

XXV: policy and regulatory  
responses to the energy-climate  
problem



# review

- there is widespread agreement that stabilization of the atmospheric CO<sub>2</sub> concentration at any “safe” level requires reduction (and then stabilization) of C emissions
- despite this understanding, and the known urgency of the climate change problem, there has been little meaningful policy or regulatory response
- delay in policy response is symptom of weak leadership on the issue and a widely held public view that tackling the climate change problem will hurt the economy
- MIT’s John Sterman argues that this has led public to “wait and see” approach to climate change problem
- Sterman argues that this is only reasonable if there are small delays between understanding, policy actions, emissions reductions, and CO<sub>2</sub> and climate responses, and that damage is reversible
- the public needs to understand that none of this is true
- a number of economically viable emissions abatement options are available (given as “abatement cost curves”)
- the US can reduce its emissions substantially via (largely cost-saving) efficiency measures alone
- this is a leadership opportunity

# outline

- consequences of EPA finding
- US climate/energy legislation
  - Safe Climate Act HR 1590 (new draft 4/09)
  - industry stance (USCAP)
  - challenges
- regional (multi-state) response
- international response
  - Kyoto Protocol (and successor treaty)
  - Major Emitter Group

- 
- recommendations (i.e. biased view of a climate scientist)
  - FCQs

# recent GHG news?

- EPA proposes to find GHGs in the atmosphere endanger the public health and welfare of current and future generations
- GHGs at unprecedented levels and are very likely the cause of observed temperature change and other climatic changes
- effects observed to date and projected to occur in the future include- more frequent and more intense heat waves, more wildfires, more heavy downpours and flooding, increased drought, greater sea level rise, more intense storms, harm to water resources, harm to agriculture, and harm to wildlife and ecosystems- are effects on public health and welfare within the meaning of the Clean Air Act
- the proposed finding is specifically with respect to six GHGs- CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs, PFCs, and SF<sub>6</sub>
- proposing to find that combined emissions of several of these gases from new motor vehicles are contributing to these gases in atmosphere, contributing to pollution and endangering public health

April 24, 2009 at <http://epa.gov/climatechange/endangerment.html>

## EPA finding: consequences

- such broad regulatory authority will not be welcomed (and will spur many law suits) so legislative response is very likely
- i.e. finding forces Congress' hand

## climate legislation

- “dead letter” since 2007 (when a variety of bills were drafted)
  - election cycle
  - war
  - economy
  - public opinion
- EPA finding will lead to resurrection of some bills
  - analysis

# dead bills of 2007

## A Comparison of Federal Global Warming Legislation of the 110th Congress

The Bill	Global Warming Pollution Reduction Act	Safe Climate Act	Global Warming Reduction Act	Climate Stewardship Act	Climate Stewardship and Innovation Act	Electric Utility Cap and Trade Act	Bingaman Proposal
<b>Sponsor(s)</b>	Sanders-Boxer (S. 309)	Waxman (H.R. 1590)	Kerry-Snowe (S. 485)	Olver-Gilchrest (H.R. 620)	Lieberman-McCain (S. 280)	Feinstein (S. 317)	Bingaman
<b>Introduced</b>	January 2007	March 2007	February 2007	January 2007	January 2007	January 2007	Not introduced— as analyzed by EIA <sup>4</sup>
<b>Sectors Covered</b>	Multi-sector	Multi-sector	Multi-sector	Multi-sector	Multi-sector	Electric sector	Multi-sector
<b>Emission Targets<sup>5</sup></b>	Start date: 2010 Declining cap: emissions decrease 14% by 2020, 83% by 2050	Start date: 2010 Declining cap: emissions decrease 14% by 2020, 83% by 2050	Start date: 2010 Declining cap: emissions decrease 14% by 2020, 67% by 2050	Start date: 2012 Declining cap: emissions decrease 14% by 2020, 76% by 2050	Start date: 2012 Declining cap: emissions decrease 14% by 2020, 65% by 2050	Start date: 2011 Declining cap: emissions decrease 8% by 2020, 42% (unless adjusted by EPA) by 2050	Start date: 2012 Emission intensity reduction <sup>6</sup> (starting at 2.6%/yr increasing to 3%/yr in 2022): emissions <i>increase</i> 14% by 2020, 39% by 2050

(proposed reductions/ increases are w.r.t. 2004 emissions)

# dead bills of '08....

A Comparison of Select Multi-sector Federal Global Warming Bills of the 110th Congress						
The Bill	Global Warming Pollution Reduction Act	Safe Climate Act	Lieberman-Warner Climate Security Act	Climate Stewardship Act	Climate Stewardship and Innovation Act	Low Carbon Economy Act
Sponsor(s)	Sanders-Boxer (S. 309)	Waxman (H.R. 1590)	Lieberman-Warner (S. 2191)	Olver-Gilchrest (H.R. 620)	Lieberman-McCain (S. 280)	Bingaman-Specter (S. 1766)
Percent of U.S. emissions covered <sup>4</sup>	100%	100%	86%	74%	74%	86%
Emission Targets <sup>4</sup> (reductions in total U.S. emissions compared to 2005 levels)	2010-2050 Declining cap: emissions decrease 14% by 2020, 83% by 2050	2010-2050 Declining cap: emissions decrease 14% by 2020, 83% by 2050	2012-2050 Declining cap: emissions decrease 18 to 25% by 2020, 62 to 66% by 2050	2012-2050 Declining cap: emissions decrease 11% by 2020, 56% by 2050	2012-2050 Declining cap: emissions decrease 13% by 2020, 50% by 2050	2012-2030 Cap: 6% <i>above</i> <sup>5</sup> to 4% below by 2020, 11% <i>above</i> <sup>5</sup> to 20% below by 2030

*revived for '09*

draft legislation at:

[http://energycommerce.house.gov/Press\\_111/20090331/acesa\\_discussiondraft.pdf](http://energycommerce.house.gov/Press_111/20090331/acesa_discussiondraft.pdf)



# H.R. 1590, analysis

## targets and offsets

### 2020 Near-term Targets:

✓ At least 30% below 2005 levels (19% below 1990 levels), 17% of which is from the cap and the rest from avoided deforestation abroad and standards outside the cap, and via offsets.

### 2050 Long-term Targets:

83% below 2005 levels (80% below 1990 levels) within the cap alone.

### Emission Offsets vs. Direct Funding of Emission Reductions

✓ The bill allows very high levels of global warming emission offsets by polluters – 2 billion tons annually – which is around 27% of annual emissions in the U.S. What that means is that there could be no domestic global warming emissions reductions from fossil fuels for at least a decade.

## auctions

The bill draft intentionally does not yet specify whether or not the carbon pollution emission permits will be auctioned. This uncertainty is not entirely discouraging, as it leaves room for it to become 100% auction to ensure that there is a price paid for pollution and that taxpayer monies are not used to clean up after polluters.

## coal

Relies on eventual performance standards for new plants.

✓ Between 2009 and 2015, there is nothing in this current bill draft other than an economy-wide cap and a 2025 retrofit date to prevent dirty new coal plants from being built.

✓ After 2015, new coal plants must sequester at least 50% of their global warming pollution, and 60% after 2020.

✓ Since public funding for new plants with CCS (a.k.a. “clean coal”) technology is not contingent on a high CCS performance, the bill could end up funneling public money into large dirty energy projects. And more funding is distributed to better-performing large-scale plants, but there’s no guarantee that what public money is funding is actually better than existing forms of energy infrastructure.

analysis of 1sky.org

# H.R. 1590, analysis

## transition investments

- ✓ A section for domestic consumer assistance is included but currently lacks specifics.
- ✓ The bill must position the U.S. as a leader in the international climate negotiations coming up in December. For that to happen, it is critical that the bill allocate funds to help vulnerable communities adapt to climate change, protect tropical forests, and export clean energy technology worldwide.

## energy

- ✓ Better appliance standards and building codes.
- ✓ Smart grid funding.
- ✓ Transportation standards and funding, including strengthened Low Carbon Fuel Standard (LCFS) funds for electric vehicles and auto industry retooling, and mandates for new transportation plans and funds for infrastructure projects in major metropolitan areas.
- ✓ National Renewable Energy Standard (RES), including 25% renewable by 2025 with up to 5% from efficiency upgrades.
- ✓ National Energy Efficiency Resource Standard (EERS), including 15% electricity savings by 2020 and 10% natural gas savings by 2020.

analysis of [1sky.org](http://1sky.org)

# Tradeable Carbon Permit Auctions

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## How and why to auction not grandfather

### Abstract

An auction of carbon permits is the best way to achieve carbon caps set by international negotiation to limit global climate change. To minimize administrative costs, permits would be required at the level of oil refineries, natural gas pipe lines, liquid sellers, and coal processing plants. To maximize liquidity in secondary markets, permits would be fully tradable and bankable. The government would conduct quarterly auctions. A standard ascending-clock auction in which price is gradually raised until there is no excess demand would provide reliable price discovery. An auction is preferred to grandfathering (giving companies permits based on historical output or emissions), because it allows reduced tax distortions, provides more flexibility in distribution of costs, provides greater incentives for innovation, and reduces the need for politically contentious arguments over the allocation of rents.

# industry action



"We are committed to a pathway that will slow, stop and reverse the growth of U.S. emissions while expanding the U.S. economy."

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### Welcome to the U.S. Climate Action Partnership (USCAP) Web Site

United States Climate Action Partnership (USCAP) is a [group of businesses and leading environmental organizations](#) that have come together to call on the federal government to quickly enact strong national legislation to require significant reductions of greenhouse gas emissions. USCAP has issued a [landmark set of principles and recommendations](#) to underscore the urgent need for a policy framework on climate change. [More >](#)

**USCAP Members Include:**

- [Alcoa](#)
- [Boston Scientific Corporation](#)
- [BP America Inc.](#)
- [Caterpillar Inc.](#)
- [Chrysler LLC](#)
- [ConocoPhillips](#)
- [Deere & Company](#)
- [The Dow Chemical Company](#)
- [Duke Energy](#)
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- [Environmental Defense Fund](#)
- [Exelon Corporation](#)
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- [FPL Group, Inc.](#)
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- [General Motors Corp.](#)
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- [Marsh, Inc.](#)
- [Natural Resources Defense Council](#)
- [The Nature Conservancy](#)
- [NRG Energy, Inc.](#)
- [PepsiCo](#)
- [Pew Center on Global Climate Change](#)
- [PG&E Corporation](#)
- [PNM Resources](#)
- [Rio Tinto](#)
- [Shell](#)
- [Siemens Corporation](#)
- [World Resources Institute](#)
- [Xerox Corporation](#)

### Our Proposal: A Blueprint for Legislative Action

Our consensus report, titled [A Blueprint for Legislative Action](#), is a detailed framework for legislation to address climate change. It is a direct response to federal policymakers who recognize, as we do, that well-crafted legislation can spur innovation in new technologies, help create jobs and provide a foundation for a vibrant, low-carbon economy.



- [Summary Overview: A Blueprint for Legislation Action](#)
- [Full Report: A Blueprint for Legislative Action](#)
- [Press Release](#)
- [Blueprint Issue Briefs](#)



### What's New

April 22, 2009 [USCAP Tells Congressional Panel That Clarity on Climate Policy Will Spur Economic Investment](#)

March 31, 2009 [USCAP Statement on release of the Waxman-Markey Climate Discussion Draft](#)

March 20, 2009 [USCAP Statement on Obama Budget](#)

February 25, 2009 [USCAP Response to President Obama's Address to a Joint Session of Congress.](#)

February 20, 2009 [USCAP Response to Rep. Dingell on Comparing Blueprint to Dingell-Boucher Discussion Draft](#)

February 3, 2009 [USCAP Statement on Sen. Barbara Boxer's Climate Legislation Principles](#)

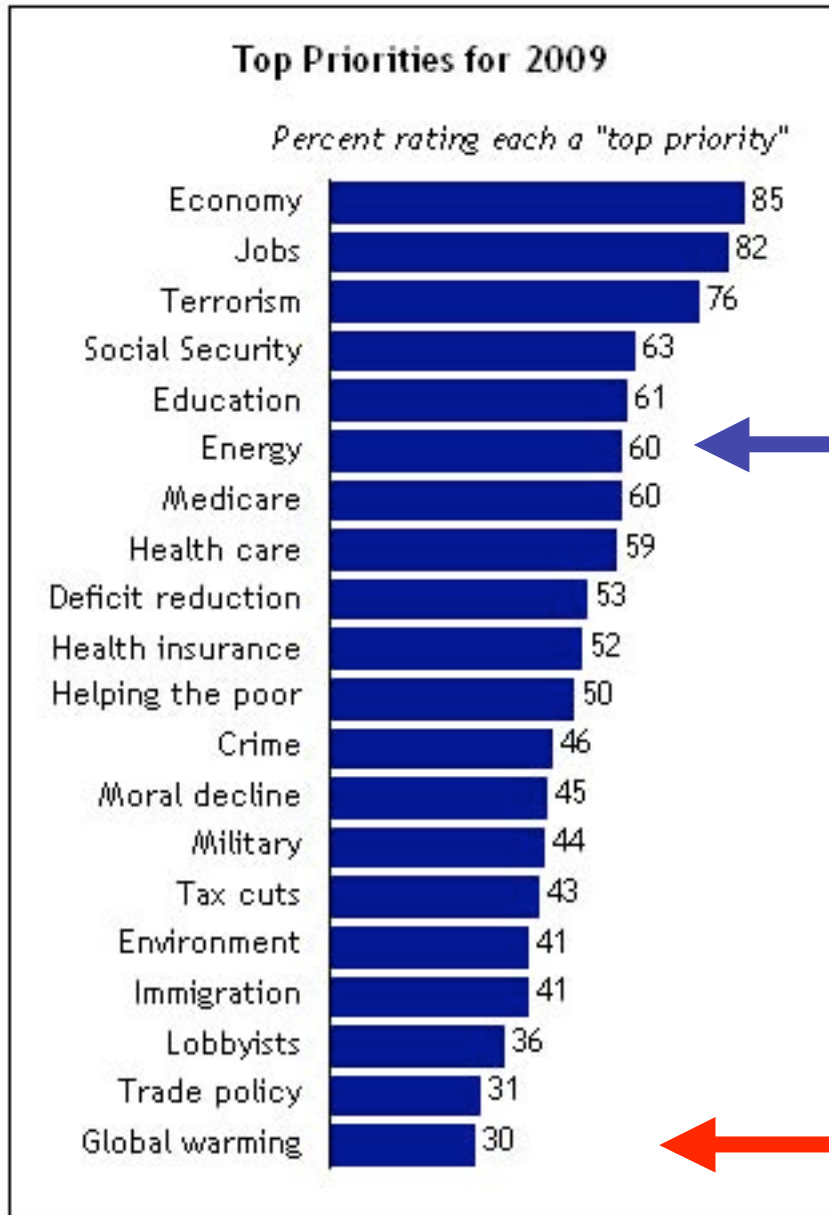
February 3, 2009 [Letter to Sen. Bob Corker regarding USCAP's views on its Blueprint for Legislative Action.](#)

January 29, 2009 [Interview with E&E TV on Blueprint for Legislative Action with Nikki Roy and Melissa Lavinson](#)

January 15, 2009 [Business and Environmental Leaders Release Landmark Blueprint for Climate Protection Legislation](#)

formed 2007  
<http://www.us-cap.org/>

# public opinion



challenge re.  
legislative  
action

fell by 5-6% since  
last year

## regional/state response

- lacking federal leadership, states and regional coalitions began acting on own beginning (generally) in 2007

# northeastern states



## Regional Greenhouse Gas Initiative

An Initiative of the Northeast & Mid-Atlantic States of the U.S.

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[Stakeholder Process](#)

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### Latest News on RGGI

- > [Maryland Joins RGGI - 4/20/2007](#)
- > [Staff Working Group Report Evaluating Potential Emissions Leakage - 3/16/2007](#)
- > [Massachusetts and Rhode Island Join RGGI - 2/7/2007](#)
- > [States Release Model Rule - 8/15/2006](#)
- > [States Release Draft RGGI Model Rule for Comment - 3/23/2006](#)
- > [States Announce RGGI Agreement - 12/20/2005](#)
- > [Staff Working Group Package Proposal - 8/24/2005 \(Pdf Format\)](#)
- > [Staff Working Group Recommendations at a Glance - 8/24/2005 \(Pdf Format\)](#)



The Regional Greenhouse Gas Initiative, or RGGI, is a cooperative effort by Northeastern and Mid-Atlantic states to reduce carbon dioxide emissions – a greenhouse gas that causes global warming. Climate change is expected to raise sea level, change precipitation and impact other local climate conditions. Changing regional climate could alter forests, crop yields, and water supplies. It could also affect human health, animals, and many types of ecosystems.

To address this important environmental issue, the RGGI participating states will be developing a regional strategy for controlling emissions. This strategy will more effectively control greenhouse gases, which are not bound by state or national borders. Central to this initiative is the implementation of a multi-state cap-and-trade program with a market-based emissions trading system. The proposed program will require electric power generators in participating states to reduce carbon dioxide emissions.

To learn more about RGGI, access the links to the left.

<http://www.rggi.org/>

# Regional Greenhouse Gas Initiative

an initiative of the Northeast and Mid-Atlantic States of the U.S.

[RGGI Inc](#)

[About RGGI](#)

[Participating States](#)

[Emissions and Allowance Tracking](#)

[CO<sub>2</sub> Auctions](#)

[Offsets](#)

[News](#)

[Welcome](#)

## Upcoming Auctions

CO<sub>2</sub> Allowance Auction  
4-2009

June 17, 2009

CO<sub>2</sub> Allowance Auction  
4-2012

June 17, 2009

CO<sub>2</sub> Allowance Auction 5  
September 09, 2009

[Auctions RSS Feed](#) 

## Welcome

The Regional Greenhouse Gas Initiative (RGGI) is the first mandatory, market-based effort in the United States to reduce greenhouse gas emissions. Ten Northeastern and Mid-Atlantic states will cap and then reduce CO<sub>2</sub> emissions from the power sector 10% by 2018.

States will sell emission allowances through auctions and invest proceeds in consumer benefits: energy efficiency, renewable energy, and other clean energy technologies. RGGI will spur innovation in the clean energy economy and create green jobs in each state.

This website provides a portal for official user platforms, state applications, and materials for participants in RGGI, as well as current information about the status of RGGI auctions and state rules.

## [RGGI Update](#)

RGGI States Receive  
Climate Protection  
Award from U.S. EPA

[News Release](#)

## [Market Monitor](#)

Please follow the link  
below to review reports  
by RGGI, Inc.'s  
independent market  
monitor.

[Market Monitor  
Reports](#)

Countdown to Auction  
4-2012 June 17, 2009:



[Media Room](#)



[Key Documents](#)



[Auction  
Materials](#)



[RGGI Inc.](#)

RGGI Inc. is a nonprofit corporation created to provide technical and administrative services to the Regional Greenhouse Gas Initiative CO<sub>2</sub> budget trading programs of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island and Vermont.



# California



## Key Links

- [Governor's Issues Page On Energy & Environment](#)
- [Governor's Issues Page on Low Carbon Fuel Standard](#)
- [Governor's Issues Page on Water](#)
- [Executive Orders & Legislation](#)

## Related Links

- [CAT State Agencies Greenhouse Gas Report Card \(PDF file\)](#)

## California Climate Change Policy & Programs

Scientific evidence shows that global temperatures are likely to increase during this century. Continued global warming caused by rising levels of greenhouse gas emissions in the atmosphere will have significant and widespread impacts on California's economy and the environment.

To respond to the challenge of climate change, Governor Schwarzenegger and the State Legislature passed the [California Global Warming Solutions Act of 2006 \(Assembly Bill 32 - Núñez\)](#). The Act caps California's greenhouse gas emissions at 1990 levels by 2020. By 2050, the Governor has established a goal of reducing emissions to 80 percent below 1990 emission levels in 2050.

By committing the state to reduce greenhouse gas emissions, the Governor and California Legislature have put California at the forefront of global action. Achieving these ambitious goals for reducing greenhouse gas emissions will require significant collaboration and support from all public entities and private stakeholders representing all sectors of California's diverse economy.

Addressing wide-ranging impacts of climate change requires a state-wide and coordinated multi-agency response. As such, Governor Schwarzenegger established the California Environmental Protection Agency (CalEPA) as the lead for coordinating all state agency actions for reducing greenhouse gas emissions in 2005. A Climate Action Team was established representing representatives from key state agencies responsible for implementing strategies and programs to reduce greenhouse gas emissions.

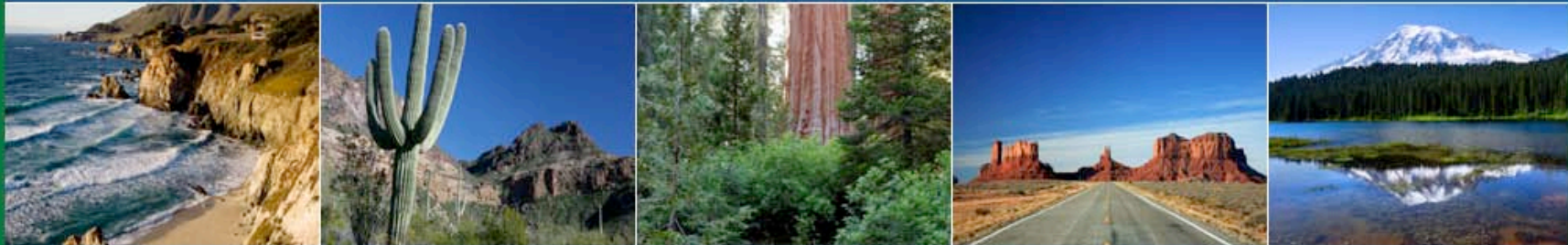
Climate Action Team subgroups made up of agency staff grouped around sectors such as agriculture, forestry and energy have been formed to identify and analyze measures for reducing greenhouse gas emissions. Each Agency and major department is contributing to the development of strategies for both mitigating the impacts of climate change and adapting to the impacts California is already experiencing.

## Programs and Activities

- [State Agency Greenhouse Gas Reduction Report Card](#), CalEPA Summary Report, March 2008. (PDF file, 9 pgs., 232 kb)
- [California State Agencies' Climate Change Activities](#)
- [AB 32 Summary and State Activities](#)

# western states (CA, Canada)

## Western Climate Initiative



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### THE WESTERN CLIMATE INITIATIVE (WCI)

The Western Climate Initiative is a collaboration which was launched in February 2007 by the Governors of Arizona, California, New Mexico, Oregon and Washington to develop regional strategies to address climate change. WCI is identifying, evaluating and implementing collective and cooperative ways to reduce greenhouse gases in the region. In the spring of 2007, the Governor of Utah and the Premiers of British Columbia and Manitoba joined the Initiative. Other states and provinces have joined as observers.

Through WCI, the partners set an overall regional goal in August 2007 for reducing greenhouse gas emissions (see the [GHG Reduction Goal Statement](#)). By August 2008 the Partners will also complete the design of a market-based mechanism to help achieve that reduction goal. The partners have developed a [Workplan](#) to guide their work and are seeking public input on the process.

#### Upcoming!

WCI will hold its first stakeholder workshop in Portland, Oregon on Thursday, January 10. For workshop details and to register, click [here](#) to get to 'WCI Meetings and Events'.

#### Training Opportunity:

**Webinar Series: Designing a Regional Cap-and-Trade Program**

#### WCI Partners

[Arizona](#)  
[British Columbia](#)  
[California](#)  
[Manitoba](#)  
[New Mexico](#)  
[Oregon](#)  
[Utah](#)  
[Washington](#)

**WCI Observers**  
[View all Observers](#)

# Colorado



## COLORADO CLIMATE ACTION PLAN

A STRATEGY TO ADDRESS GLOBAL WARMING

GOVERNOR BILL RITTER, JR.

### **Reduce Greenhouse Gas Emissions**

- By 2020, reduce greenhouse gas emissions by 20 percent below 2005 levels.
- By 2050, reduce greenhouse gas emissions by 80 percent below 2005 levels.

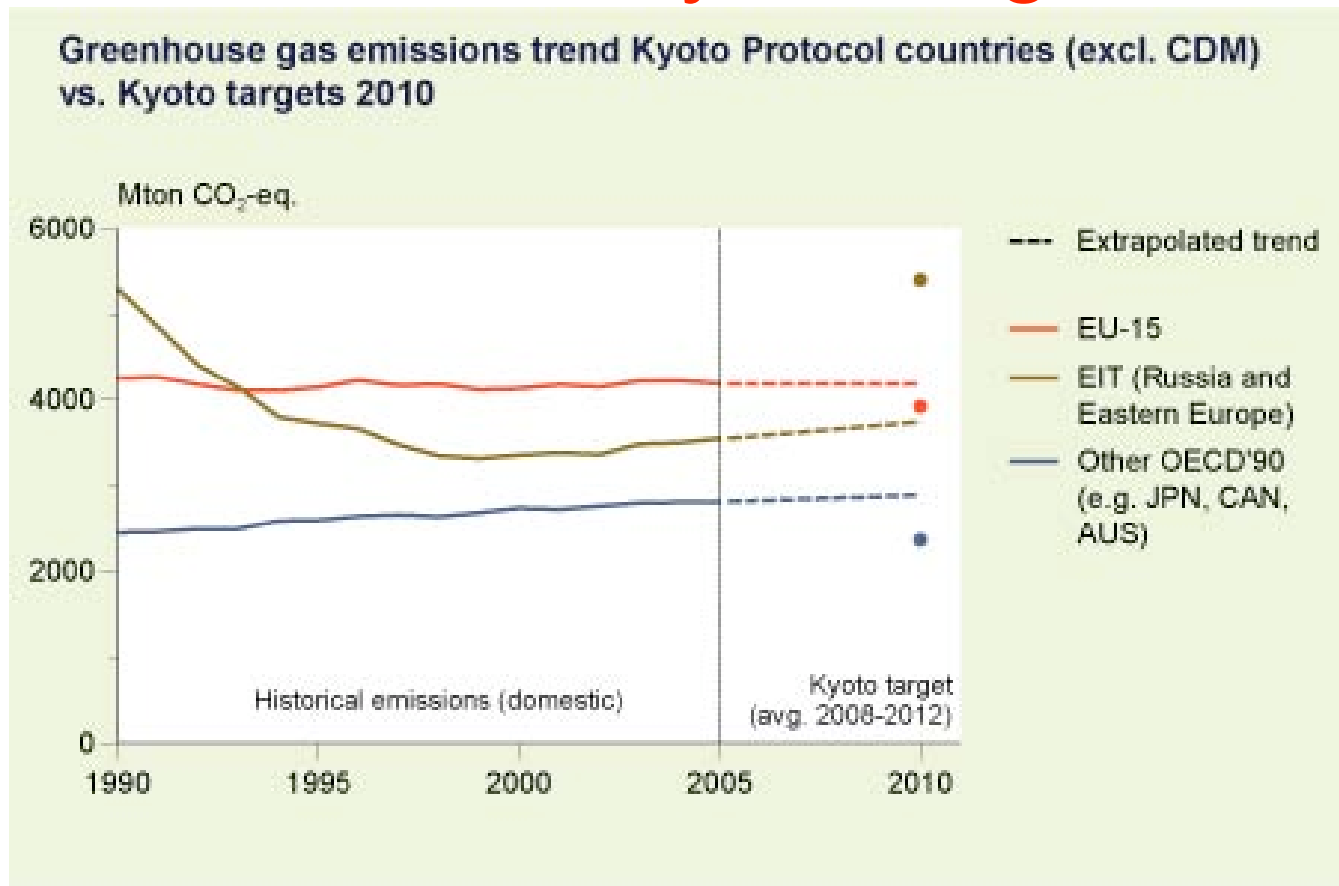
NOVEMBER 2007

[www.colorado.gov/energy/in/uploaded\\_pdf/ColoradoClimateActionPlan\\_001.pdf](http://www.colorado.gov/energy/in/uploaded_pdf/ColoradoClimateActionPlan_001.pdf)

# international response

- Kyoto Protocol
  - adopted 1997, in force 2005, ratified by 183 countries
  - modest reduction targets for developed countries
  - no targets for developing countries
  - US not signed on
  - no real penalties for non-compliance
  - motivates carbon trading mechanism
  - raises awareness, creates platform ('soft benefits')
  - 2012 successor treaty (Dec. '09 talks)

# emissions v. Kyoto targets



Extrapolation after 2005 suggests industrialized participants will collectively meet target, mostly due to early-period economic declines in E. Europe and Russia. EU countries have not met individual targets (except Sweden, UK). Global emissions still rising fast due to US (non-Kyoto) and developing countries (no targets).



# From the Kyoto Protocol to the European market

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- **2005: implementation of a European market for CO<sub>2</sub> emissions allowances**
  - ▶ 1 allowance = 1 emitted ton of CO<sub>2</sub>
  - ▶ Over 11 500 installations covered
  - ▶ 2.100 billion allowances allocated each year
- **Purpose: helping Europe reach its Kyoto target** = achieve emissions reduction 8% below 1990 levels
- From 2005: trading of European allowances on both spot and forward markets
  - ▶ \$25 bi. in 2006, \$40 bi. in 2007 (World Bank estimate)

# price of “allowance” on EU market

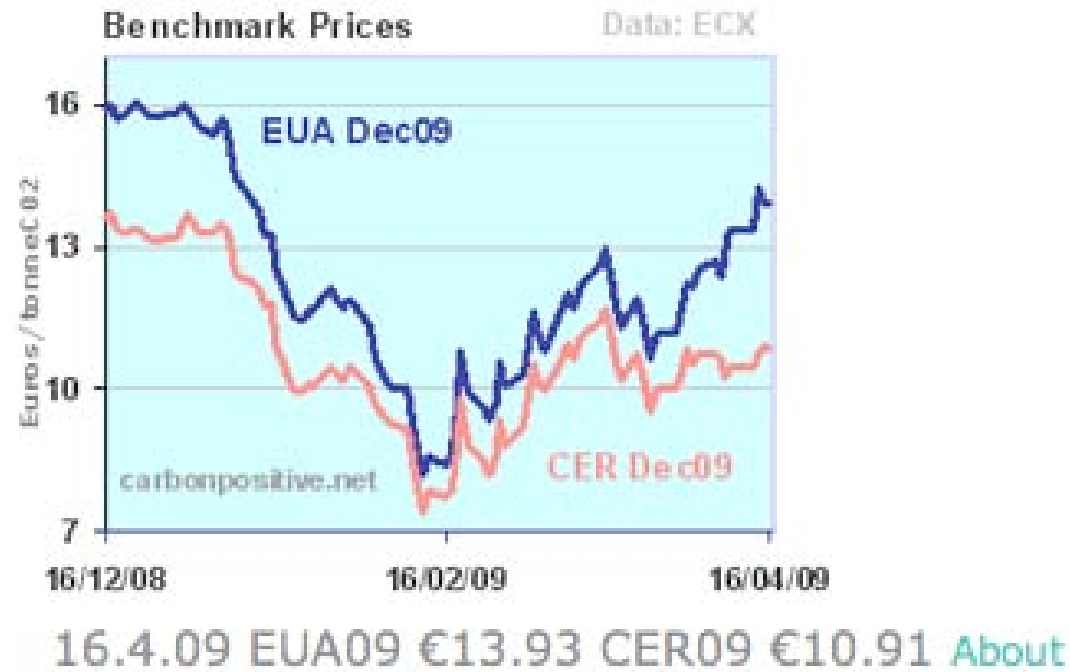
Source: Mission Climat of Caisse des Dépôts



1. High volatility: **price shock in April-May 2006 (compliance data release)**
2. First period price tends towards transaction cost: **over-allocation and no banking**
3. Higher second period prices : **expected scarcity (stricter allocation plans)**

# recent price of “allowance” on EU market

- Global recession (w/ price recovery):





# international response

- Kyoto Protocol
  - adopted 1997, in force 2005, ratified by 183 countries
  - modest reduction targets for developed countries
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  - US not signed on
  - no real penalties for non-compliance
  - motivates carbon trading mechanism
  - raises awareness, creates platform ('soft benefits')
  - 2012 successor treaty (Dec. '09 talks)
- Major Emitter Group
  - 16 countries making up 80% of all emissions
  - less wieldy, more effective than UN?
  - binding authority?
  - (meeting in DC yesterday and today)

- I have found over the years that students wish to hear recommendations which they can consider in order to help form their own opinions and inform their actions
- The following slides provide my present thinking re. big picture recommendations (often adopted from others)

# Recommendation #1

## Moratorium on Coal-Fired Power Plants

Technology w Sequestration ~ Decade Away

All Plants w/o Sequestration must eventually be bulldozed (by 2030?)

Efficiency Can Handle Needs during Interim  
(and is necessary in the long run)

→ This should be done by Congress

→ In interim Citizens must accomplish it

## Recommendation #2

### C tax and investment in technology and infrastructure

- rising tax on carbon, paid at source (POP)
  - simple, transparent
  - reflects true costs
  - allows price competition from renewables
  - funds innovation
  - avoids cap and trade loopholes
- federal support for CCS
- federal support for improved electrical grid (replace transformers now!), as needed for reliability and future demand anyway

## Recommendation #2

related:

- provide long term tax incentives for efficiency and C-free energy
- re-task DOE to develop new sources of energy (vs. stockpile stewardship)

# Recommendation #3

## Energy Efficiency Standards

### Buildings: Adopt “2030 Challenge”

- 50% less CO<sub>2</sub> fr. new/renovated buildings
- endorsed by U.S. Conference of Mayors

### Vehicles: Adopt California Standards (or better)

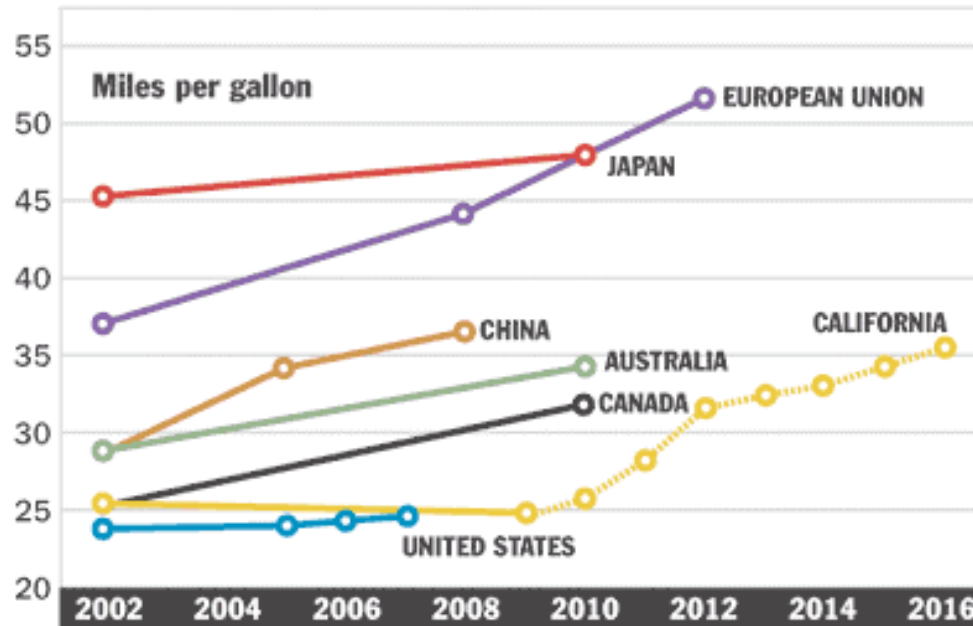
### Remove Structural Barriers to Efficiency

This needs to be legislated

borrowed from Dr. J. Hansen, well-informed US citizen

# legislate:

**Fuel economy trend lines**



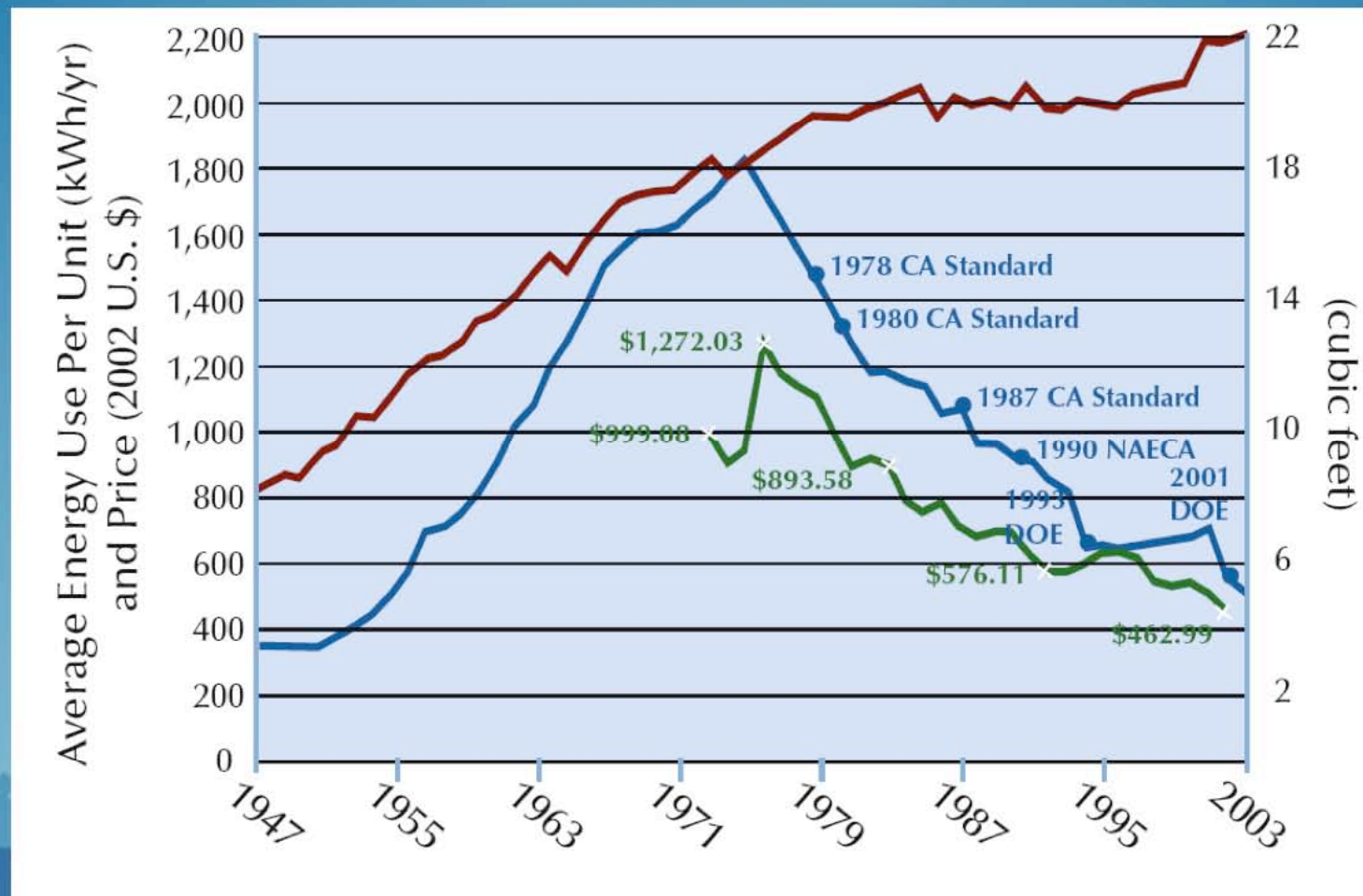
Ford, GM & Chrysler sell hi-mpg vehicles in Canadian and European markets- why not here?

## regulation:

- industry generally doesn't like
- but there are examples of how it can work well (let's see..)



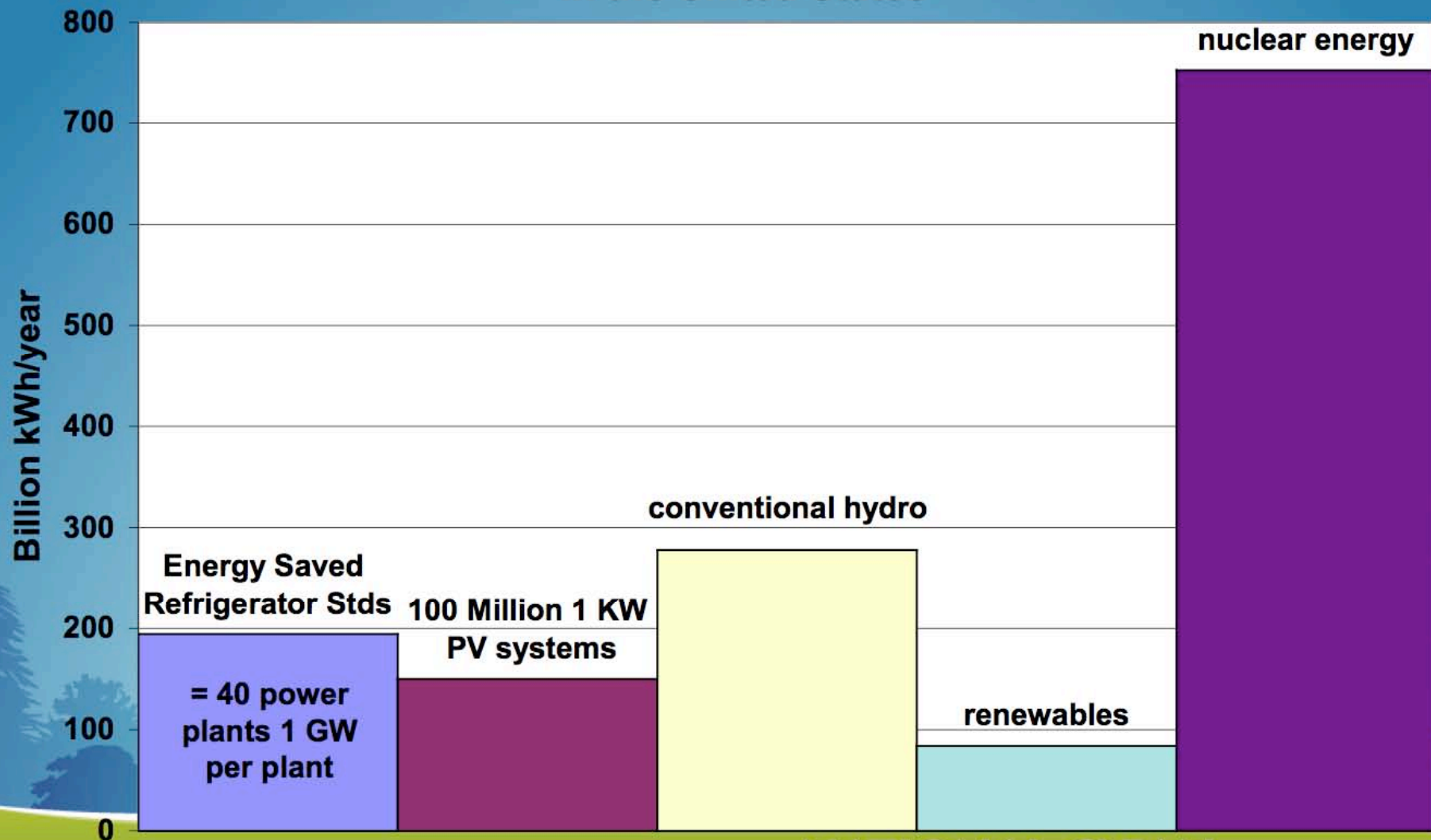
# Regulation stimulates technology: Refrigerator efficiency standards stimulated industry innovation



Regulation of consumer electronics and computers can save a similar amount of energy.

MIT  
from Steven Chu, LBNL

## Annual Energy Saved vs. Several Sources of Supply In the United States



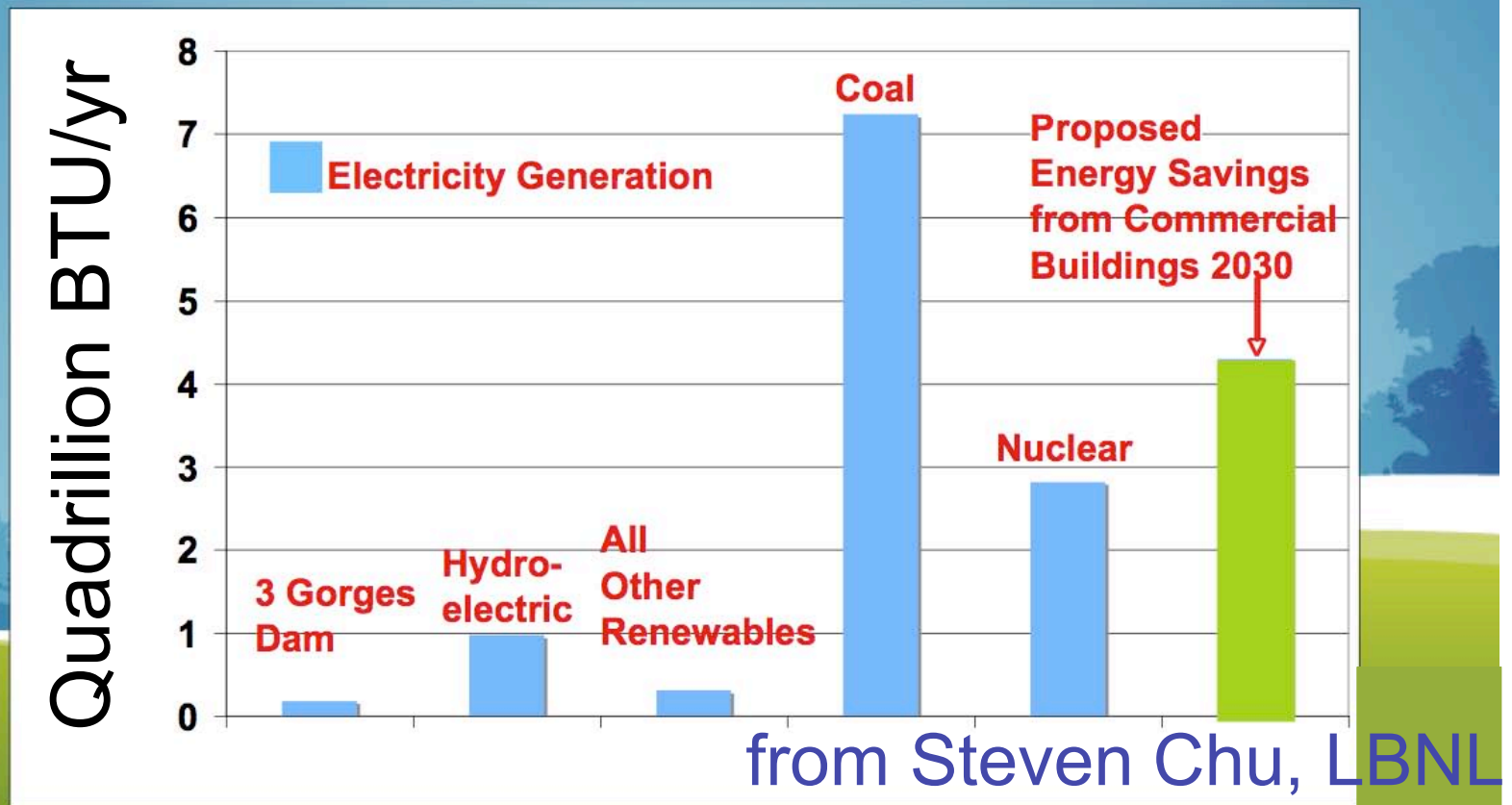
from Steven Chu, LBNL

## Buildings consume

39% of U.S. energy, produce 48% of Carbon emissions,  
Commercial building annual energy bill: \$120 billion

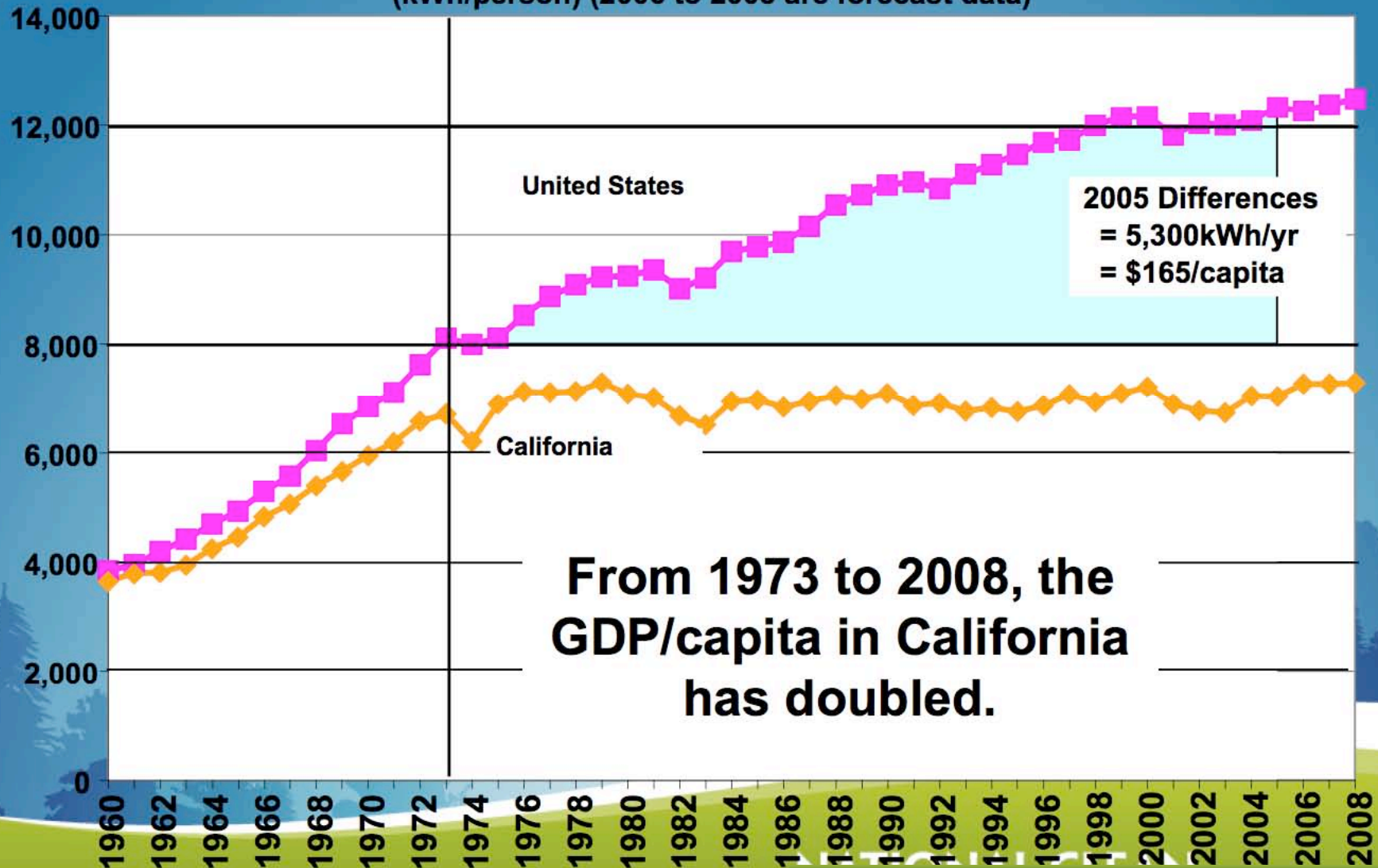
**A 80 - 90% reduction in energy in new commercial buildings is possible with new technologies.**

**could largely eliminate need for coal**



# Electricity use per person (1960 – 2008)

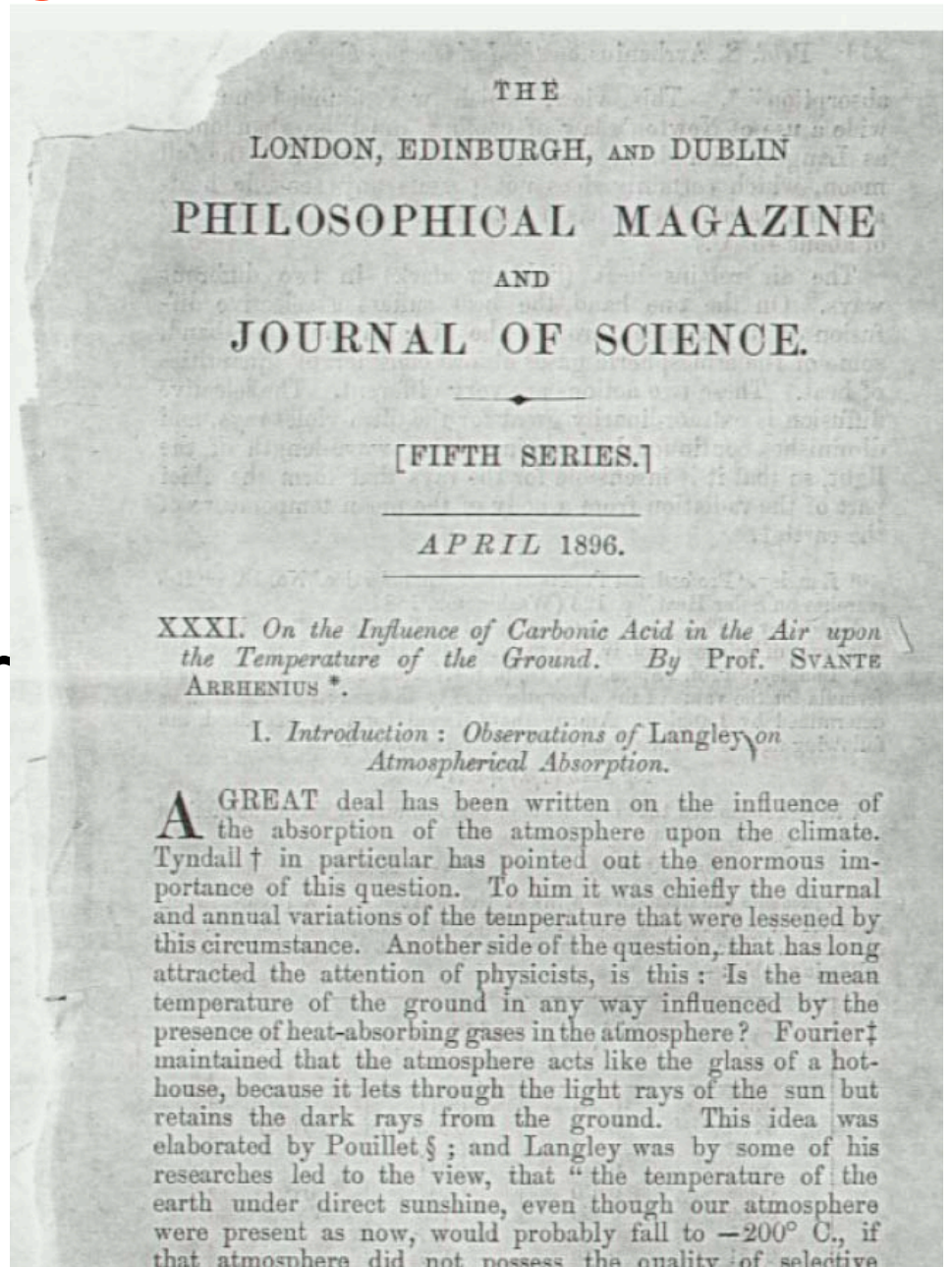
Per Capita Electricity Sales (not including self-generation)  
(kWh/person) (2006 to 2008 are forecast data)



from Steven Chu, LBNL

# learning goals

- this is your future, get involved
- have a safe and enjoyable summer
- thank you for your attention



next

- FCQs
- review
- FINAL EXAM 4 May 1:30 PM