Meeting the Energy and Climate Challenge

U.S. Center

15th Conference of the Parties

Copenhagen

14 December, 2009

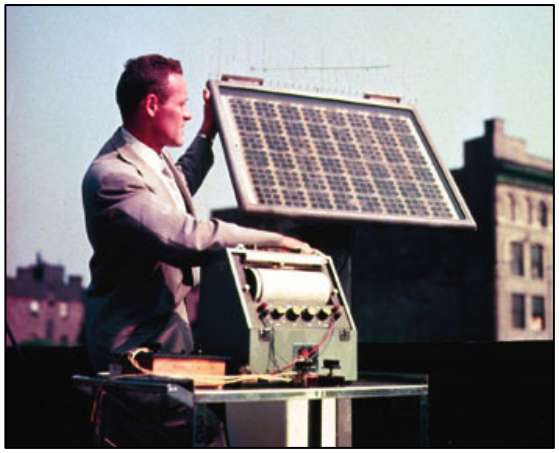
President Barack Obama, United Nations, 23 September 2009

"The danger posed by climate change cannot be denied. Our responsibility to meet it must not be deferred....

"Future generations will look back and wonder why we refused to act; why we failed to pass on an environment that was worthy of our inheritance.

"And that is why the days when America dragged its feet on this issue are over."

American innovations have transformed the world



Bell Labs solar cell - 1954

First transistor

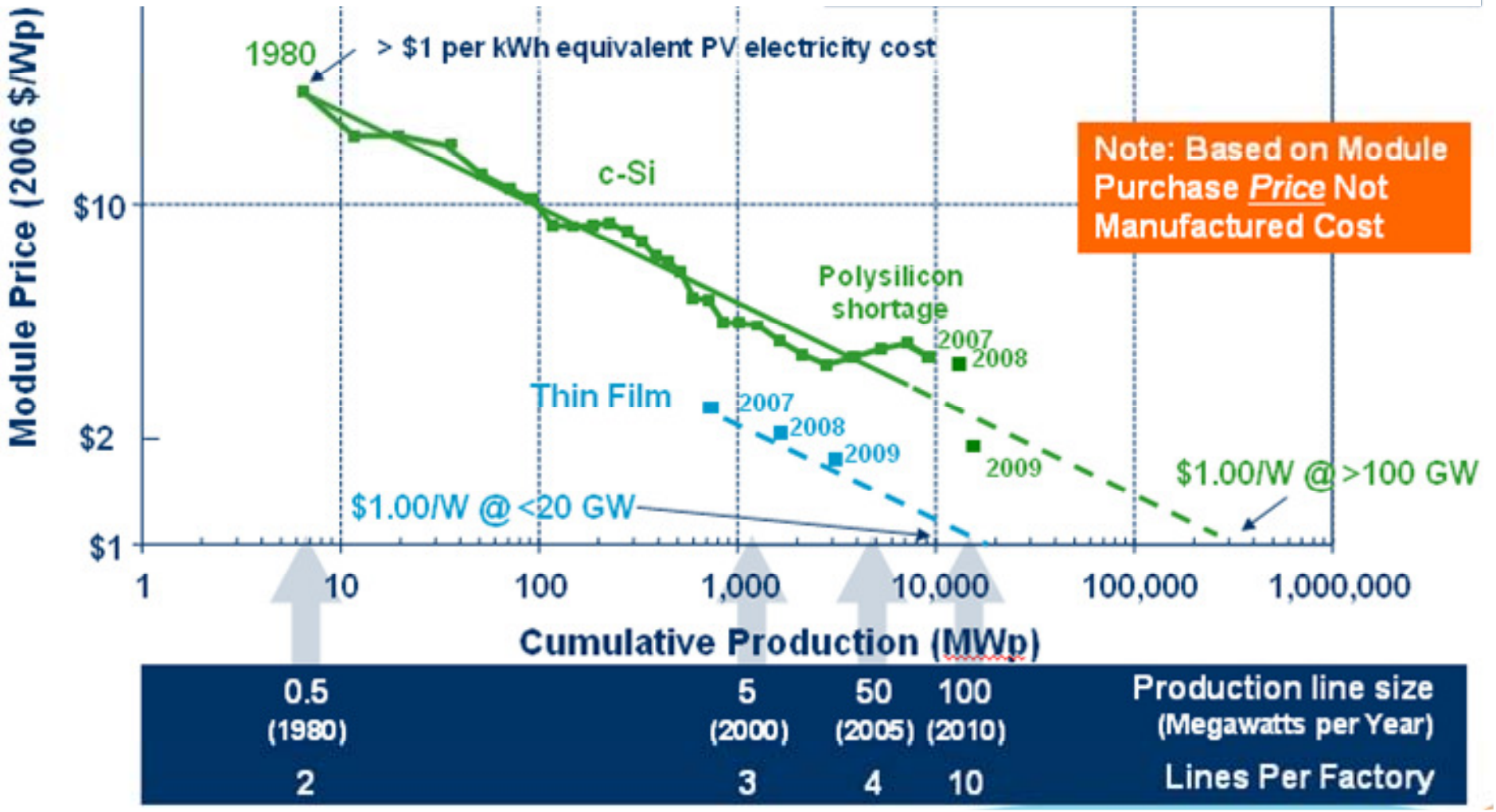
Pentium CPU

Ted Maiman and the first laser - 1961

The Internet

Solar module ***purchase*** costs are expected to go from $2/Wp to **$1/ Wp** within 1-2 years.

Full installed costs are now at $4/ Wp.



The Department of Energy has begun making loan guarantees for the first time since the 1980s

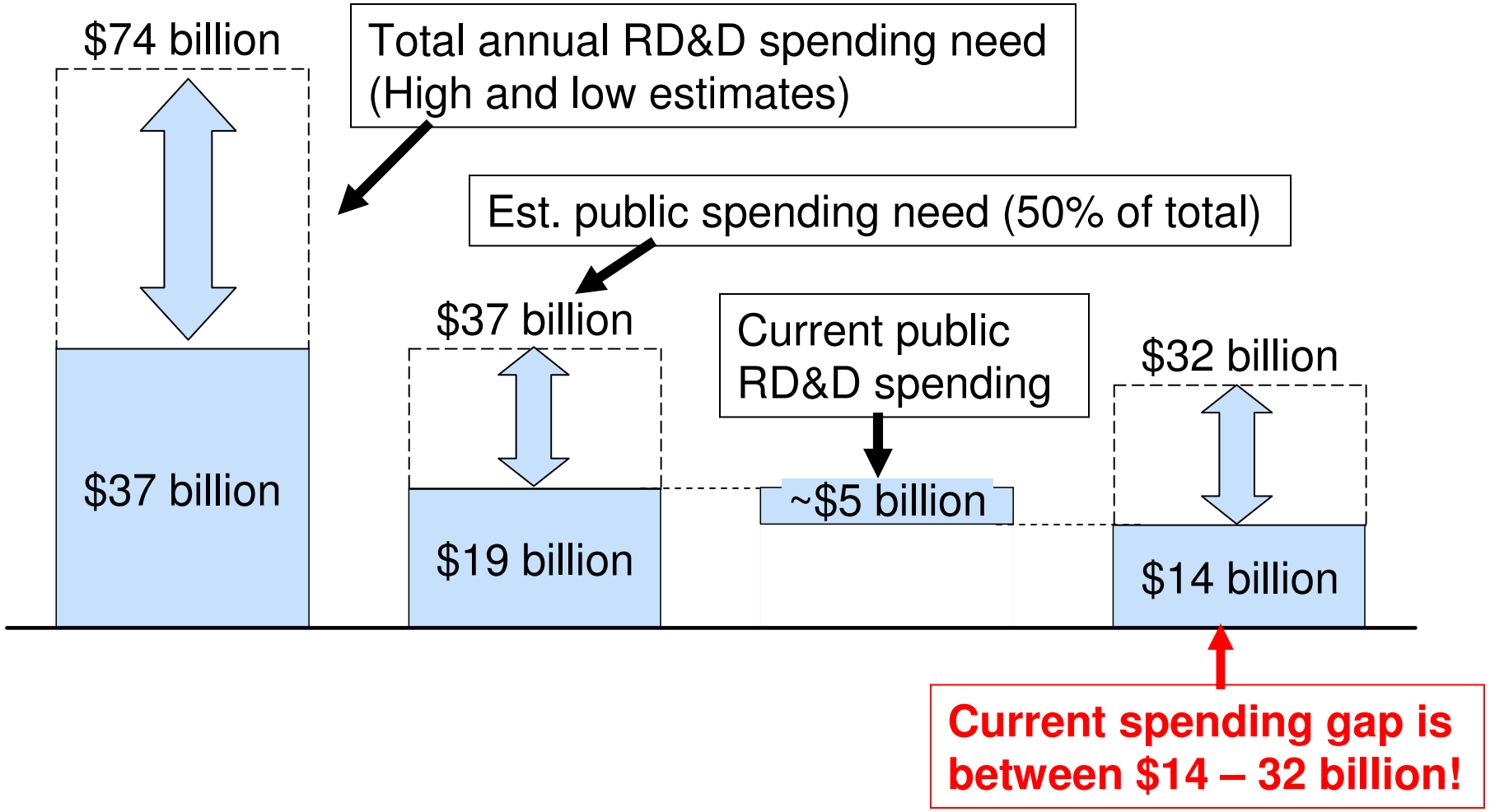
Solyndra Solar Panel

Solyndra 110MW Solar Panel Fab

Fremont, California

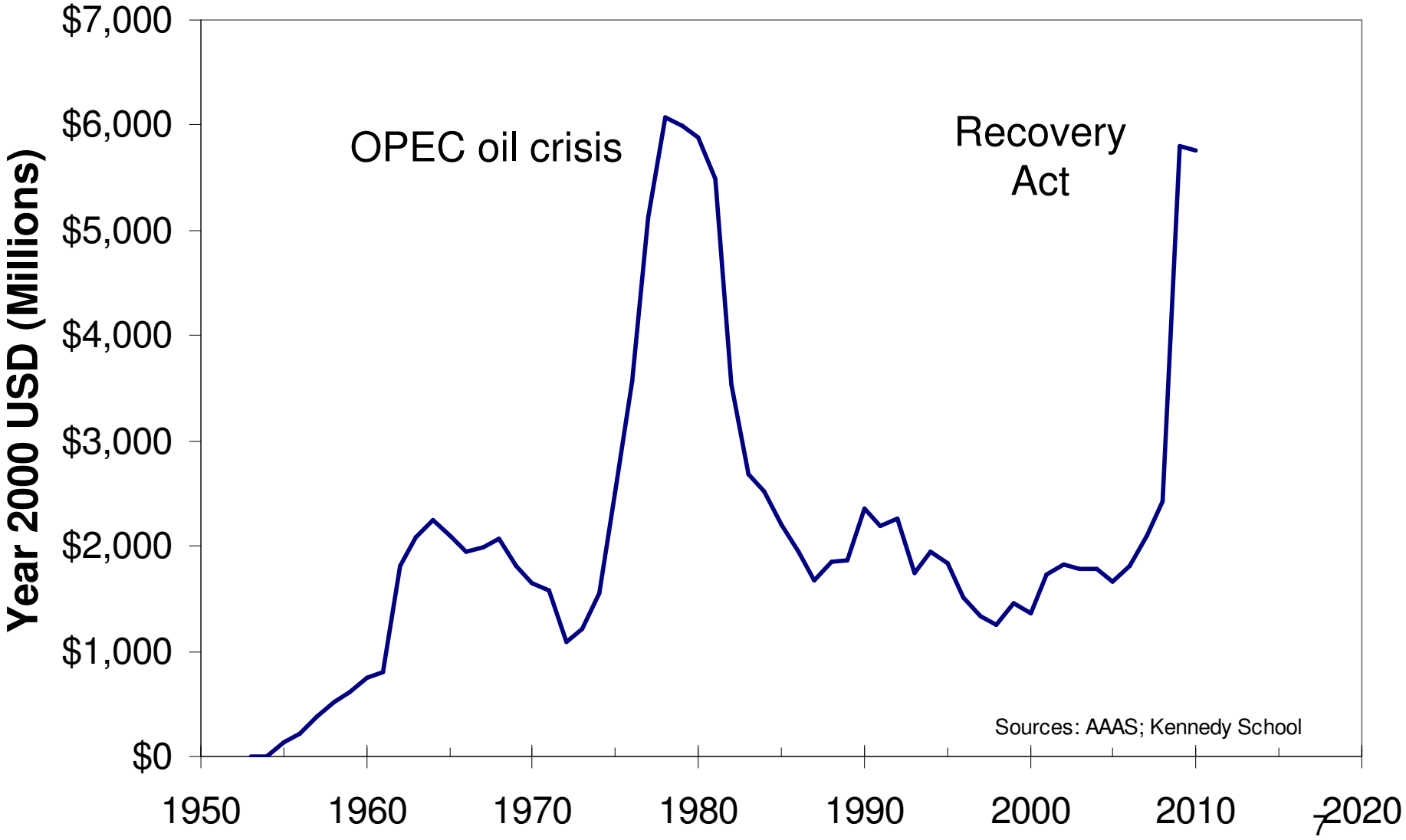
SOLYNDRA

We are working with our partners in the Major Economies Forum to identify and fill the global R&D spending gap



SOURCE: 2009 Global Clean Energy RD&D Gap Analysis by the IEA for the MEF Global Partnership

Total energy RD&D spending by the Department of Energy and predecessor agencies



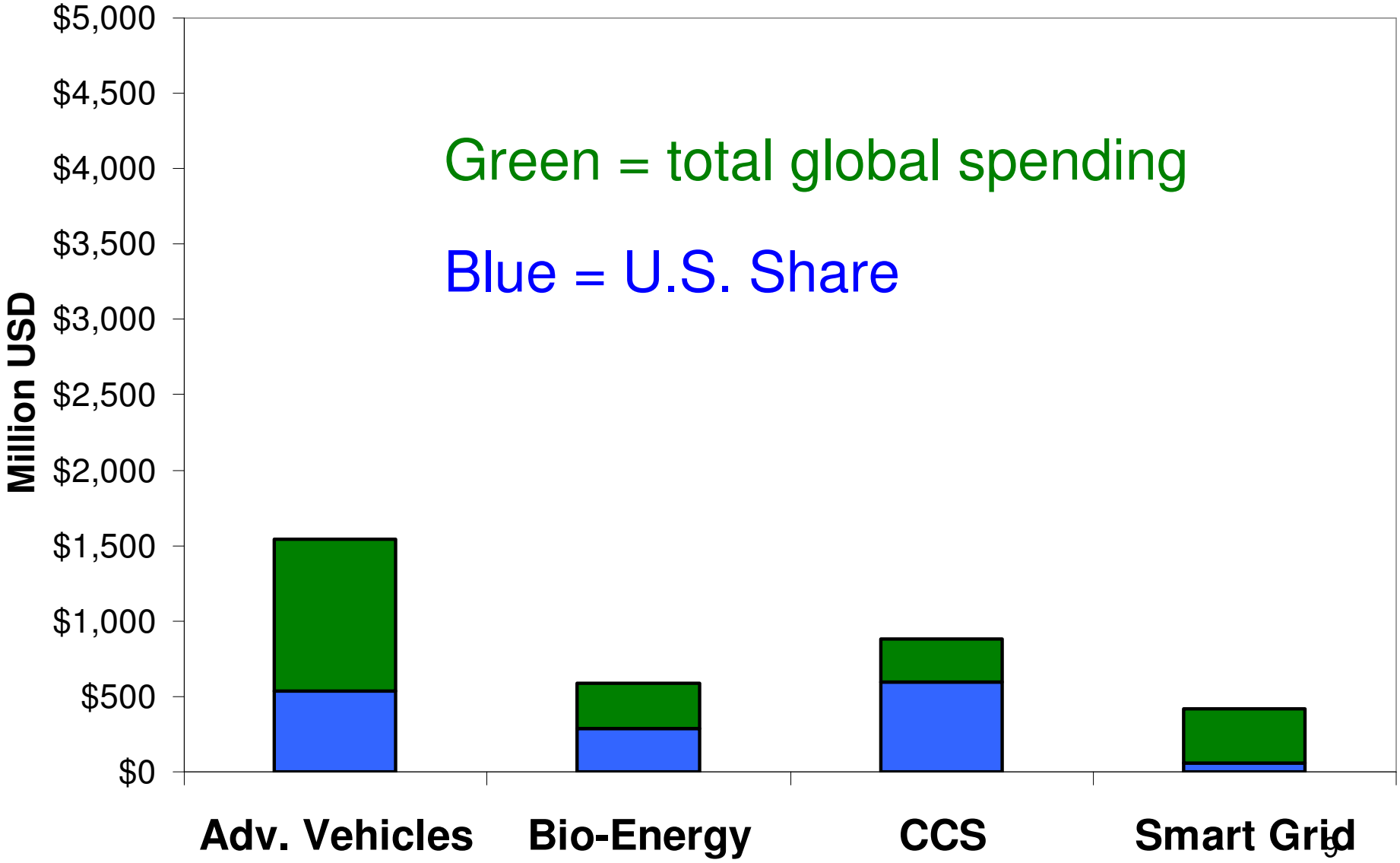
In the U.S. the Recovery Act is making an **$80 B** down payment on a clean energy economy

The Department of Energy's base budget funding for clean energy technologies is ~$3 B

The Recovery Act added:

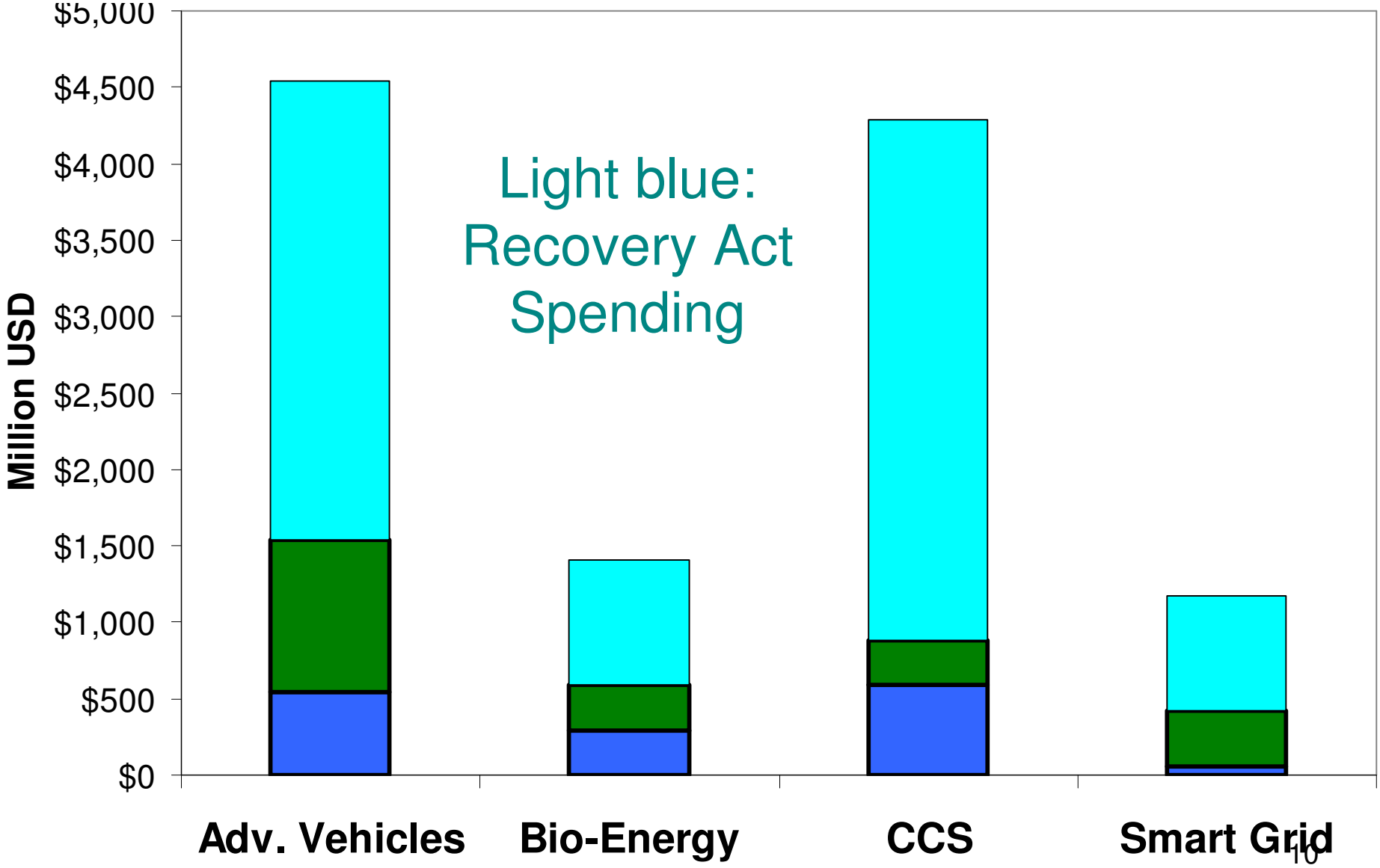
- $2.4 B for advanced batteries and transportation infrastructure,
- $4.5 B for a smarter electrical grid,
- $3.4 B for carbon capture and storage research,
- up to $2.5 B for renewable energy and energy efficiency R&D.

Global Energy RD&D Investments before US Recovery Act



* Recovery Act RD&D funding is estimated.

Recovery Act is making an **$80 B** down payment on a clean energy economy



* Recovery Act RD&D funding is estimated.

The Recovery Act will double U.S. renewable energy generating capacity by 2012

30% tax credit for renewables available when project is placed in service, instead of having to wait for annual tax refunds over ten years.

30% tax credit for major clean energy manufacturing projects

The U.S. is making ambitious investments in the buildings sector that will drive global cost reductions

We're leading the MEF Technology Action Plan on buildings

MAJOR ECONOMIES FORUM
ON ENERGY AND CLIMATE

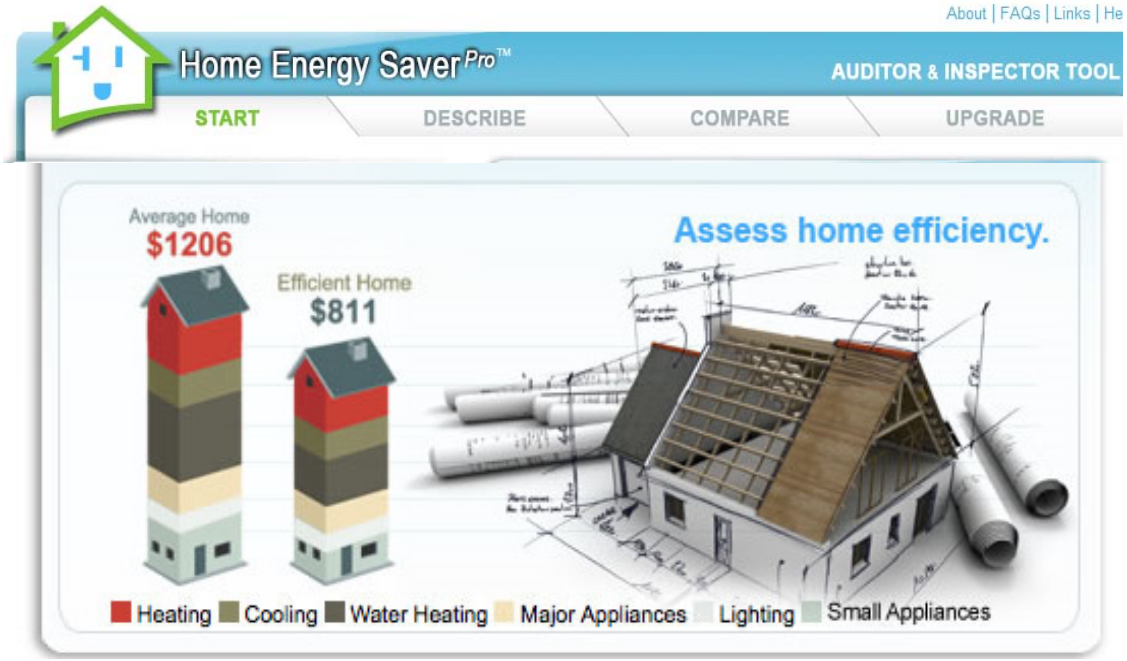
The Recovery Act included ~ $11 billion for building retrofits and local energy efficiency efforts

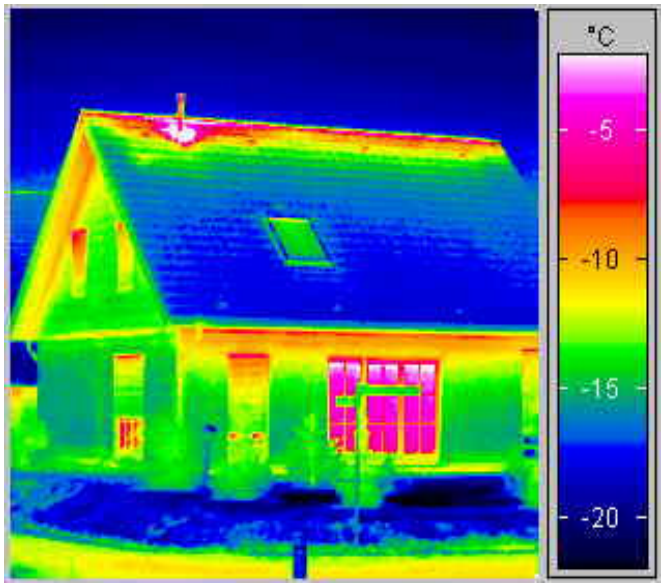
We're investing $336 million for energy efficient building technologies through the Recovery Act

Next year, we're launching an Energy Innovation Hub dedicated to Building Efficiency ($25 M / year)

We're pursuing retrofit solutions to increase convenience and effectiveness and decrease financial barriers.

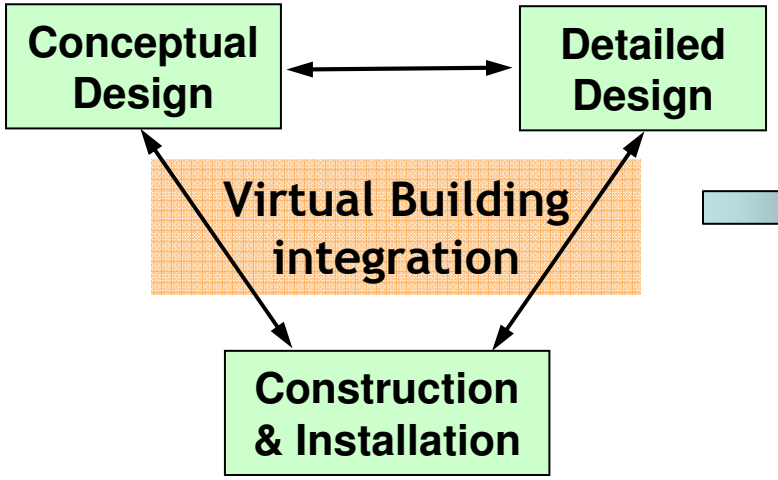
Web-based home **auditing tools for iPhones and PDAs**

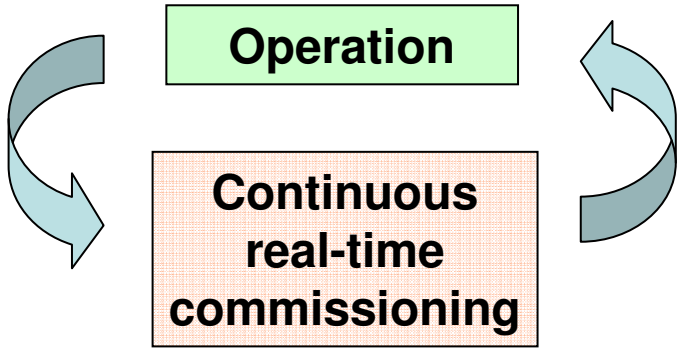




Infrared viewers and other technologies can be used in **post-work audits** that will help insure quality work.

Buildings consume 40% of energy in U.S.: A new way of designing and constructing buildings.

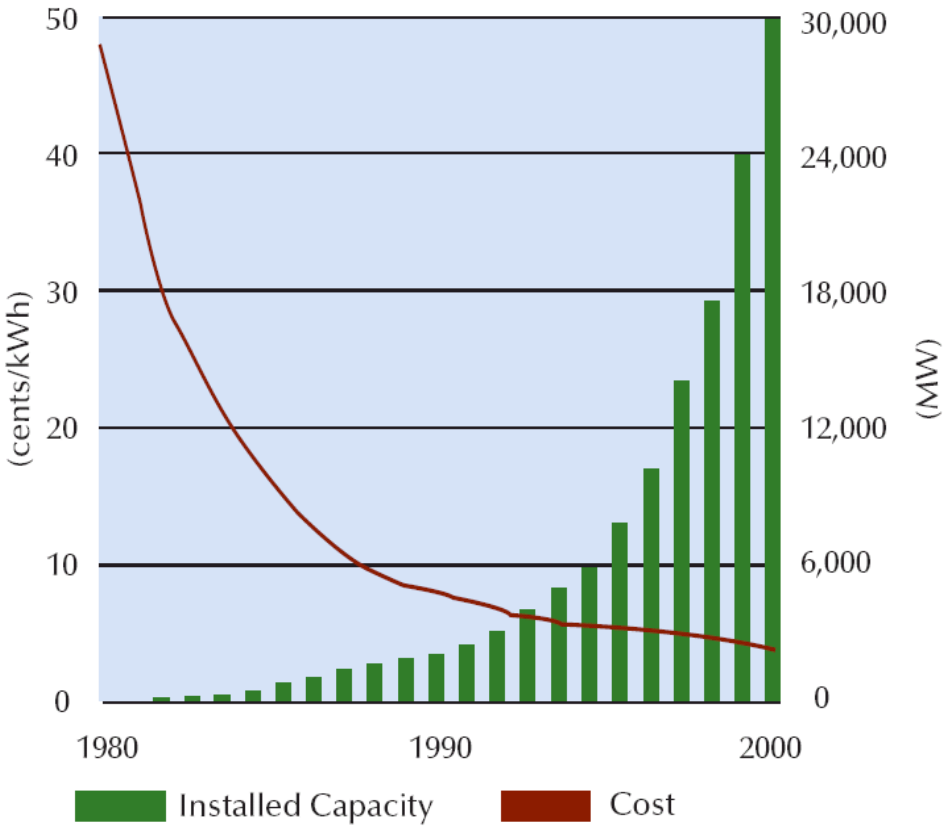




Computer-aided design tools with Embedded Energy Analysis

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



As turbines increase in size and move offshore, long term reliability will become more important:

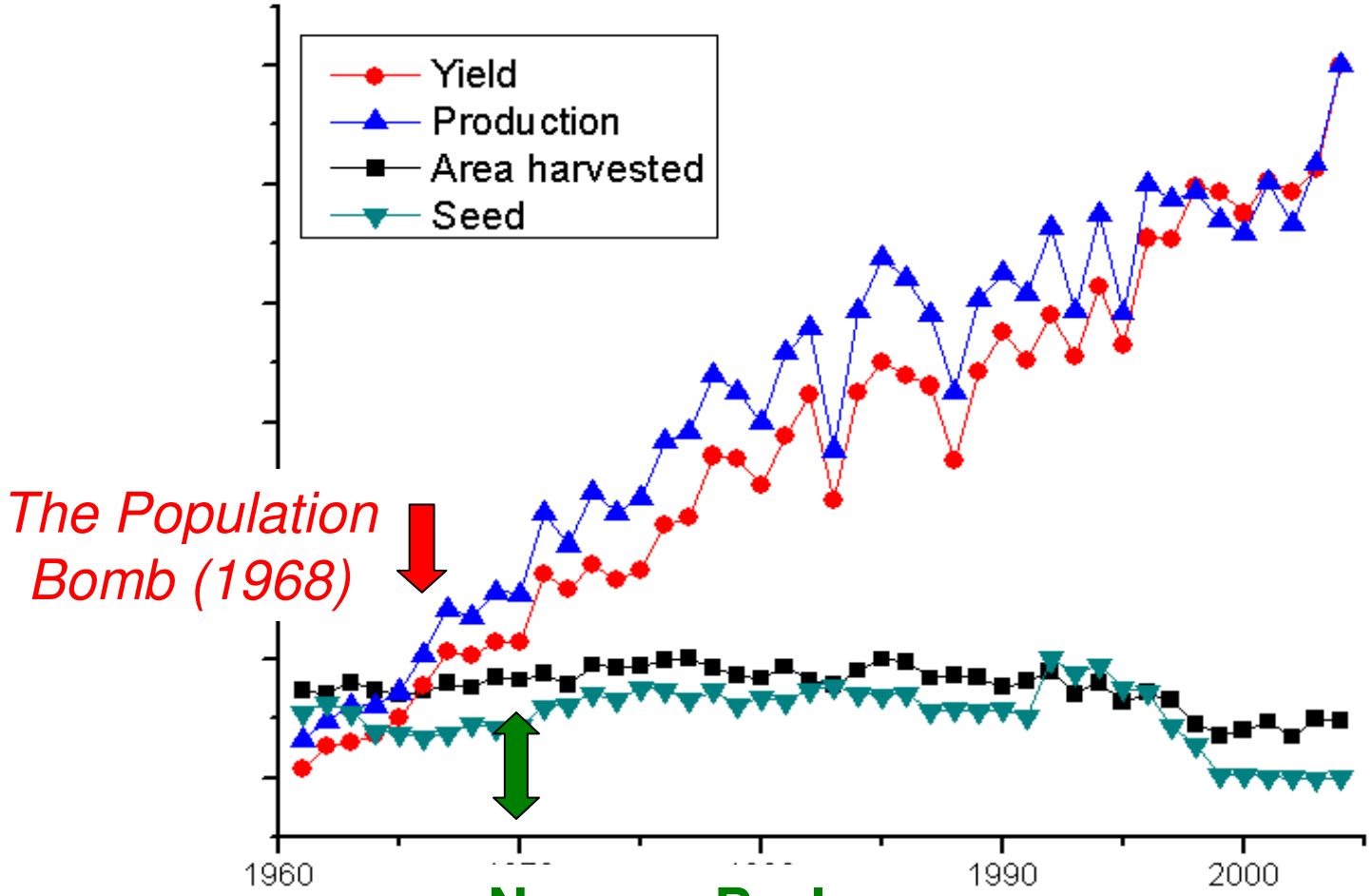
$25 million blade testing facility

$45 million drive train testing facility

Science and Technology have given us solutions in the past.

With the right government policies, we can accelerate the invention and deployment of future solutions.

World Production of Grain (1961 – 2004)



The Population Bomb (1968)

1960: Population = 3 B

Norman Borlaug awarded Nobel Prize

2005: Population = 6.5 B

Source: Food and Agriculture Organization (FAO), United Nations

Advanced Research Projects Agency - Energy

$400 M of grants in the first 2 years for *transformative* energy research

An all-liquid metal battery that could provide extremely low cost, scalable grid-scale energy storage

A compact wind turbine based on mature jet engine technologies

A new type of battery inspired by the enormous electrical energy used in aluminum production

convert this…

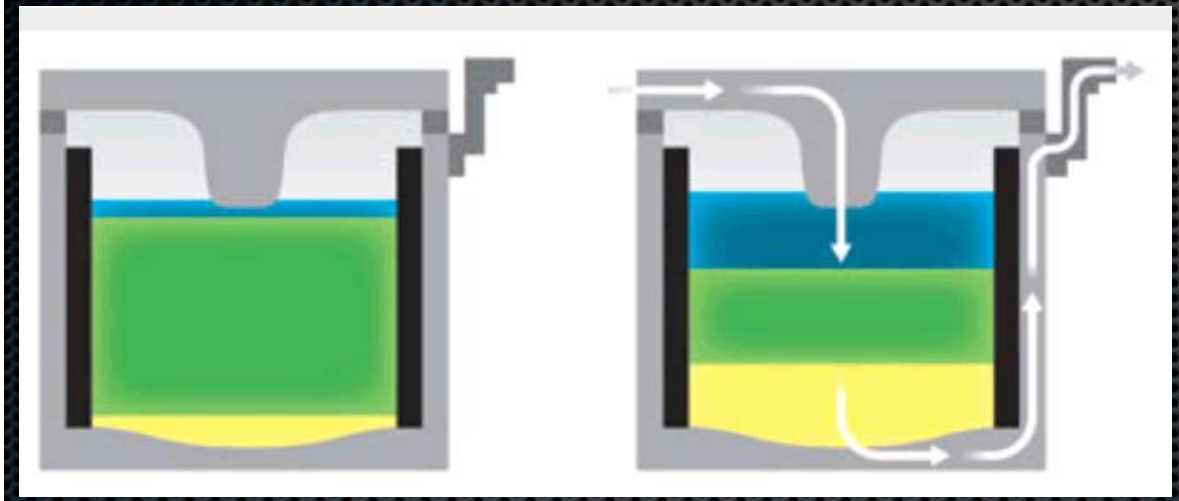
aluminum potline

500,000 A, 4 V

…into this?

Battery Charging mode

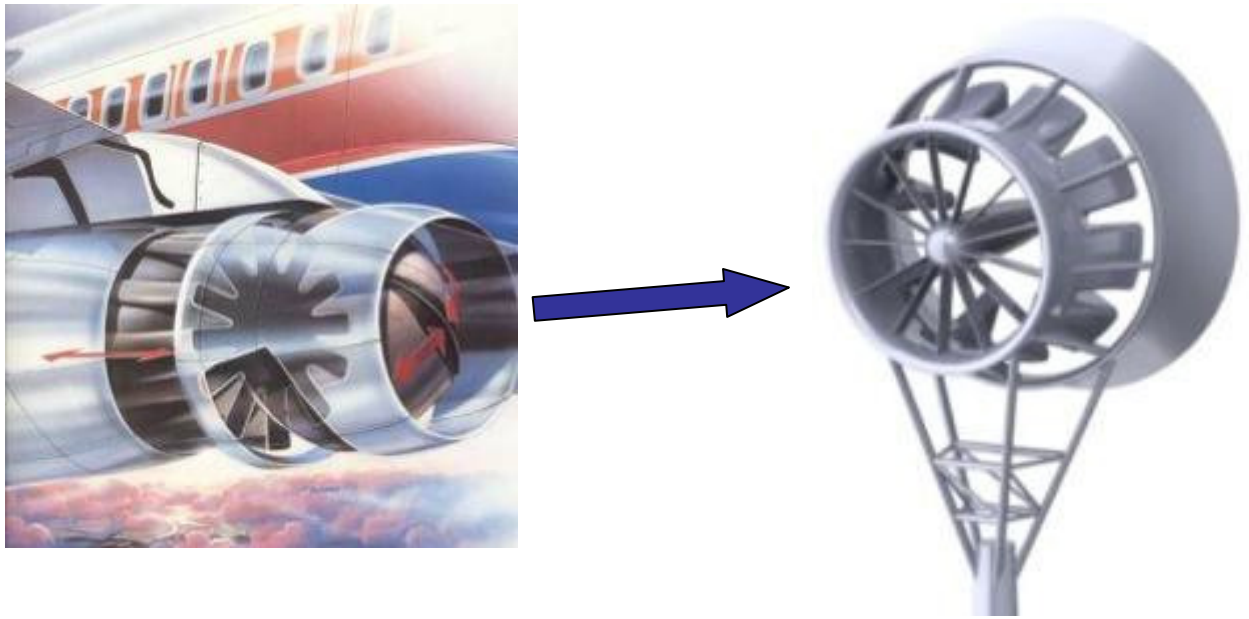
Electricity is used to convert dissolved metal salts (green) into magnesium (Mg) and antimony (Sb) metal ions.



Discharge mode

Mg (blue) and Sb (yellow) ions return to dissolved salts.

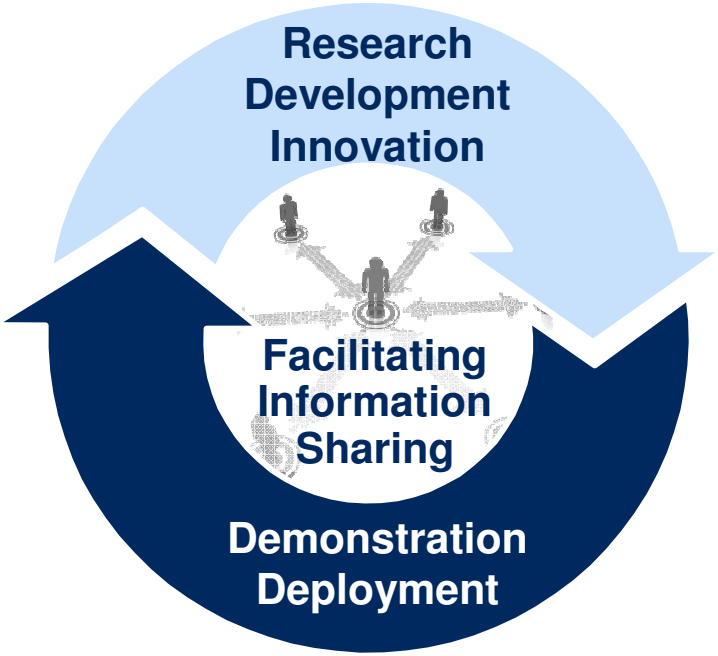
Leveraging mature jet engine technologies to create the next generation of compact wind turbines



Operational benefits: high efficiency, smaller footprint, and superior containment for rotating propellers

Efficient, compact turbines would bring wind power to many more environments

The U.S. is coordinating globally to drive innovation:



We're working through the Major Economies Forum Global Partnership

We're pursuing collaborations with China, India, the Americas, and many other countries

We're focusing on innovative technologies that are critical to the developing world to promote the building of an clean and energy efficient infrastructure

Today, we're announcing Climate REDI

(Renewables and Efficiency Deployment Initiative)

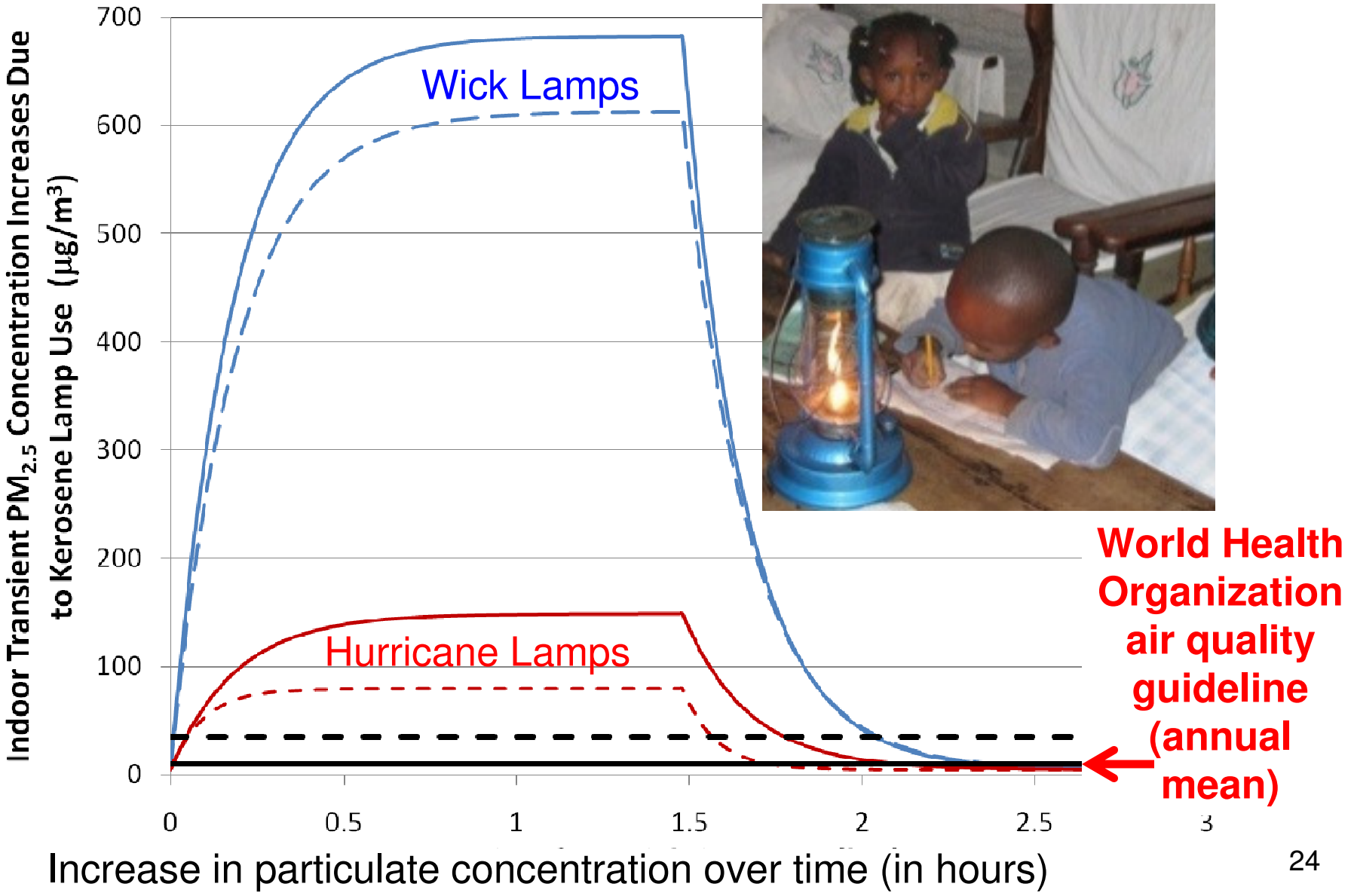
A more than $350 million initiative

The U.S. will contribute at least $85 million

It includes:

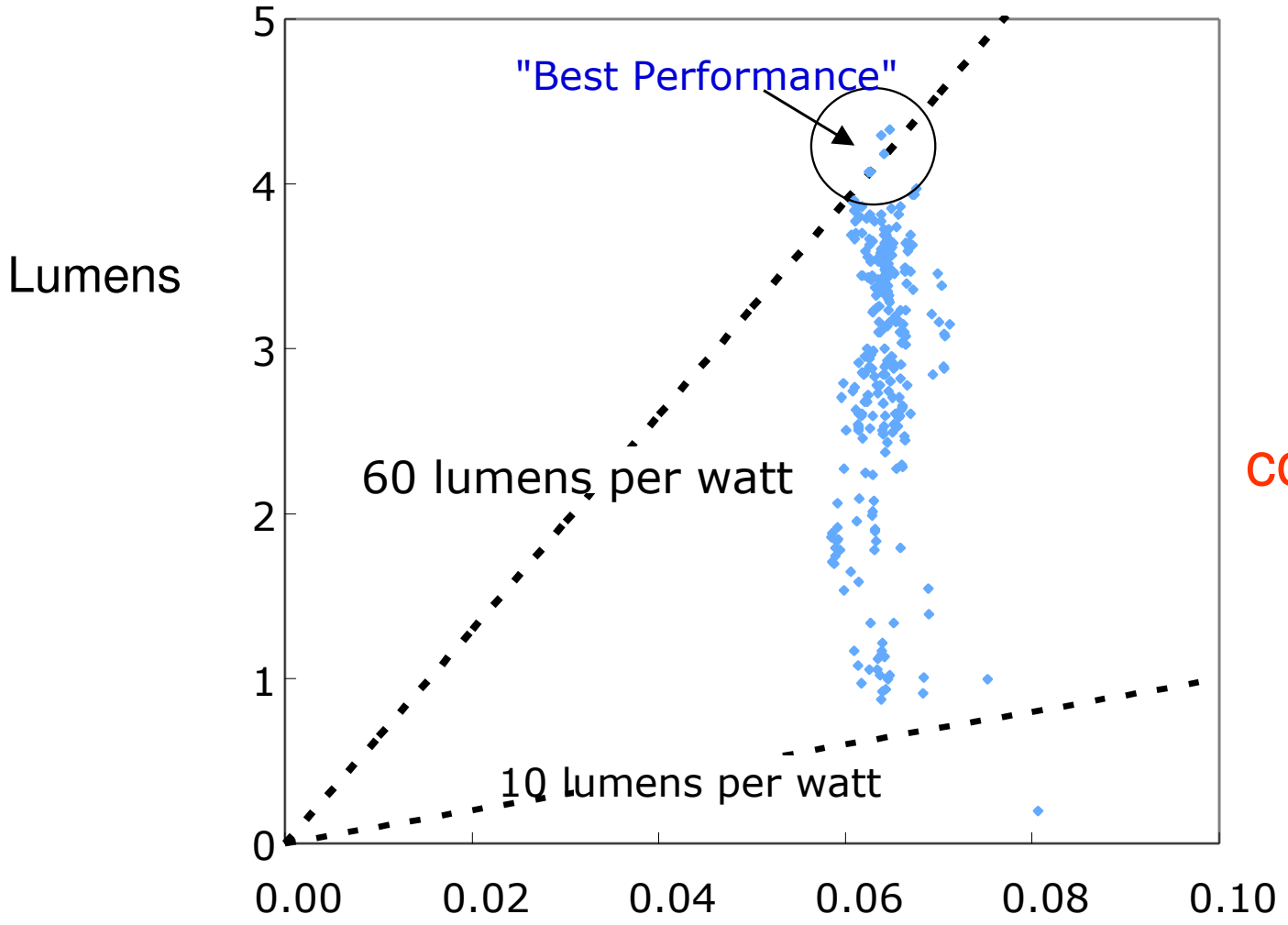
- Solar and LED Access Program (SLED)

Indoor air pollution estimated to cause 1.6 million deaths worldwide each year



(Poppendieck *et. al*. 2009)

The quality of LEDs used in off-grid lighting products varies widely

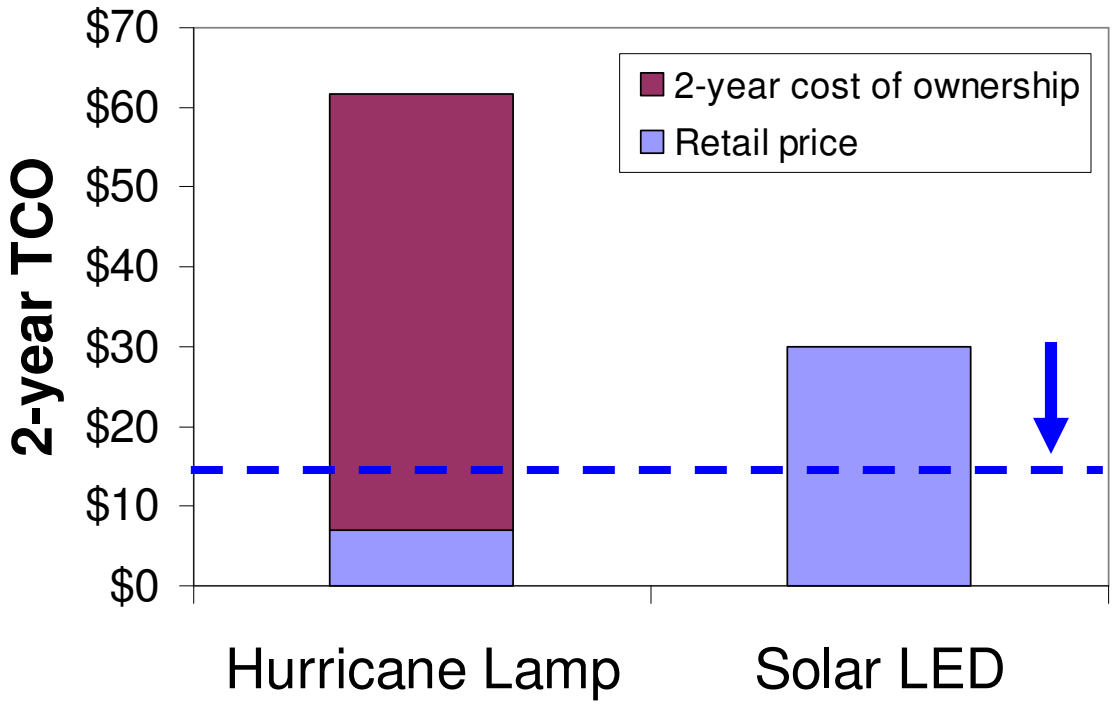


A quality assurance program is needed to protect consumers and prevent "market spoiling."

Mills, E. and A. Jacobson. 2007. "The Need for Independent Quality and Performance Testing for Emerging Off-grid White-LED Illumination Systems for Developing Countries," *Light & Engineering*, 16(2):5-24

LED systems must be ***affordable***, not just cost effective

LED lighting systems have lower operating costs, and interest is high. But buyers are <u>very</u> price sensitive.



Research indicates that retail price point for rapid uptake is $10 - $20/system.

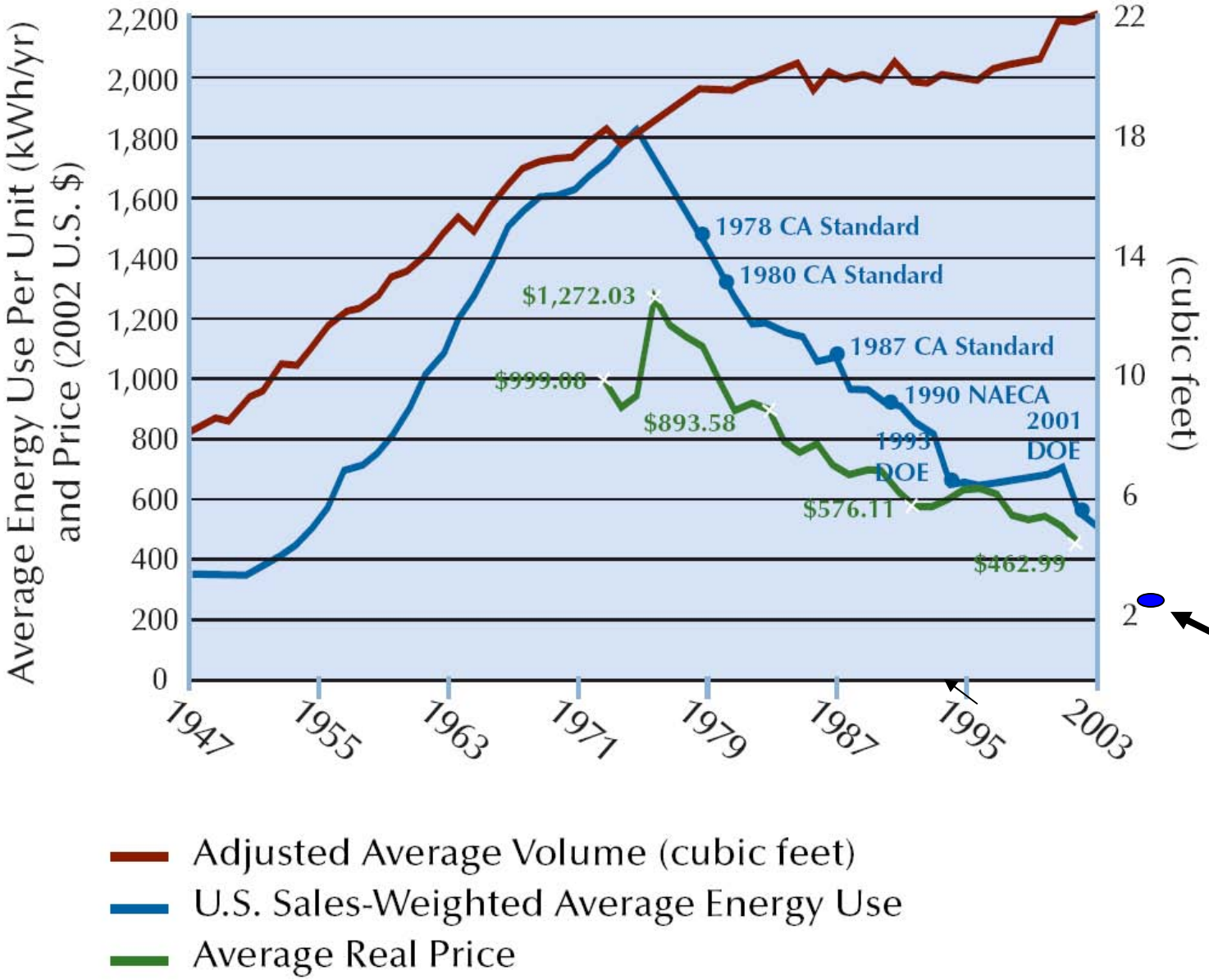
Sources: Radecsky, et al., (2008), Lumina Product Report #3 (http://light.lbl.gov)
Lighting Africa market research, 2009 (http://www.lightingafrica.org)

Today, we're announcing Climate REDI

(Renewables and Efficiency Deployment Initiative)

- Solar and LED Access Program
- Super-efficient Equipment and Appliances Deployment (SEAD)

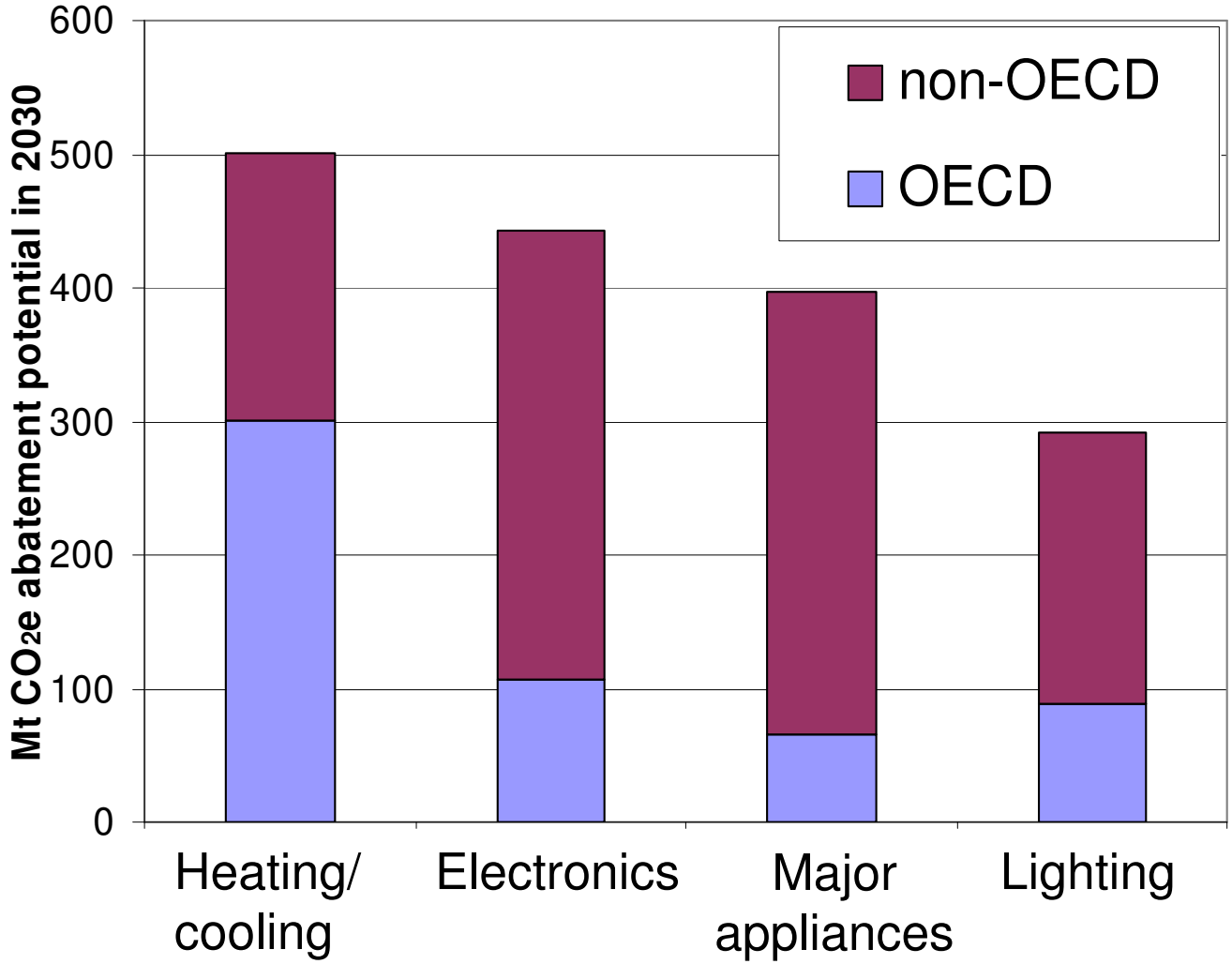
Standards stimulate technology: Refrigerator efficiency standards and performance



Energy savings is greater than ***all*** of US renewable energy generation

Best Available Tech. 254 kwh/yr

More than 1.6 Gt CO_2e annual abatement potential in 2030 from improved efficiency standards and labeling



A five-year global program that reached *all* new refrigerators in the world could result in lifetime CO_2 emissions reductions of about 1.1 Gt

Source: LBNL, November 2008

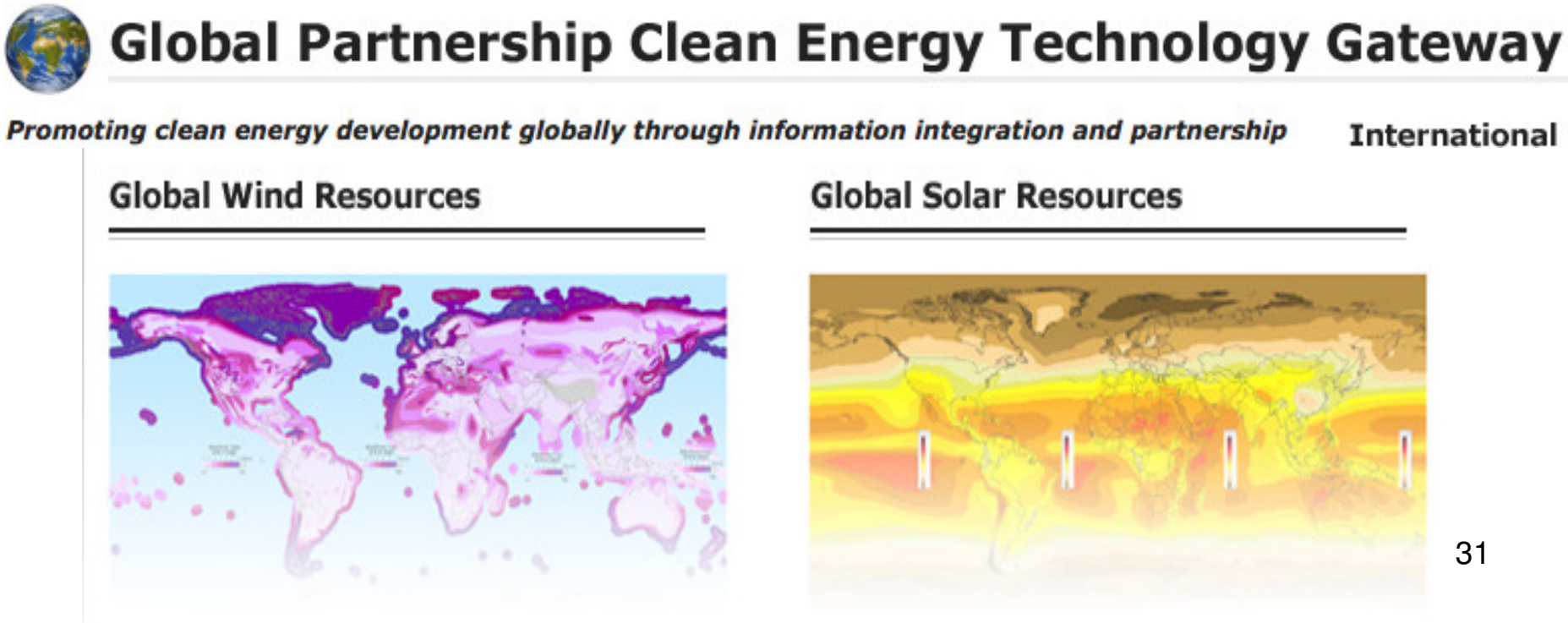
Today, we're announcing Climate REDI

(Renewables and Efficiency Deployment Initiative)

- Solar and LED Access Program (SLED)
- Super-efficient Equipment and Appliances Deployment (SEAD)
- Clean Energy Information Platform (CEIP)

Clean Energy Information Platform (CIEP)

- Open-architecture gateway to clean energy knowledge resources, such as resource maps and training tools.
- Self-reported mapping of deployment hotspots.
- Best practices policy dialog.



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(Renewables and Efficiency Deployment Initiative)

- Solar and LED Access Program (SLED)
- Super-efficient Equipment and Appliances Deployment (SEAD)
- Clean Energy Information Platform (CEIP)
- Scaling-up Renewable Energy Program (SREP)

Scaling-up Renewable Energy Program (SREP)

- Renewable energy investments, including solar, wind, bioenergy, and geothermal, as well as small hydropower
- Technical assistance and capacity building

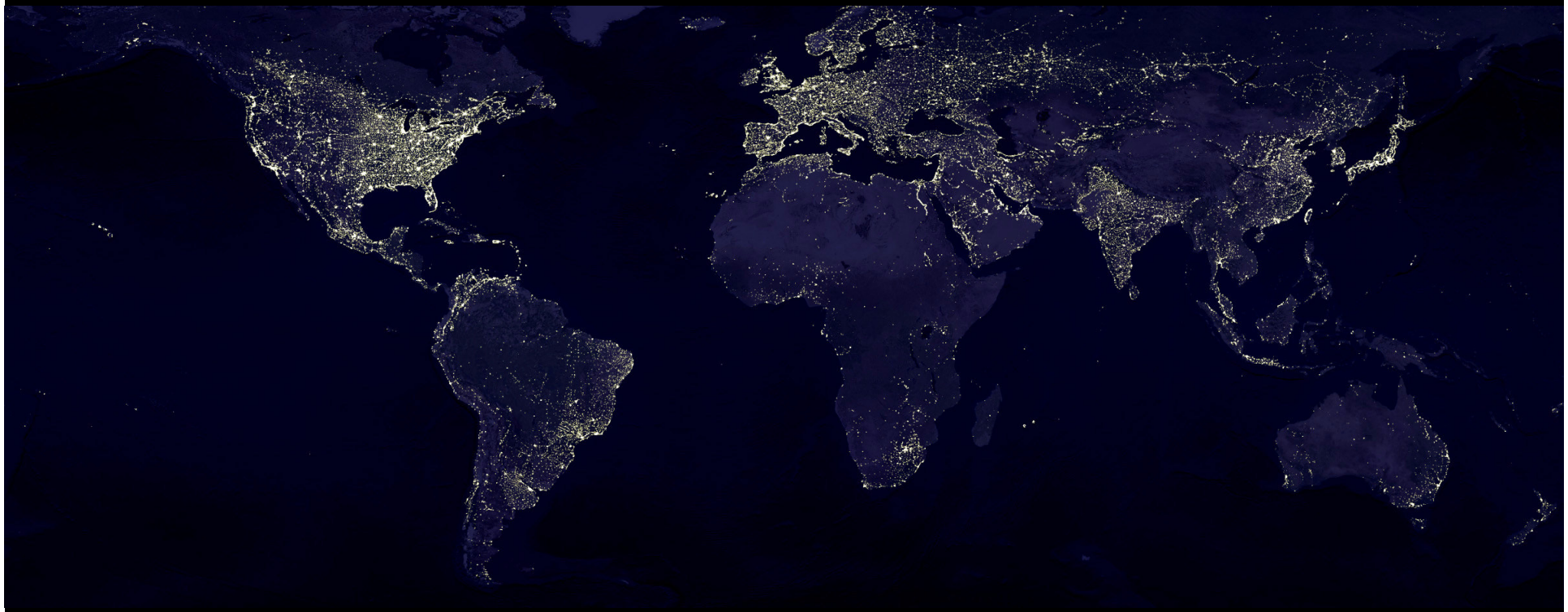
The U.S. will contribute **$50 million** – building on approximately $200 million already pledged by other countries; sufficient to launch the fund in 2010

Today, we're announcing a 2010 clean energy ministerial in Washington, D.C.

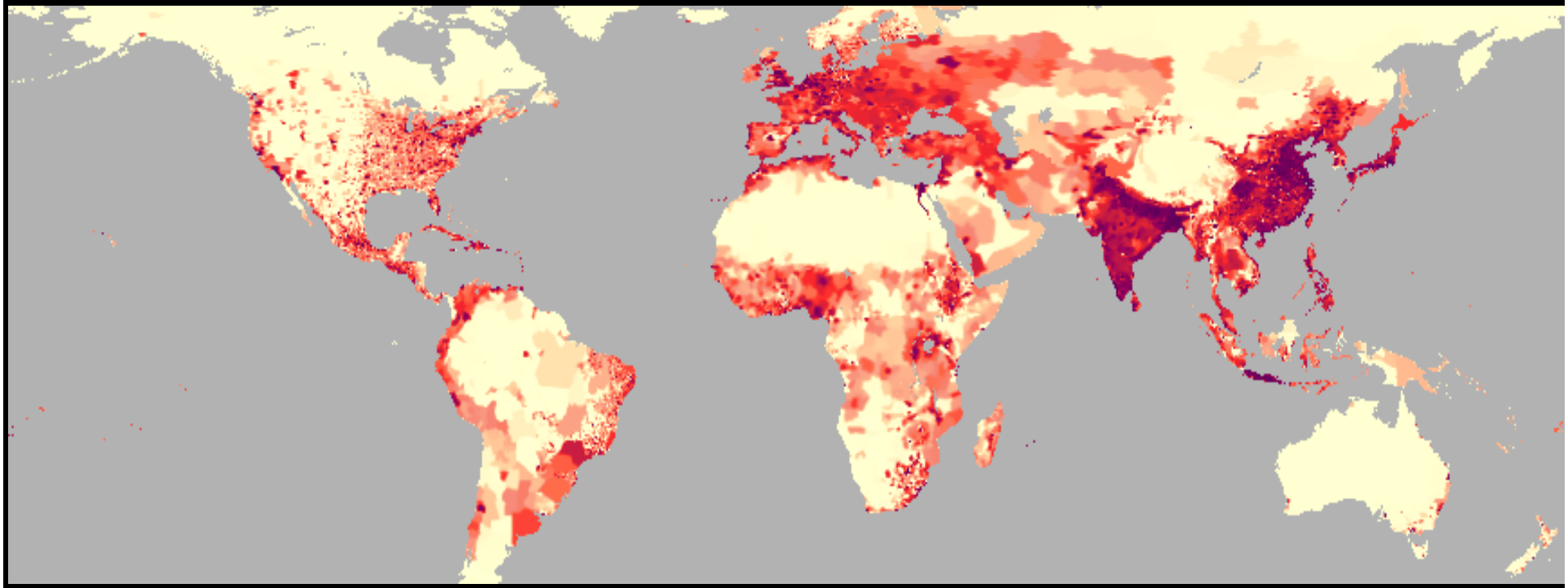
…to accelerate clean energy development and deployment worldwide.

Countries in the MEF and other interested countries are encouraged to participate.

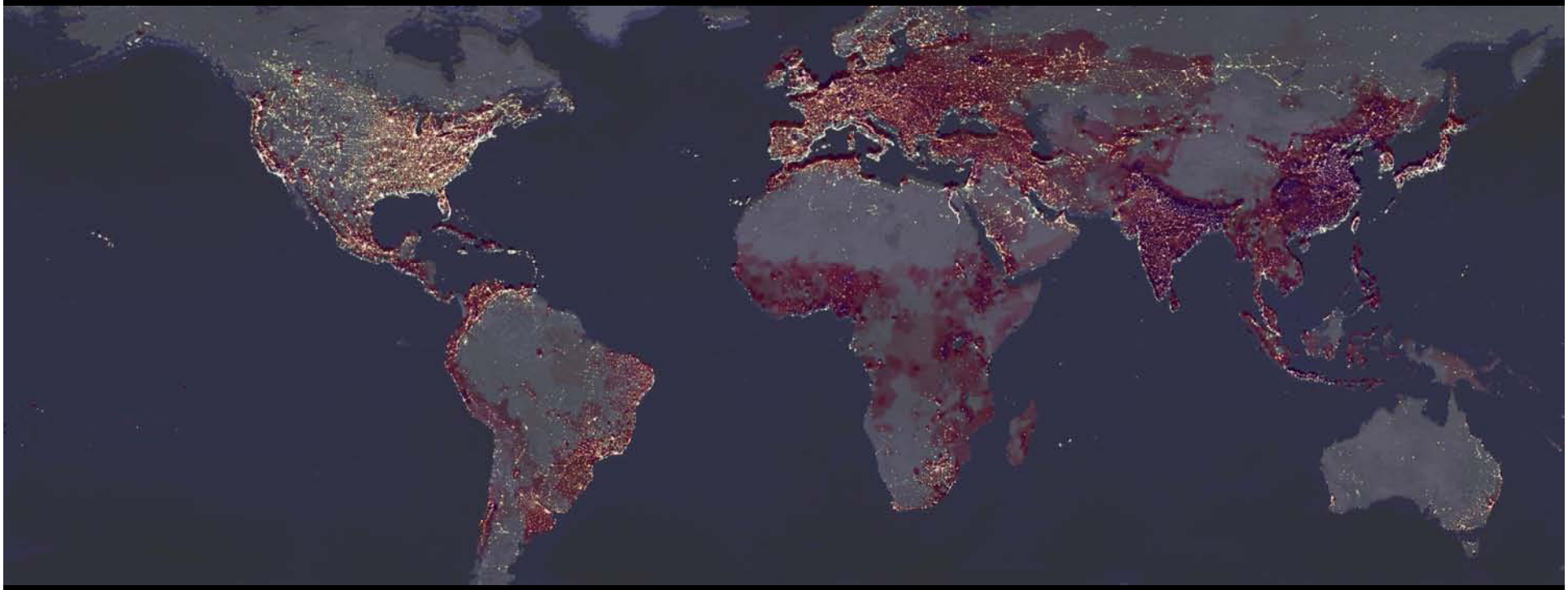
Where the world uses the most electricity…



Where the most people live.

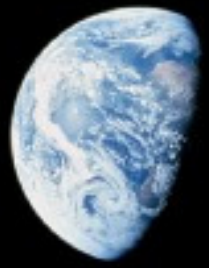


We can help turn on the lights where people live…



…***and*** solve the climate challenge at the same time.

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

On December 10, 1950, William Faulkner spoke at the 1950 Nobel Prize Banquet in Stockholm:

"I believe that man will not merely endure: he will prevail. He is immortal … because he has a soul, a spirit capable of compassion and sacrifice and endurance."

With these virtues, the world will prevail over this great energy challenge .

Martin Luther King (1967):

"….We are now faced with the fact, my friends, that tomorrow is today. We are confronted with the ***fierce urgency of now***. In this unfolding conundrum of life and history, there is such a thing as being too late."