Driving Global Progress on Clean Energy

Secretary Steven Chu
Clean Energy Ministerial
Washington, D.C.
20 July 2010
Represented here today:

- 80% of world energy use
- 4 billion people
- $50 trillion in GDP
Today, we’re announcing significant initiatives in:

- Energy efficiency
- Clean energy
- Energy access

Many countries are taking leadership roles.
Energy efficiency is the “first fuel” of the clean energy revolution

Projected 2030

Source: McKinsey
Today, we’re launching the **Global Energy Efficiency Challenge**

Initiatives in: appliances, buildings, vehicles, and Smart Grid,
Standards stimulate technology: Refrigerator efficiency standards and performance

The role of technological innovation is constantly underestimated in its ability to lower costs.

Best Available Tech. 254 kwh/yr
Refrigerator energy rules to change in 1993

The decision drew quick criticism from the appliance industry, which contends the technology to meet the new standards does not exist and is not likely to by 1993.

“Shell-shocked, that’s how we react,” said Frederick Hallett, vice president of White Consolidated Industries, maker of Philco and other refrigerator brands.

“This is akin to telling the automobile industry it has to have a mileage standard of 50 miles a gallon,” Hallett said, adding that the tougher requirements “will force some refrigerators and freezers off the market” by 1993.

Robert Gants, another official of the association, said, “We are probably going to end up with heavier, bulkier refrigerators.” Prices probably will be higher as well, he said, because of the costs of redesigning the appliances and retooling production lines.

Indeed, according to the association, just redesigning compressors and other parts of the cooling system will add $100 to $120 to the price of a typical refrigerator.

AP; November 28, 1989

(Re: Ozone phaseout)
March 8, 1989
Residential electricity use per person – U.S. and California (kWh/yr)

From 1973 to 2008, the GDP/capita in California has doubled.

Source: EIA
1 “Rosenfeld” of energy savings = 1 medium-sized power plant (500 MW)
The Department of Energy is systematically enforcing appliance standards for the first time

More than 40 DOE attorneys volunteering to work on certification cases

We’ve issued the first:
- test notices,
- subpoenas,
- consent decrees,
- notices of civil penalty,
- notices of noncompliance,
and defeated a court challenge over improper use of the Energy Star logo
**ARPA-E Goal:** Cut cooling energy consumption by 25 – 40%

Novel approaches to cooling, including an absorption-osmosis cooling cycle

Water (Refrigerant) & LiBr (absorbent)
The **Super-efficient Equipment and Appliance Deployment initiative** will help transform the global appliance market.

Cost-effective international appliance efficiency measures could reduce electricity use equal to 1,300 power plants by 2030.

Source: LBNL, July 2010.
Buildings consume 40% of energy in U.S.: A new way of designing and constructing buildings.

- Conceptual Design
- Detailed Design
- Virtual Building integration
- Construction & Installation
- Operation
  - Continuous real-time commissioning

Computer-aided design tools with Embedded Energy Analysis

Computer-controlled operation with Sensors and Controls for Real-Time Optimization

- Oxygen sensor
- Air pressure sensor
- Air temperature sensor
- Engine temp. sensor
- Throttle position sensor
- Knock sensor
LEED ratings are based on design performance, not actual performance (EUI = End Use Intensity). Actual/Design EUI > 1 means performance is worse than design goal. We need ratings based on measured performance.

Mark Frankel, ACEEE (2008)
White roofed buildings:

Sunlight energy is reflected back into space rather than heating up buildings and homes in the summer.

Dallas, Texas

Retrofitting urban roofs and pavements with solar-reflective materials is equal to eliminating carbon emissions from all automobiles for 11 years.

Santorini, Greece
The **Global Superior Energy Performance Partnership** will help large buildings and industrial facilities manage their energy use.

Includes a “Cool Roofs Task Group”

Pilot companies have over $600 billion in annual sales.
Strong light-duty vehicle fuel economy standards in place in many countries through 2015
Energy densities of chemical fuels and the best commercial battery

A rechargeable battery that can last for 5,000 deep discharges and 5x higher storage capacity will electrify personal vehicle transportation

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Mj/kg</th>
<th>Mj/liter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Fat</td>
<td>38</td>
<td>35</td>
</tr>
<tr>
<td>Kerosene, jet fuel</td>
<td>43</td>
<td>32</td>
</tr>
<tr>
<td>Lithium ion battery</td>
<td>0.54</td>
<td>0.9</td>
</tr>
</tbody>
</table>
Question: What does a Boeing 777 have in common with a Bar-tailed Godwit?

Answer: Both can fly non-stop 11,000 km. At take-off, the fuel weighs ~ 50% of their total weight.
IEA: Meeting current national targets could lead to 20 million EVs on the road by 2020

The **Electric Vehicles Initiative** will help countries deliver on their electric vehicle targets
Blackouts have precursors. Phasors would have given grid operators 30-40 minutes warning and prevented 2003 blackout in U.S.

Smart meters give consumers more control over their energy use.

The **International Smart Grid Action Network** will promote seamless global smart grid development.
The Global Energy Efficiency Challenge will save 500 “Rosenfelds”
500 power plants avoided
The Clean Energy Education and Empowerment Women’s Initiative

Leaders from academia, government, & industry committed to empowering women and girls through education and energy

Less than 20% of the professional energy workforce today is comprised of women
We are making announcements today on:

**Clean Energy Supply**

- Renewable Energy
  - Denmark, Germany and Spain

**Energy Access**

- Ethanol for domestic use
  - Brazil

- Solar LEDs
  - United States and Italy

- Carbon capture, use & storage
  - United Kingdom and Australia
I’m pleased to thank the hosts of the next Ministerials

2011: United Arab Emirates

2012: United Kingdom
Earthrise from Apollo 8 (December 24, 1968)

"We came all this way to explore the moon and the most important thing is that we discovered the Earth."

Bill Anders, Apollo 8 Astronaut