

New and Emerging Technologies

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- ▶ High Performance Windows
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Appliances and HVAC



Source: Joe Kinney, New Yorker Hotel



Dishwasher with Adsorption-Enhanced Drying

- ▶ BOSCH has developed a dishwasher for sale in **Europe** (only) that uses synthetic zeolite to adsorb water during the drying cycle.
- ▶ Warm humid air after last rinse is mechanically moved out of the interior compartment to ~3 lbs of zeolite which accelerates drying.
- ▶ Zeolite is regenerated (and heated water produced) by heating element & used in the next wash cycle.
- ▶ At just 0.83 kWh/cycle, and 2.6 gal/cycle, the dishwasher is at least 20 percent more efficient than the most energy-efficient dishwasher.
- ▶ Retail: £500 (US\$750)



www.gizmag.com



www.theengineer.co.uk


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Ultrasonic Dishwasher

- ▶ Onis by Designers de Dietrich 'disappearing' dishwasher (<http://www.dedietrich.co.uk/>).
- ▶ Uses very little water and does not require dish detergent.
- ▶ Combination of ultrasound and any type of acidifier such as vinegar does the cleaning.
- ▶ Operates in 'closed circuit' and thus recycles the water.
- ▶ Washing time cut by half compared to conventional dishwasher.
- ▶ Price is not available but may be no more than high-end dishwasher!



Source: www.appliancist.com


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Washing Machines



Source: www.gizmag.com



Xeros Ltd 'beaded' washer

- Nylon beads in tub absorb dirt and stains – good for ~100 washes before beads replaced.
- Claim 90% less water and 30% less energy compared to current standard washers.

www.xerosltd.com

Sanyo Ultrasonic Washer

- Uses electrolyzed water to dissolve dirt and bacteria.
- Low water/energy use.
- ~\$US1800 but not available in US



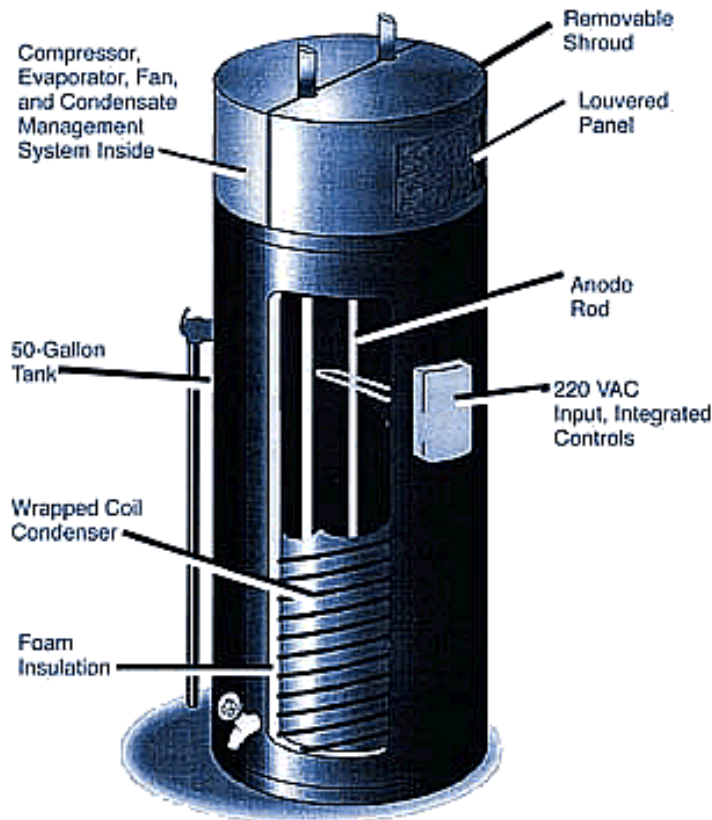
Yali Dai multi-compartment washer

- 3 compartments for sorting by color/temp/fabric.
- Smart logic used to adjust washing according to the sort/compartment.
- Claims to be water and energy efficient.

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Heat Pump (Hybrid) Water Heaters: The Next Generation of Electric Water Heating



- ▶ Since the introduction of the Rheem HPWH at last year's UEF, 2 additional products have entered the market: GE and O.A. Smith.*
- ▶ HPWH will become the federal standard for all electric water heaters >55 gals starting in 2015.**
- ▶ $EF \approx 2.0$. This represents a ~60% energy savings over conventional 50-gal electric resistance water heater.
- ▶ MSRP ~\$1,500 and available at big box retailers (sometimes on sale).
- ▶ Field testing underway by NEEA and others.

*Note other technologies in the market include 'add-on' heat pumps to existing tanks.

**New Federal residential water heater standards were set March 31, 2010 to take effect in 2015.

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High Performance (R-5) Windows DOE Technology Procurement

- ▶ Solicitation for high performance windows and low-e storm windows issued in late 2009.
- ▶ 62 qualified vendors responded with products meeting the specifications.
- ▶ Suppliers and products offered are listed on the volume purchase web site
www.windowsvolumepurchase.org
- ▶ ***(active May 27, 2010)***
- ▶ Price ranges for window products are given and do not include delivery, taxes or installation.
- ▶ Volume buyers purchase directly from suppliers.
- ▶ Competitive prices: <\$250 for 3x5 double hung (U=0.22).



Source. www.R5windowsvolumepurchase.gov

“Smart” Windows



Source: Pat Corkery, NREL

An entire house equipped with electrochromic windows can be operated using the equivalent of a 75-watt light bulb.
[Sage Electrochromics, Inc.]

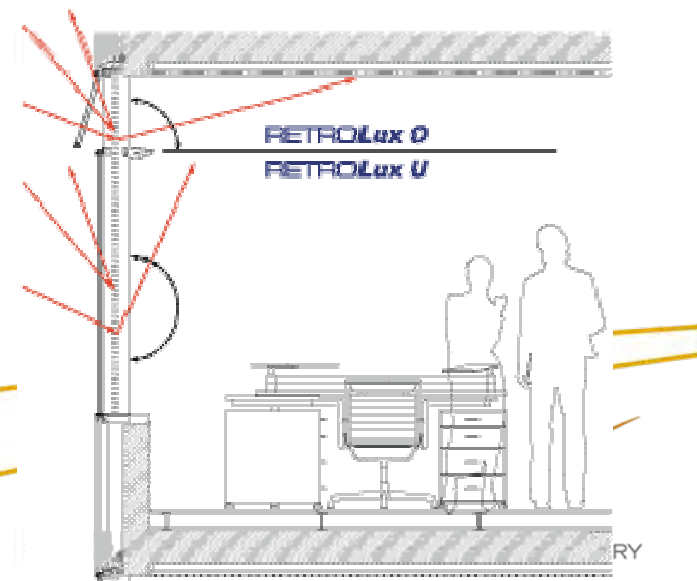
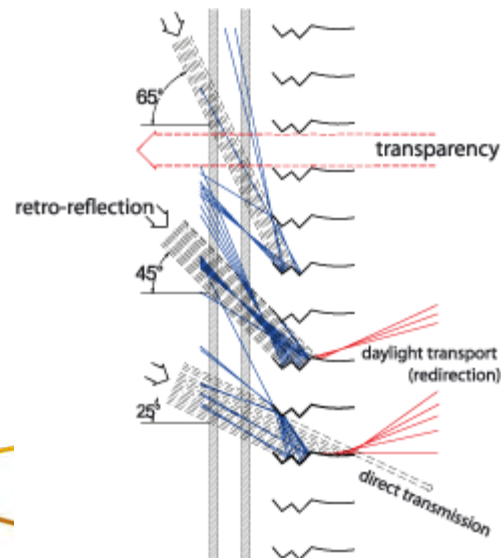
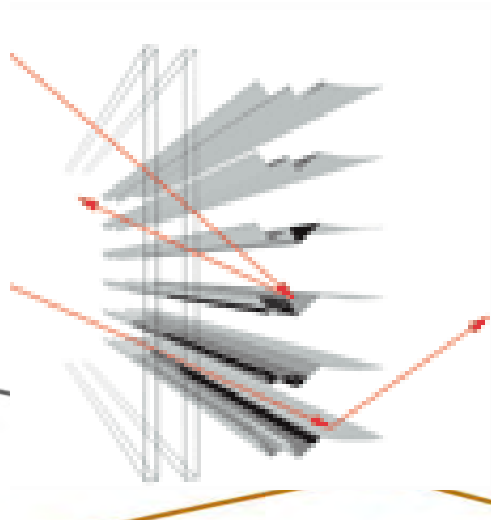
- ▶ A new generation of ‘dynamic’ windows is being developed after ~20 years of R&D.
 - Dynamic windows react to sunlight to electronically ‘dim’ or tint to reduce interior solar heating or – more importantly – interior heat from escaping.
 - Triple-pane glazing + electronic tinting using new nanotechnology thin film on outside pane can produce a window with an R-value of ~8.
 - Durability and cost (~\$1,000/ft²) remain as barriers to overcome.
- ▶ DOE recently awarded Sage Electrochromics over \$100 million in tax credits to mass produce dynamic window glass.
 - Sage is working under an agreement with NREL to lab test dynamic windows.

Window Blind/Light Shelf

- ▶ Daylight-guiding 'venetian' blind.
- ▶ Blind blocks direct sun as well as redirect sun.
- ▶ <http://retrosolar.de> (Germany).

http://retrosolar.de/flash/ani_rlux_e.html

Source: retrosolar.de.com



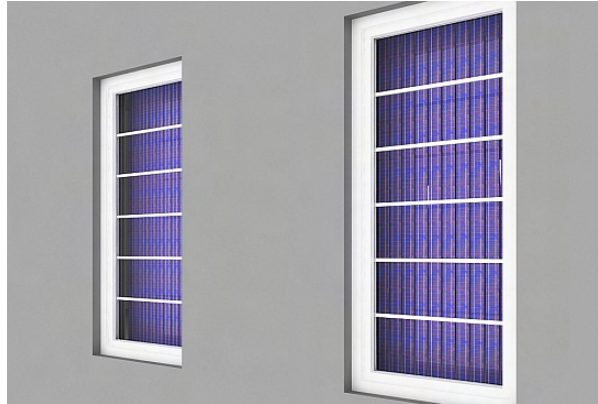
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Energy-Generating Window Shades

A number of new and emerging technologies



Energy -Generating Window Shades



SunIT



Solar Modules



Energy Curtain



Light-in-the-Dark



Source: www.ecofriend.org

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Cold Climate Heat Pump (again!)

- ▶ Industry continues to strive to produce a residential air source heat pump that will perform at very low outside temperatures (@-10F or less) at a COP of at least 2.0.
 - Eliminates the need/cost for auxiliary heating.
- ▶ Several industry attempts have resulted in failures of either the technology or the companies (see Nyle Special Products).
- ▶ New commercial-sized product from Daikin shows promise and is undergoing field testing.
 - 8- and 16-ton models currently available.
 - Likely only cost-effective in areas without natural gas for heat.



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Heat Pump.....for Automobiles



- ▶ New advances in nanotechnology have made it possible to use waste engine heat to drive 'small' adsorption generators in autos replacing the mechanical compressor for A/C
 - Technology first described in 1824, but of course the units would have taken the back half of an automobile or a trailer to haul around!
- ▶ Activated charcoal on thin plates absorbs and releases methanol refrigerant in cycles frequent enough to cool a car's interior.
 - Nanotubes filled with methanol make it possible for efficient heat exchange.
 - Eliminates GHG refrigerants entirely.
 - Eliminating a compressor can increase fuel efficiency by ~5%
 - Generators can be as small as 6 inches square.
- ▶ Downside is that the engine must be hot to work and who can wait that long on a hot summer day with interior temps approaching 150 degrees!
 - A phase change material used to store exhaust heat could help solve this issue.

Lighting Technologies

The Lighting Conundrum

“...only 20 percent of existing commercial buildings feature some degree of upgraded lighting technology, the National Electrical Manufacturers Association said, while the rest use lighting systems installed before 1986.”

Businesses bidding farewell to outdated fluorescent lighting Mar 14, 2010

Richmond Times-Dispatch

So, in addition to ‘cash for clunkers’ and ‘cash for caulkers’, how about a ‘lighting for laggards’ program?

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CALiPER Testing of SSL Products

<http://www1.eere.energy.gov/buildings/ssl/caliper.html>

- ▶ Round by round summaries
- ▶ Detailed photometric reports
- ▶ Benchmark reports
 - Linear replacement lamps (T8)
 - MR16 replacement lamps
 - Omni-directional replacement lamps
- ▶ Exploratory reports
 - Dimming study
 - Long-term testing study
 - Variability and repeatability study
- ▶ Not all products are tested and thus be sure to request “LM-79” and “LM-80” test data from qualified independent test labs*.

*www.ies.org

CALiPER



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Inappropriate Application of SSL



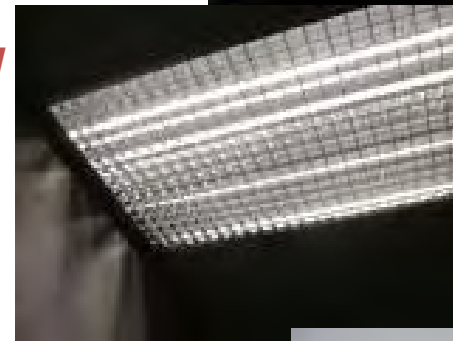
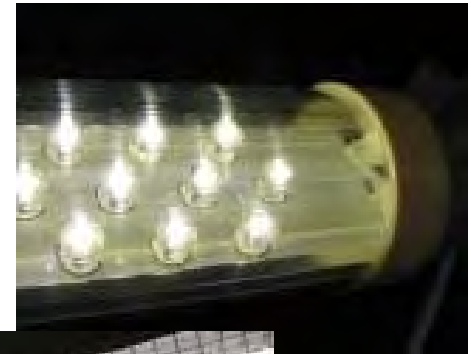
The LED T8 Replacement Lamps

Source: PNNL

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4' Linear LED Replacement

- ▶ If it's too good to be true...watch out....
 - LED manufacturer literature says:
 - '15W / 1500lm & 100 lm/W'
 - 'Replaces 32 – 45W fluorescent'
 - CALiPER measurements say:
 - LED 16W /~1100lm & 69 lm/W
 - **Fluorescent 32W / 3250lm & 101 lm/W**
- ▶ $\frac{1}{2}$ the watts but with $\frac{1}{2}$ the lumens!
- ▶ Would you pay ~\$65-\$80 for one lamp?



Source: PNNL

<http://www.1000bulbs.com/LED-T8-Fluorescent-Replacement-Tubes/>

After reviewing the CALiPER Round 9 test results referenced in the following "Postings," 1000Bulbs.com has decided to discontinue our offering of LED T8 Replacement Tubes at this time (01/07/10). We will continue to monitor LED technology developments and revise our offerings at a later time if / when appropriate.



2'X2' LED Luminaries

- ▶ Fixtures designed to replace 2'x2' or 2'x4' T8 fixtures
- ▶ Designed to meet or exceed efficacy of fluorescent fixtures

Results

- ▶ Lumen output >2'x2' T8 for both
- ▶ One \approx 2'x4' T8 fixture but at higher wattage



Source: PNNL

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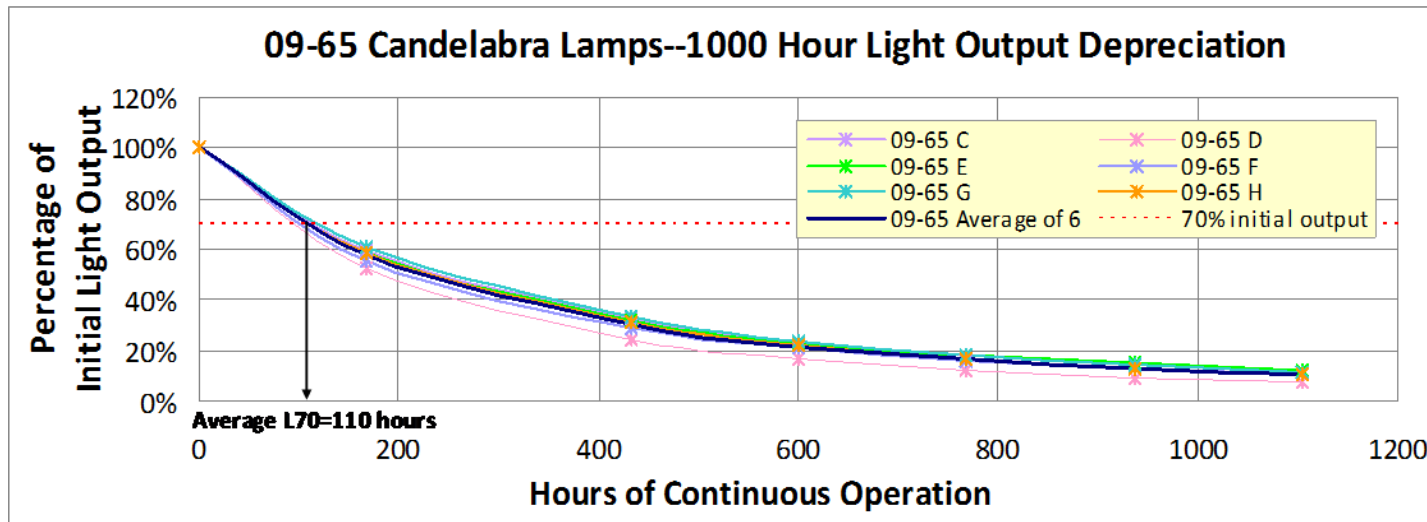
Candelabra LED: Truth in Labeling?

REPLACES
40
WATTS

USES ONLY
1.5
WATTS

30,000 Hour Life
(Life Rating of LED's)

450 lm vs. 66 lm (huh?)



Based on results, retailer pulled products from shelves although product as tested is still produced by manufacturer.

GE Energy Smart[®] LED Bulb

- ▶ GE has just released a LED bulb to replace the standard A-line 40W incandescent.
- ▶ Designed to meet the 2014 DOE standard for 40W bulbs.
- ▶ Unverified specifications include:
 - 9W/450 lm (equiv. 40W/450 lm).
 - 25,000 hrs (750 hrs).
 - Heat management.
 - CREE LEDs.
 - Omnidirectional light.
 - ENERGY STAR qualified.
- ▶ Available early 2011.
- ▶ \$40-\$50 retail?



Source: www.gizmag.com



Save the Easter Bunny!

- ▶ http://www.youtube.com/watch?v=LyVU470TQBk&feature=player_embedded



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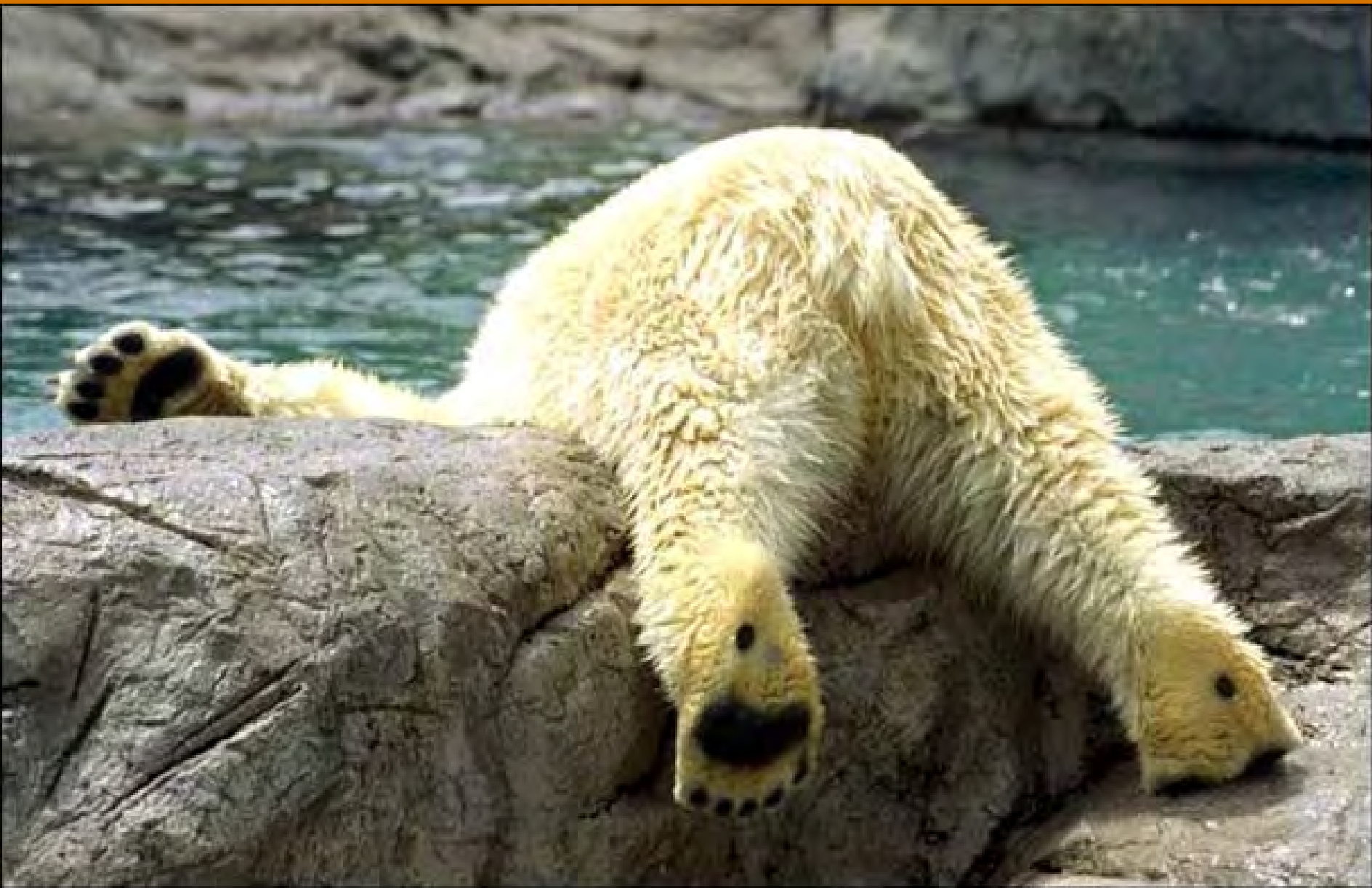
Lighting Endnote.....

- ▶ DANVERS, Mass., April 14, 2010 – OSRAM SYLVANIA is marking the 25th birthday of the modern compact fluorescent (CFL) light bulb. Born on April 17, 1985 in Hannover, Germany, the CFL arrived **a full eight inches tall, consuming 20 watts of energy**. The stick-shaped CFL was the first screw-in, energy-saving replacement for a standard incandescent light bulb that featured an integrated electronic ballast.

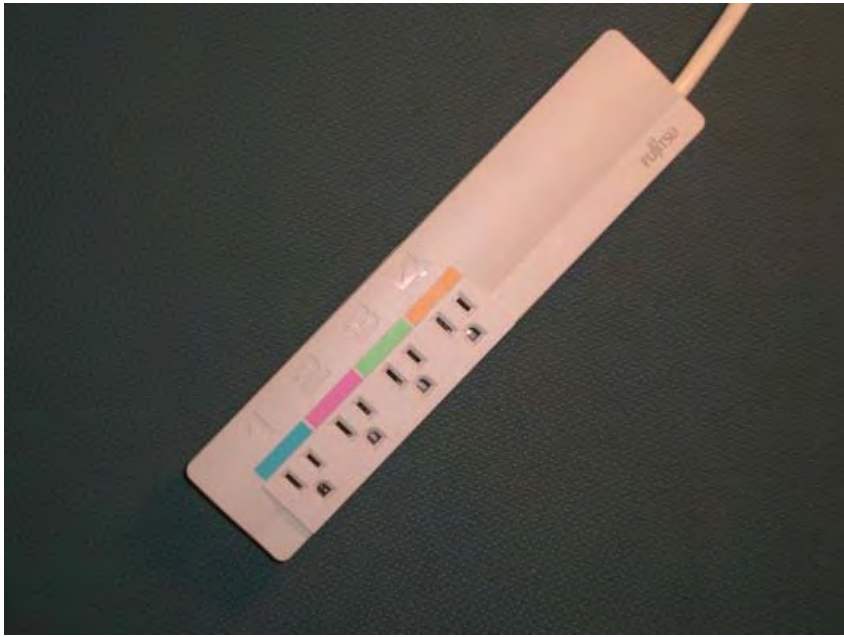


Source: G. Parker, PNNL

Odds and Ends



Smart Power Strip



Source: Fujitsu www.gizmag.com



Source: <http://techon.nikkeibp.co.jp>

- ▶ Power strip with built-in sensors that monitor plug load usage for each device.
- ▶ Usage is sent via USB port and recorded by office PC.
- ▶ Data provided to power strip user in anticipation of user reducing energy use by turning off devices.
- ▶ Early studies report a 20% reduction in office plug load usage due to feedback.
- ▶ Not yet commercialized; retail cost >\$200.



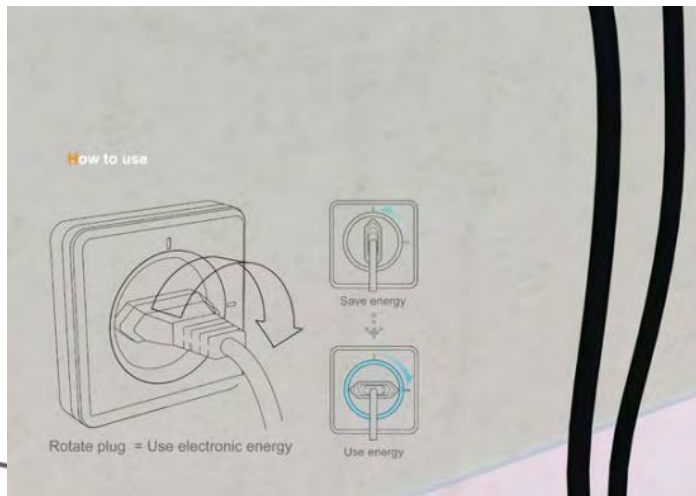
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Energylock™ Power Strip



- ▶ Lockout plug prevents appliances that are not being used from consuming power.
- ▶ Timer-style plug is set to turn off after prescribed time.
- ▶ At set time, plug physically turns the appliance to the off position.
- ▶ Not yet commercially available.



Source: www.ecofriend.org

Self-Powered/Power-Generating Appliances

- ▶ Sony is developing products with dye-sensitized solar cells that can generate needed electricity by themselves.
- ▶ Goal is to reduce GHG emission by over 90% in total life cycle of Sony products.
- ▶ Sony's medium-term goal for fiscal 2015 is to reduce the annual power consumption per each product by 30%, the mass of each product by 10% and the usage of oil-derived virgin plastics by 5% compared to the fiscal 2008 levels of Sony products.
- ▶ Long-term goal is 'zero environmental load' by 2050.

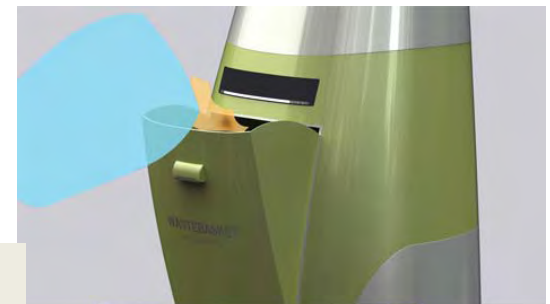


Source: <http://techon.nikkeibp.co.jp/english/>

Garbage-Powered Street Lamps



Source: www.yankodesign.com



- ▶ The 'Gaon' methane-from-garbage-powered streetlight.
- ▶ Pedestrians are welcome to deposit food waste in garbage bins at base of streetlight.
- ▶ Composting of the garbage produces methane gas used by lights.
- ▶ Can you conceive of the problems with such?

Solar Charging Station/Hybrid Electric Bikes

- ▶ Sanyo is installing several solar charging stations in Tokyo for up to 100 electric 'hybrid' bikes.
- ▶ Charging station also illuminates parking lot with LED lights at night (Li-Ion battery storage/plug-in module).
- ▶ Hybrid bikes are available for community use.
- ▶ Hybrid bike uses a dynamotor built into the hub of front wheel to charge battery when peddled or cruising downhill.



Enloop bike



Source: www.sanyo.com


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Water Technologies



The 'Dial' Faucet



Source: www.inhabitat.com

- ▶ Designer Eun Ji Byeon has come up with a new way to conserve [water](#) when washing your hands. Far more thoughtful than those pressure-packed push button faucets, the Dial is a stylish polished metal design that gives a nod to old-school [rotary phones](#). Depending on your water needs, all you have to do is turn the dial to 5, 10, 15 seconds or more to manage the flow, and *tad-dah!* A successful connection to increased eco-consciousness!

Trusted Energy Technology Resources*

- ▶ DOE www.doe.gov
- ▶ E-Source (membership services) www.esource.com
- ▶ Tech-On (Asia) <http://techon.nikkeibp.co.jp/english/>
- ▶ Giz Mag (Emerging Technology Magazine) www.gizmag.com
- ▶ Eco Geek (hard to describe!) www.ecogeek.org/
- ▶ Lighting for Tomorrow www.lightingfortomorrow.org
- ▶ International Energy Agency www.iea.org/efficiency/index.asp
- ▶ Ecofriend www.ecofriend.org
- ▶ Green Launches www.greenlaunches.com
- ▶ Builder www.builderonline.com/
- ▶ Inhabitat Technology www.inhabitat.com/
- ▶ California Energy Commission www.energy.ca.gov
- ▶ California Lighting Technologies Center www.cltc.ucdavis.edu
- ▶ California Emerging Technology Coordinating Council www.etcc-ca.com

*Not a comprehensive list by any means.....