNNL has performed rigorous testing of hard-wired, airtight fixtures which are rated for use in insulated ceilings, resulting in recommended design changes. The design changes address the effects of heat buildup in insulated ceiling fixtures which can cause the ballast – the component responsible for starting the lamp and maintaining the current – to fail prematurely. The ballast isn't part of the

bulb itself, but is usually located above the ceiling and exposed to insulation, making it difficult and even dangerous to replace. PNNL relocated the ballast, taking advantage of cooler adjacent ceiling spaces, lowering the temperatures ballasts are exposed thus extending their lifespan.

PNNL's program which involved long term testing simulating 7 to 8 years of operation, identified five fixtures that met stringent performance requirements.

Building on successes with previous market transformation efforts, PNNL is continuing to work with manufacturers and potential buyers to introduce more high-performing, airtight downlight fixtures that are hard-wired to use energy efficient CFLs.

More information on qualified products is available at www.pnl.gov/cfldownlights/index.html

Source: Pacific Northwest National Laboratory

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