

# Hedging Future Carbon Risk with Wind Power

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# What is now obvious

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- 1. The scientific debate is on global warming is over.**
- 2. Limits on greenhouse gas emissions are coming -- soon.**
- 3. These limits pose significant financial risks to utilities and consumers and will change the economics of power generation options.**
- 4. We need to factor these future costs into investment decisions today.**

# A changing political climate

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- **Global response: Kyoto ratification, EU Trading, G8 Summit**
- **State/regional response: CA, NM, MA, NH, WA, OR; Northeast Regional Greenhouse Gas Initiative (RGGI), West Coast Governors Initiative; Renewable Electricity Standards in 20 states & DC**
- **Local response: 174 cities have agreed to reduce emissions by at least 7 percent below 1990 levels (Kyoto)**



# Sense of the Senate Resolution

- **“It is the sense of the Senate that Congress should enact a comprehensive and effective national program of mandatory, market-based limits and incentives on emissions of greenhouse gases...”**
  - adopted June 22, 2005, supported by 54 Senators
  - co-sponsored by: Bingaman (D-NM), Specter (R-PA), Byrd (D-WV), Domenici (R-NM)
  - Bingaman & Domenici released white paper on design elements for a mandatory system on Feb. 2, 2006; 29 panelists presented proposals at Energy Committee’s Climate Conference on April 4
- **Federal proposals: Climate Stewardship Act, National Commission on Energy Policy, power plant multi-pollutant caps.**



# Industry leaders recognize inevitability of carbon limits

- **GE, BP, British Airways, Ford**
- **Financial institutions and insurance companies**
  - **JP Morgan Chase, Merrill Lynch, Swiss Re**
- **Utilities & Power Suppliers**
  - **Duke Energy—CEO called for economy-wide carbon tax**
  - **Exelon**
  - **American Electric Power**
  - **Cinergy**
  - **Xcel Energy**
  - **Pacificorp**
  - **Idaho Power**
  - **Pacific Gas & Electric**
  - **PSE**
  - **Avista**
  - **Entergy**
  - **Sempra**
  - **PNM Resources**
  - **Calpine**

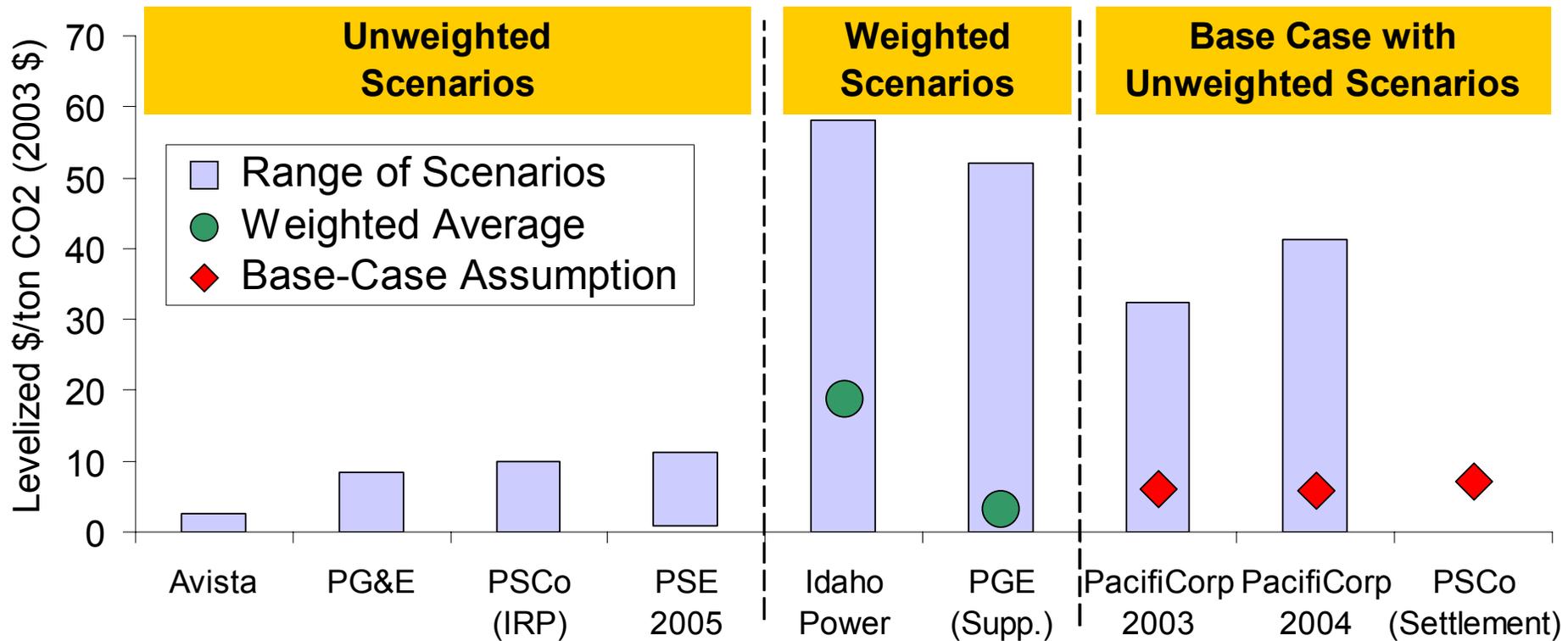
# Utilities are increasingly evaluating carbon risk

- **7 of 12 western utilities considered carbon risk in latest resource plans, representing 30% of western electricity supply**
  - 10 of 12 plans will consider in next round: 42% of western electricity
  
- **CA PUC requires utilities to include “adder”**
  - \$8/ton initially rising at 5% year
  - Required to include in long-term planning and evaluating bids

Sources: LBL, *Balancing Cost and Risk: The Treatment of Renewable Energy in Western Utility Resource Plans*, August 2005;

CA PUC Decision No. 04-12-048 December 2004, and revised decision in April 2005..

# Methods and Approach to Carbon Risk Evaluation Vary

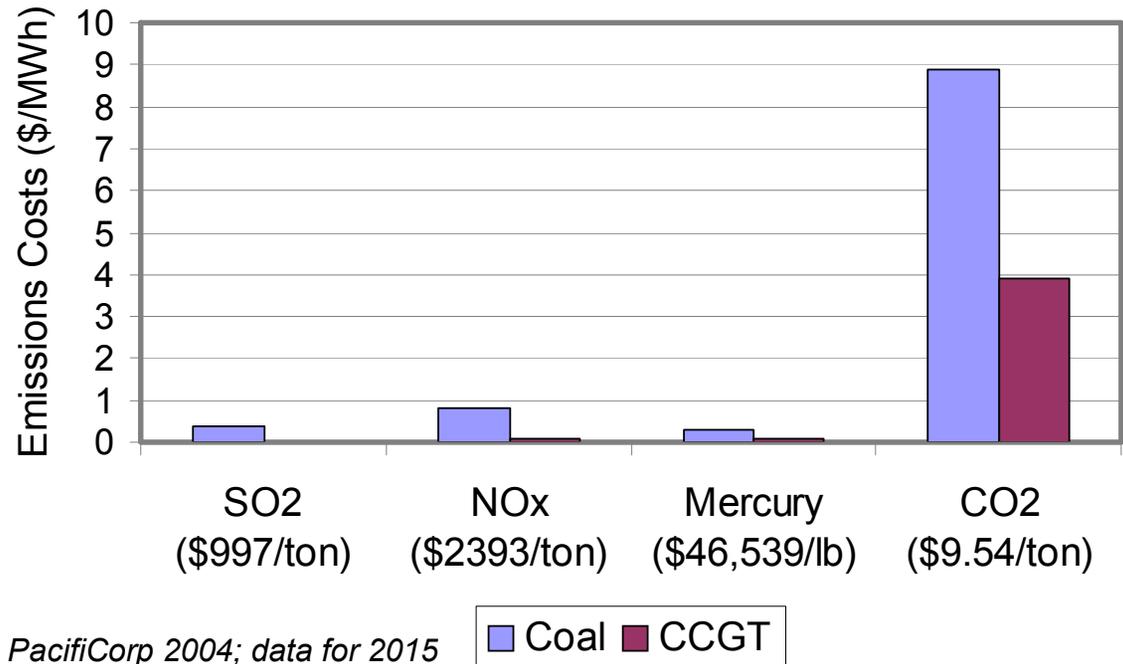


## Lawrence Berkeley Lab recommends that...

- all utilities evaluate carbon risk
- a greater level of consistency in evaluation approaches be sought
- a broad range of possible regulatory environments be considered

# CO<sub>2</sub> is important component of environmental regulatory risk

Environmental regulations are likely to change over the lifetime of electric supply investments, and utility planning should evaluate these risks, and mitigate them if cost-effective to do so

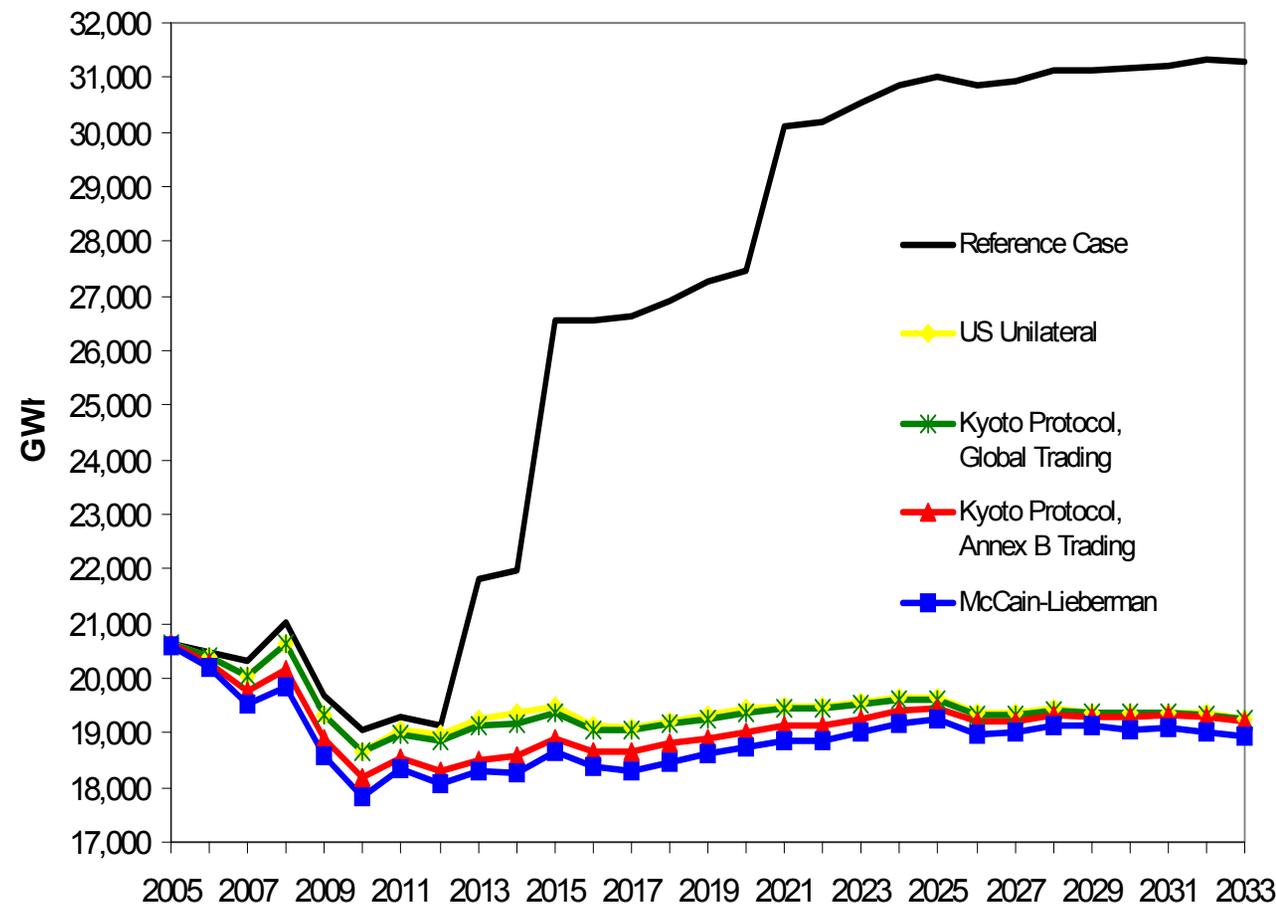


Risk of carbon regulation – at the state or federal level – is likely the most important to consider, but risk of strengthened regulations of SO<sub>2</sub>, NO<sub>x</sub> and mercury also deserve note

# Economics of electricity generation options will change

- **Xcel Energy's 2004 IRP in MN included 1125 MW of new coal in its "Preferred Plan."**
- **When future CO<sub>2</sub> costs were included in Xcel's model, ALL THE NEW COAL GENERATION DISAPPEARED, even using CO<sub>2</sub> costs lower than current prices in the EU.**
- **New coal plants become uneconomic when CO<sub>2</sub> regulations are included.**

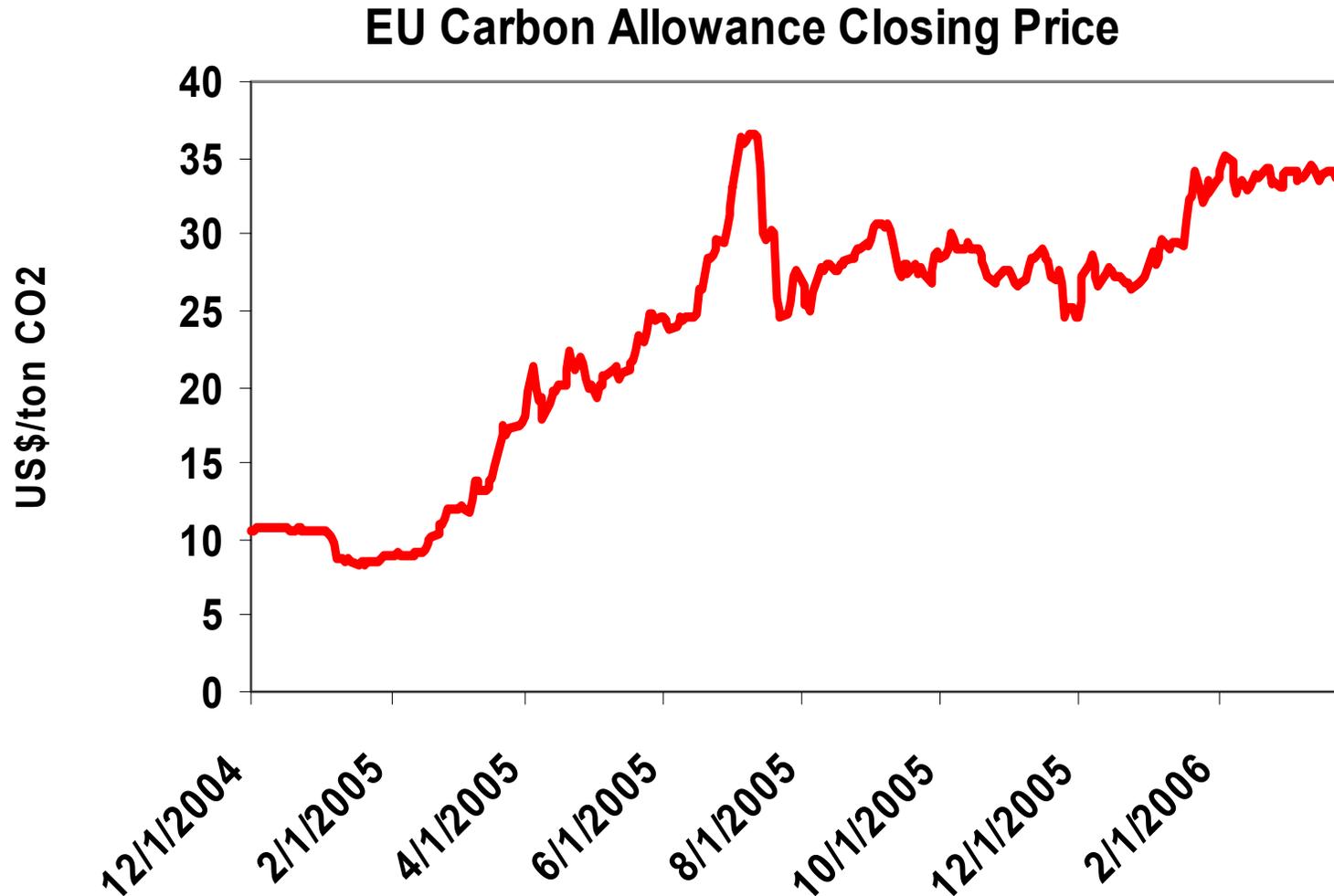
**Coal Generation under Xcel's Preferred Plan (Reference Case) and Carbon Reduction Regulatory Scenarios (GWh)**



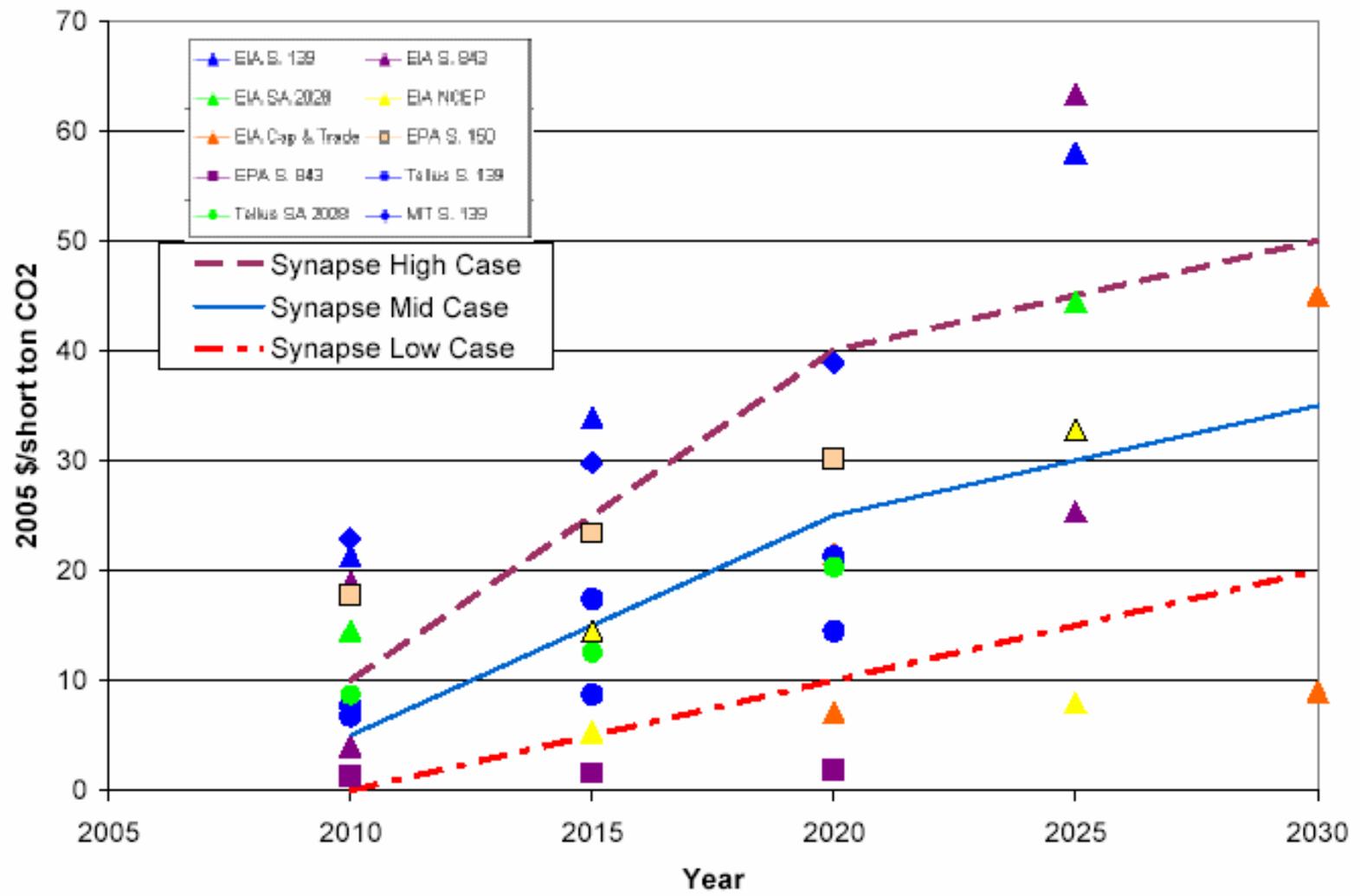
Source: Xcel responses to IWLA/ME3/UCS/MCEA Information Requests 7d and 19b.

# What is the cost of CO<sub>2</sub> limits?

## Current Market Prices in Europe



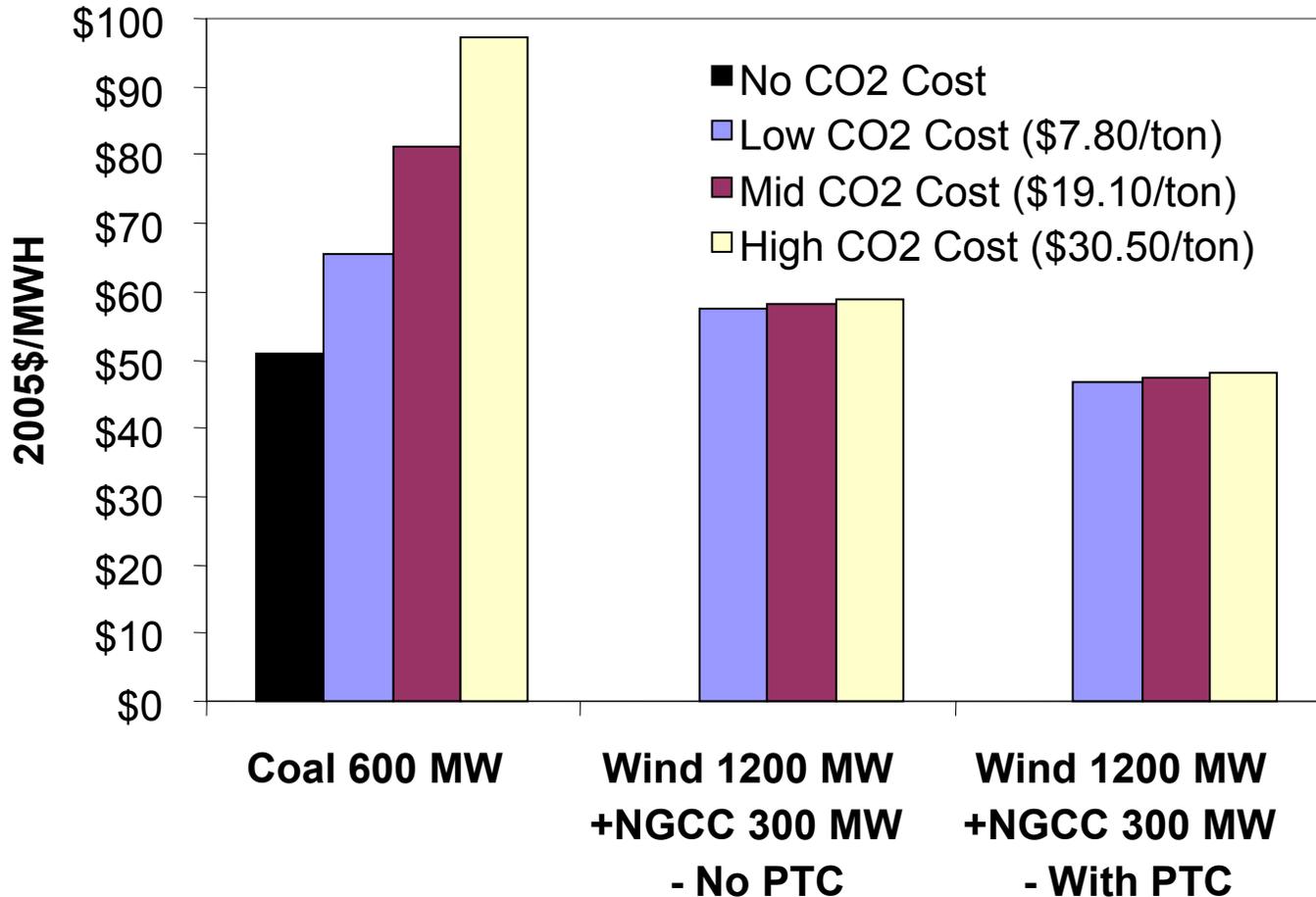
# What is the cost of future CO2 limits in the US?



Source: Synapse Energy Economics, *Climate Change and Power: Carbon Dioxide Emissions Costs and Electricity Resource Planning*, May 2006.

# Wind-gas alternative is cheaper than proposed new coal plant in South Dakota

Levelized Cost of Electricity





# How low do emissions need to go?

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- **EU target (below 1990 levels):**
  - **60-80% by 2050**
  
- **California target (below 1990 levels):**
  - **80% by 2050**
  
- **New Mexico target (below 2000 levels):**
  - **75% by 2050**

# New coal plants would lead to higher carbon emissions

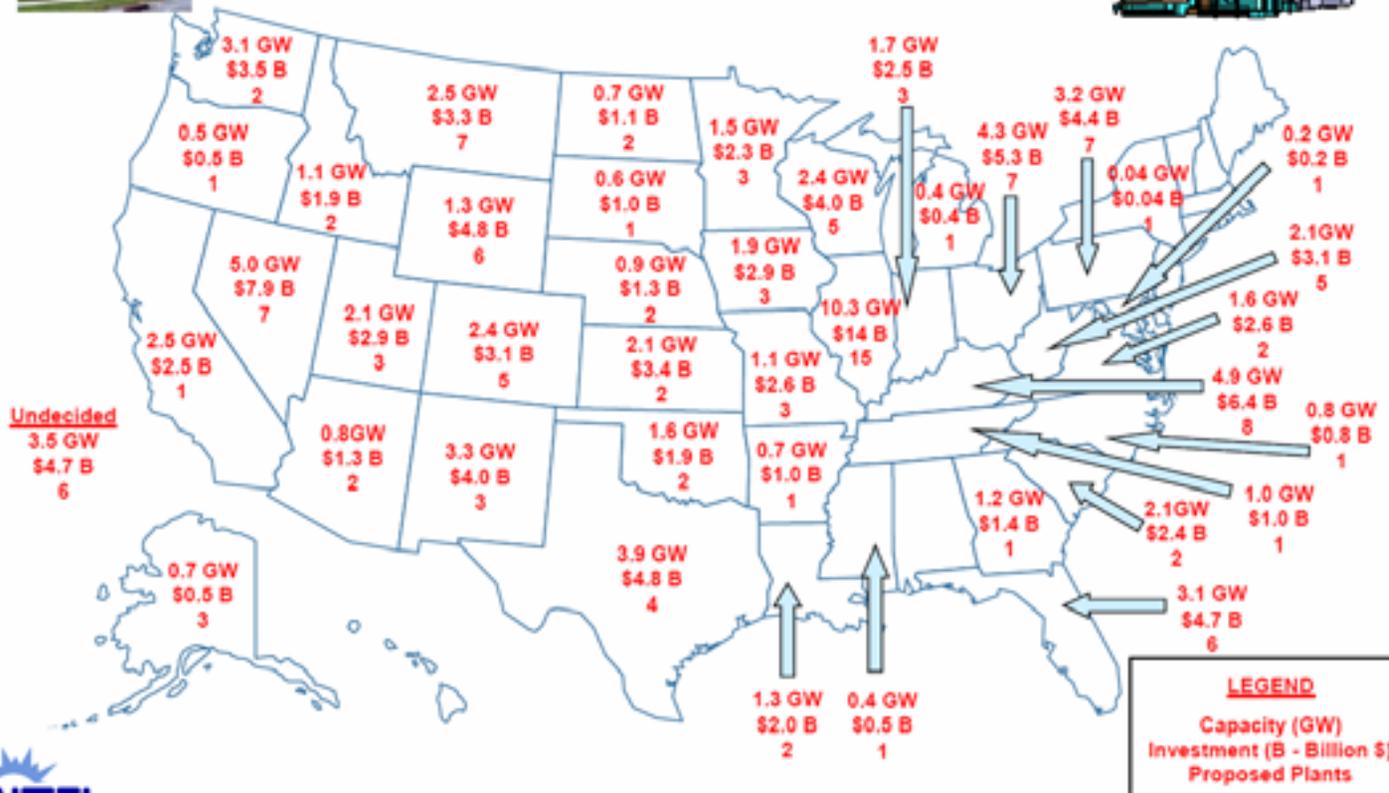
## Coal's Resurgence in Electric Power Generation



Equivalent Power  
for  
85 Million Homes

### Proposed New Plants

140 Plants  
85GW  
\$ 119 Billion



140 new plants (85 GW)

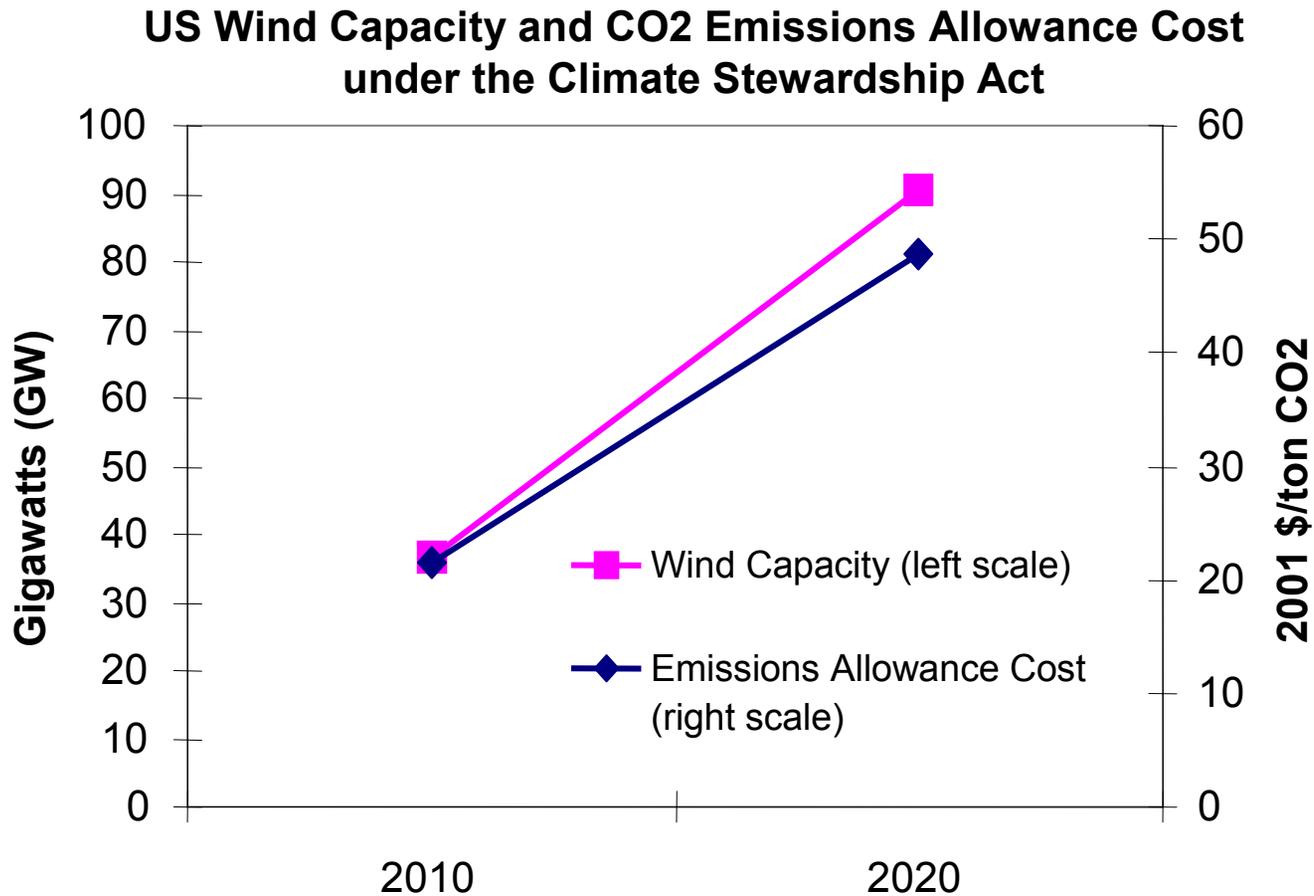
No plans to capture and store CO<sup>2</sup>

Locks us in for decades to highest-carbon energy, with huge environmental AND financial risk

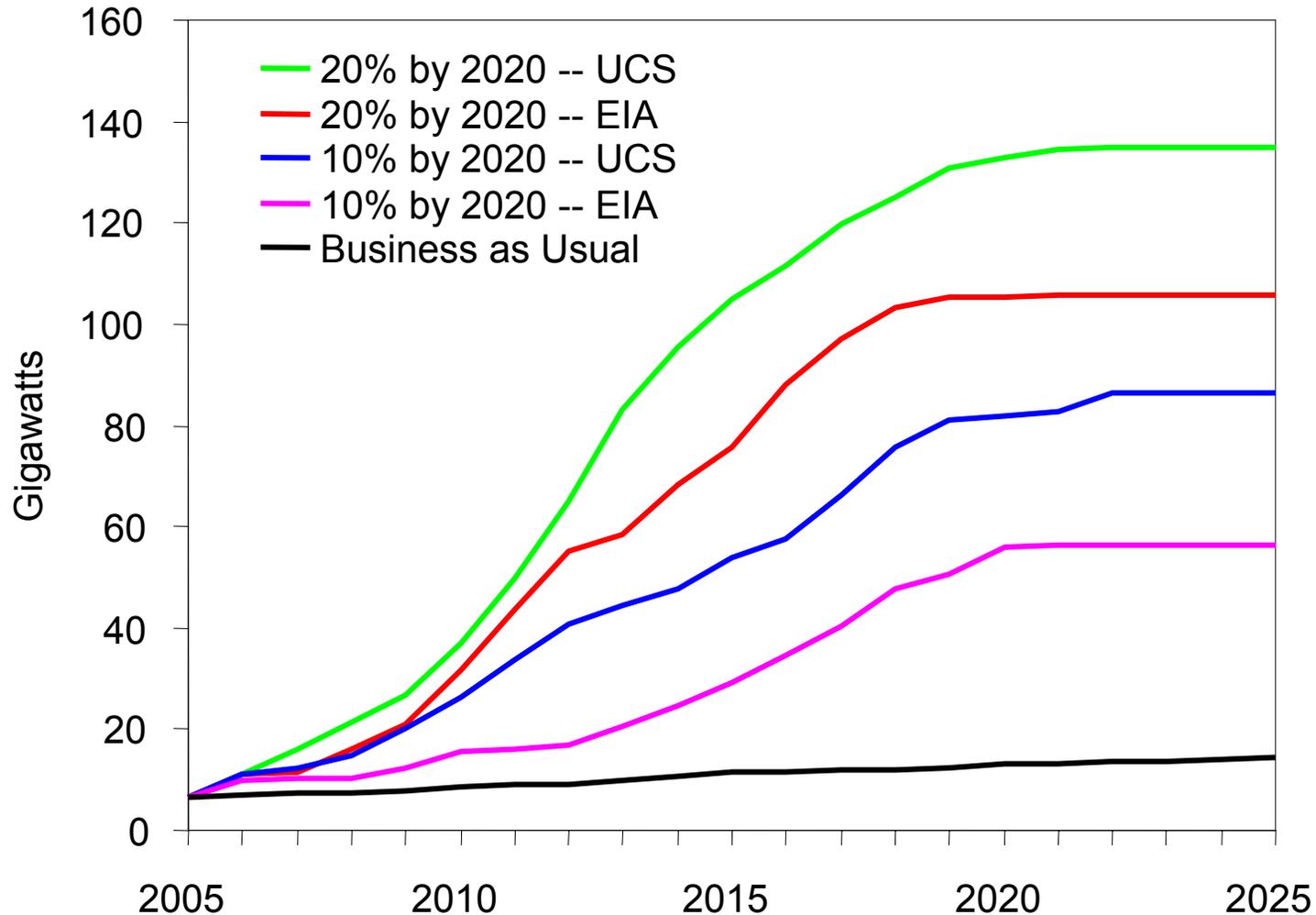
Ratepayers shouldn't bear the risk of these imprudently incurred costs

**LEGEND**  
Capacity (GW)  
Investment (B - Billion \$)  
Proposed Plants

# EIA: Huge increase in wind capacity under Climate Stewardship Act



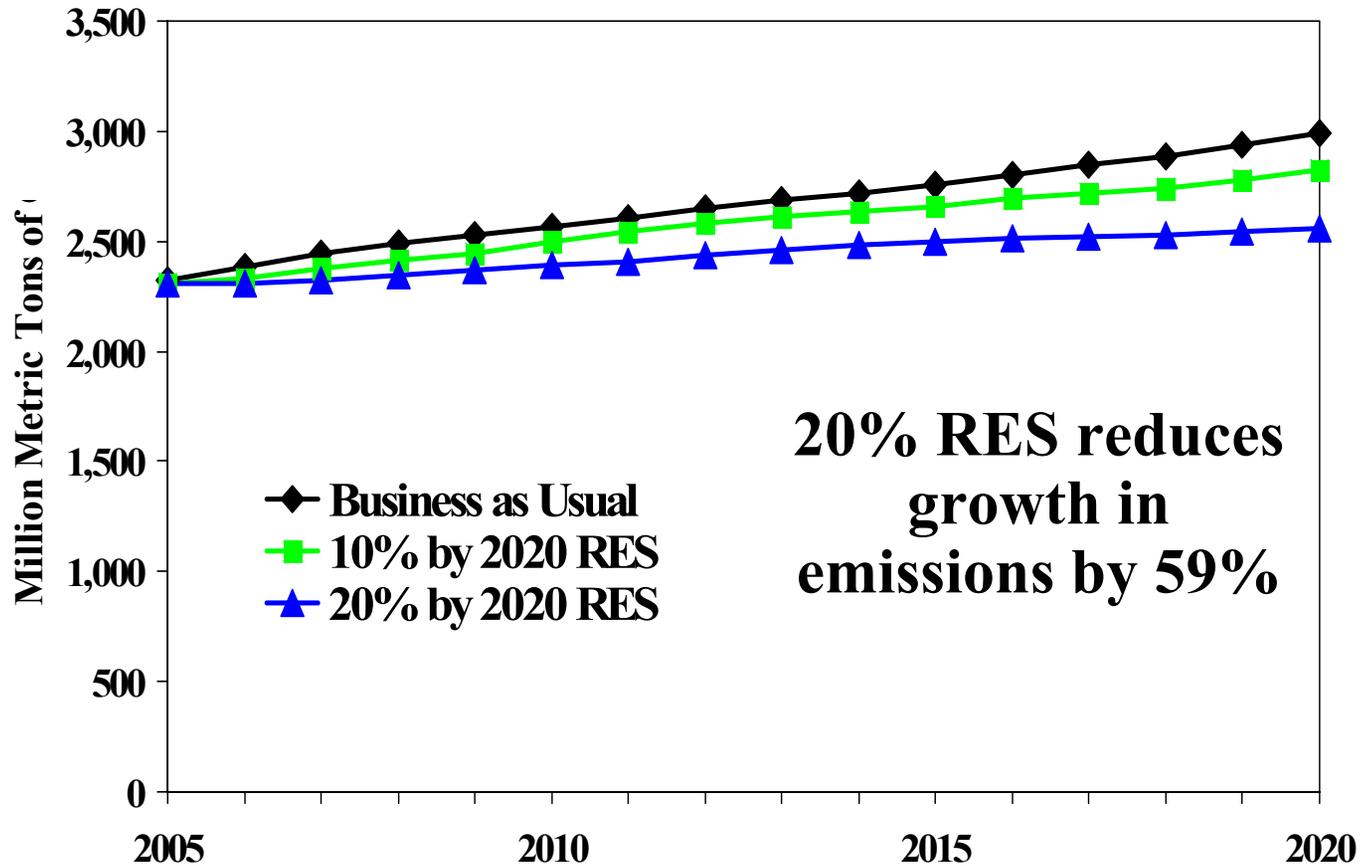
# US wind capacity under a national renewable standard



Source: UCS, *Renewing America's Economy*, 2004, using EIA model

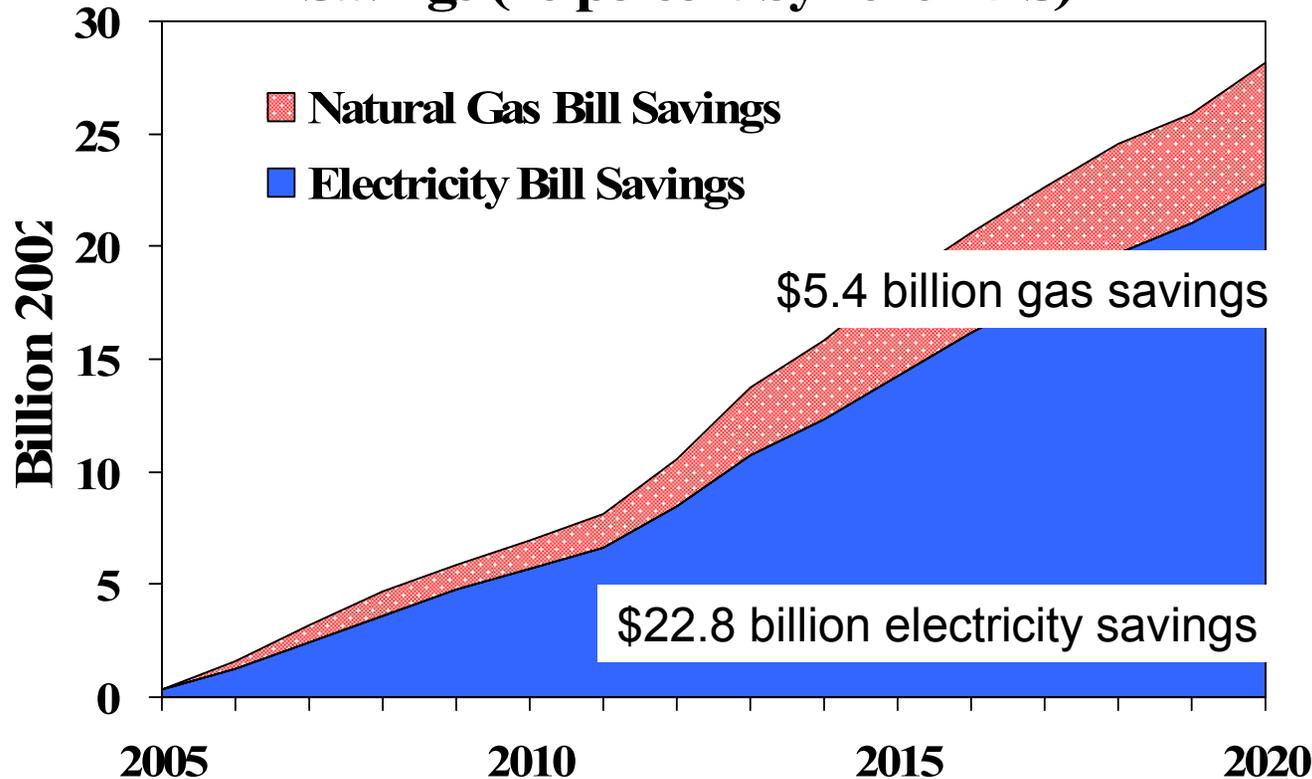
# A national standard reduces emissions and compliance costs

## Carbon Dioxide Emissions, U.S. Power Plants



# Renewable energy saves electric & natural gas consumers money

**Cumulative Natural Gas and Electricity Bill Savings (10 percent by 2020 RPS)\***



**Savings in all customer classes:**

- Res.: \$7.9 bil
- Comm.: \$11.3 bil
- Ind.: \$9 bil

➤ EIA: 10% RES saves \$23 billion

➤ 20% RES saves \$49 billion by 2020

# Renewable Electricity Standards

NV: 20% by 2015,  
solar 5% of annual

MN: 19% by 2015 (Xcel Energy)\*

NY: 24%  
by 2013

ME: 30%  
by 2000

IA: 2% by 1999\*

WI: 10% by 2015

IL: 8%  
by 2013\*\*

MA: 4%  
by 2009

MT: 15%  
by 2015

RI: 16%  
by 2019

CT: 10% by 2010

NJ: 22.5% by 2020

CO: 10%  
by 2015

DE: 10% by 2019

MD: 7.5% by 2019

D.C: 11% by 2022

CA: 20%  
by 2017

NM: 10%  
by 2011

PA: 8% by 2020

AZ: 15% by 2025

TX: 5,880 MW  
(~5.5%) by 2015

HI: 20% by 2020

➤ 20 States  
+ D.C.

- RES
- RES and Goal
- RE Goal

\*MN has a requirement for one utility, Xcel Energy, and a 10% by 2015 renewable energy goal for all other utilities. In addition to its requirement, IA has a 1,000 MW (~10%) by 2010 goal.

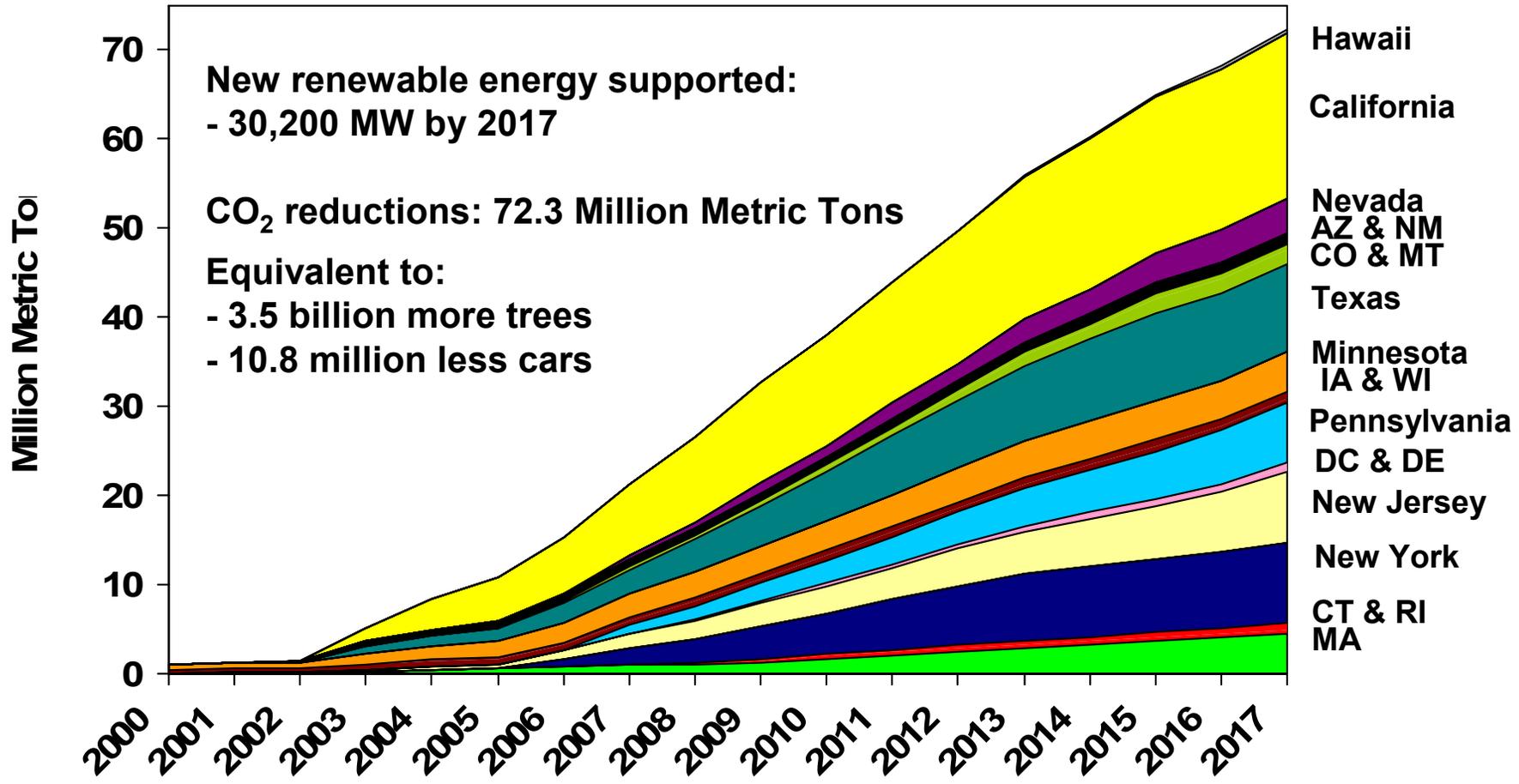
\*\*Renewable energy goal, with no specific enforcement measures.



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# Projected CO<sub>2</sub> reductions from state renewable standards

**CO<sub>2</sub> Reduction from State Renewable Electricity Standards\***

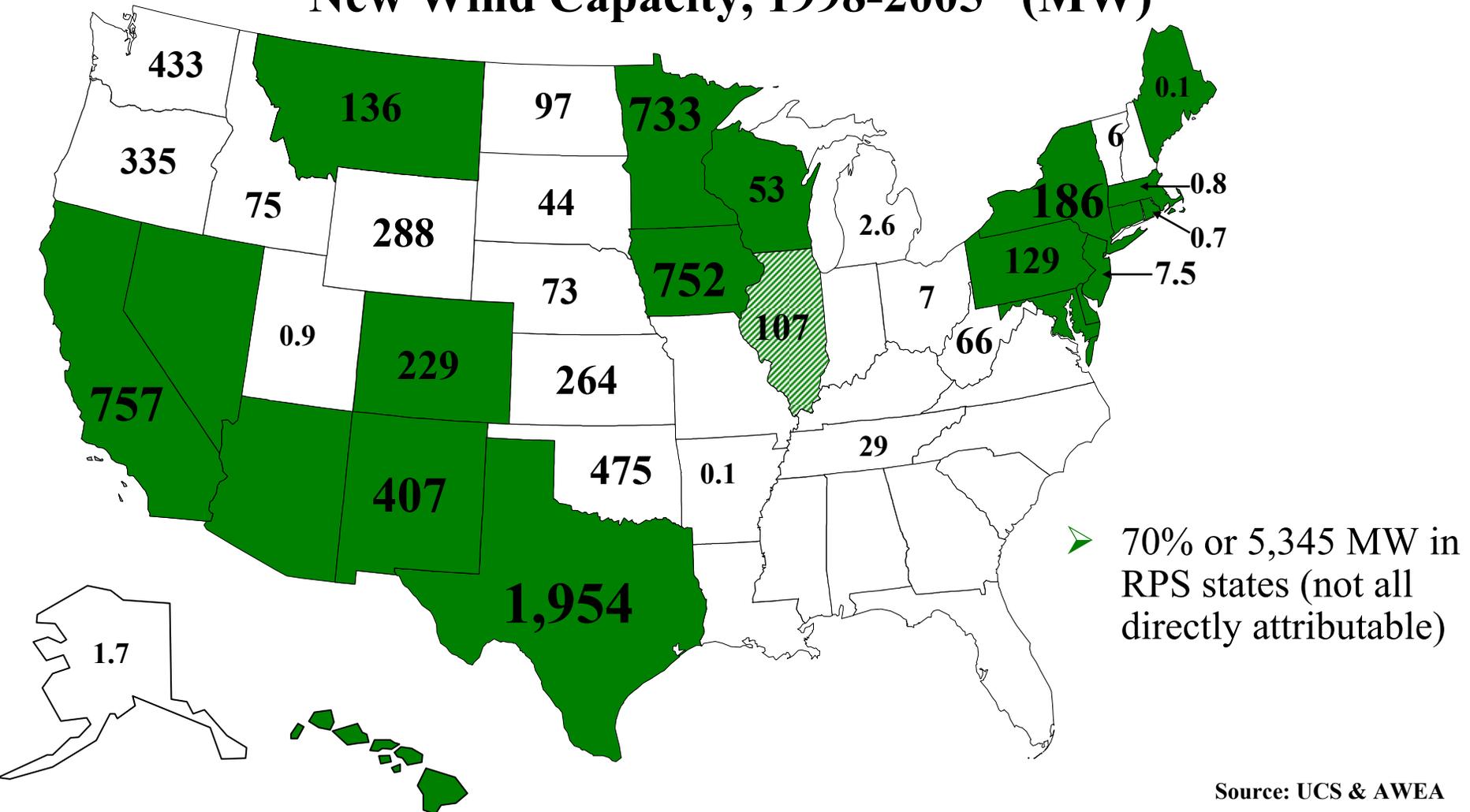


\*Projected development assuming states achieve annual RPS targets.

Source: UCS, 2006.

# Most new wind capacity installed in states with renewable standards

New Wind Capacity, 1998-2005\* (MW)

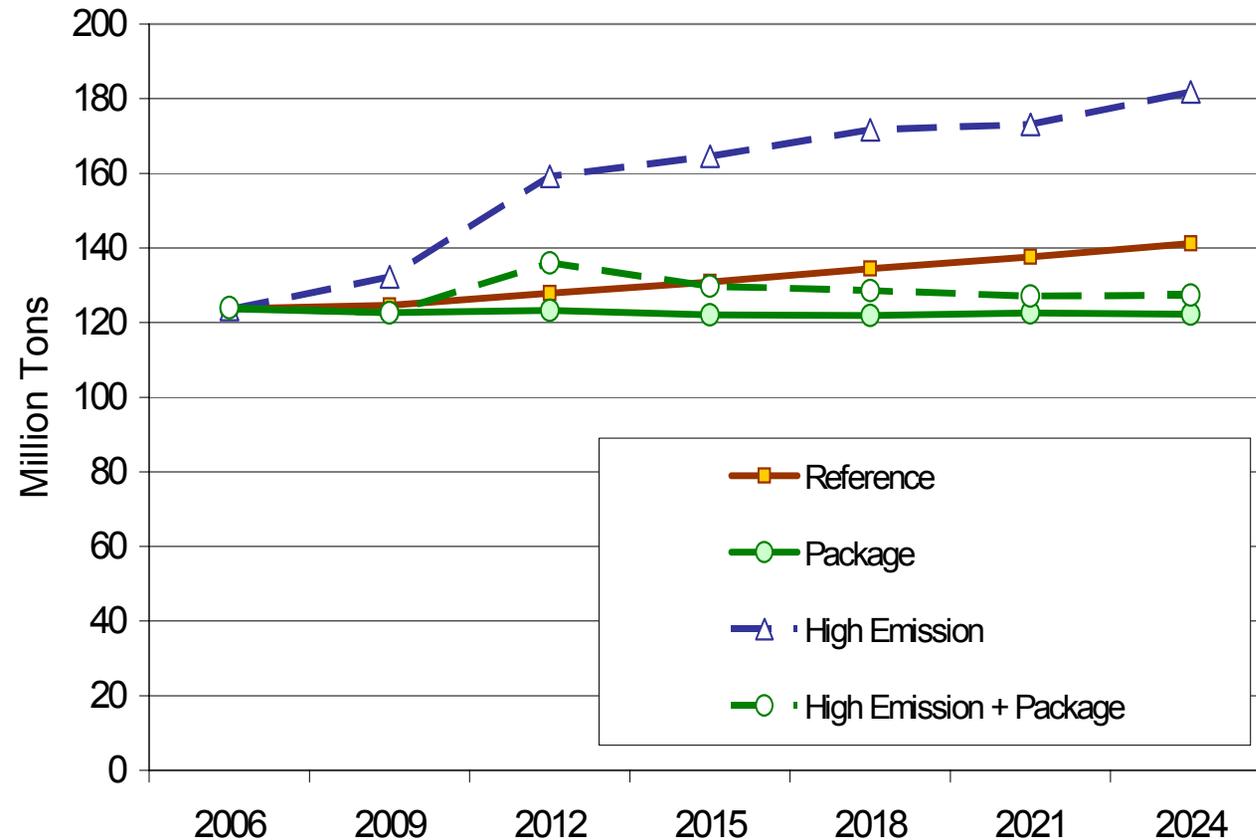


# **RGGI Policy Package Scenario**

## **ICF Modeling of Electricity Sector Impacts**

- **CO<sub>2</sub> Policies – Phased-in regional cap to 2020, With or Without US and Canada National Programs**
  - US Policy assumes stabilization at projected 2015 levels starting in 2015
  - Canada Policy assumes stabilization at projected 2008 levels starting in 2008
- **Offsets – Combined RGGI and CDM Offset Curves, Limited to 50% of Required Reductions**
- **End Use Efficiency – assumes current levels of annual state expenditures for public benefit programs continue through 2025. Supply curve developed by ACEEE.**
- **Wind and other renewables built to meet state RPS programs included in reference case**

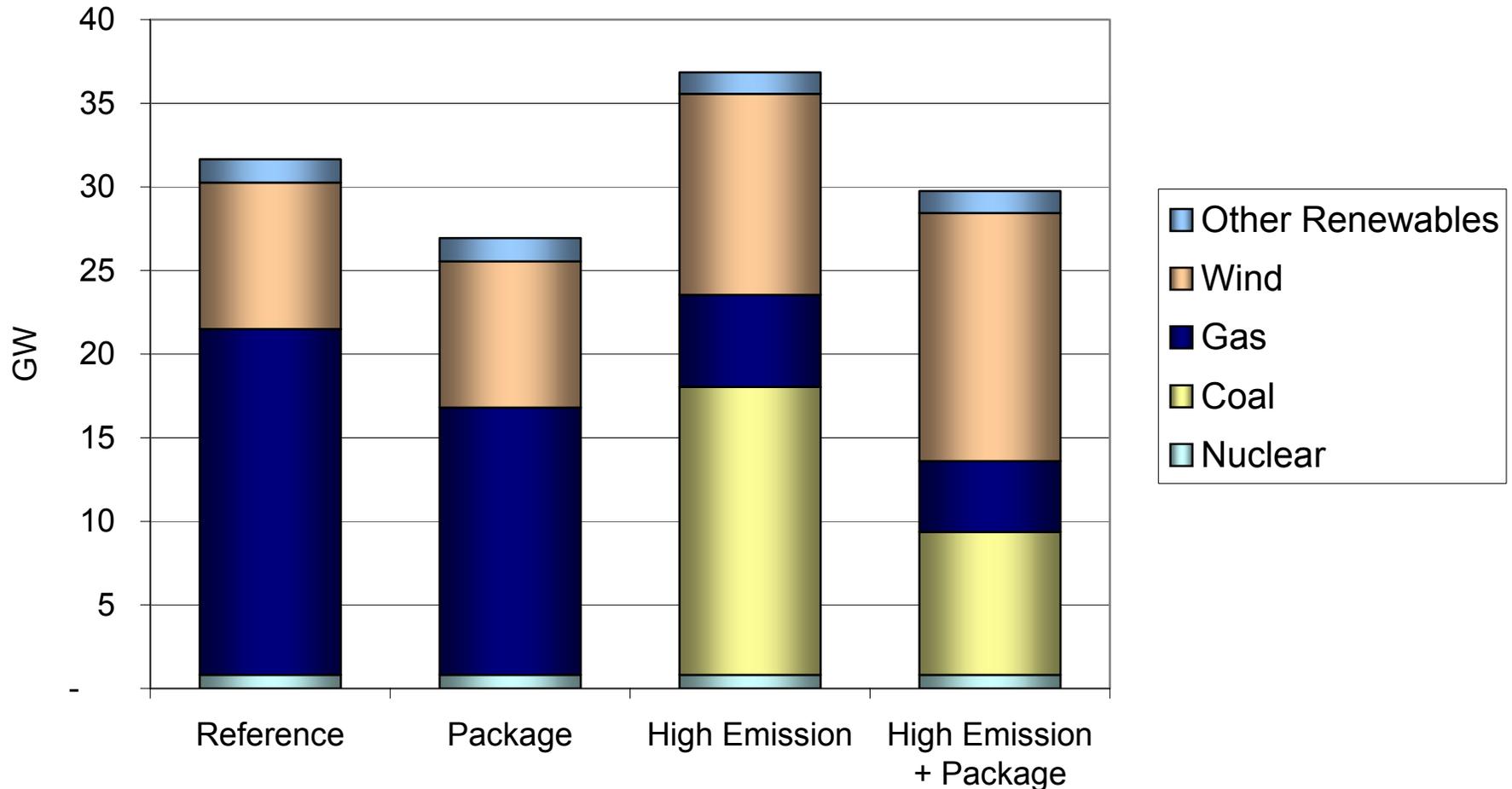
# RGGI CO<sub>2</sub> Emissions Trajectories



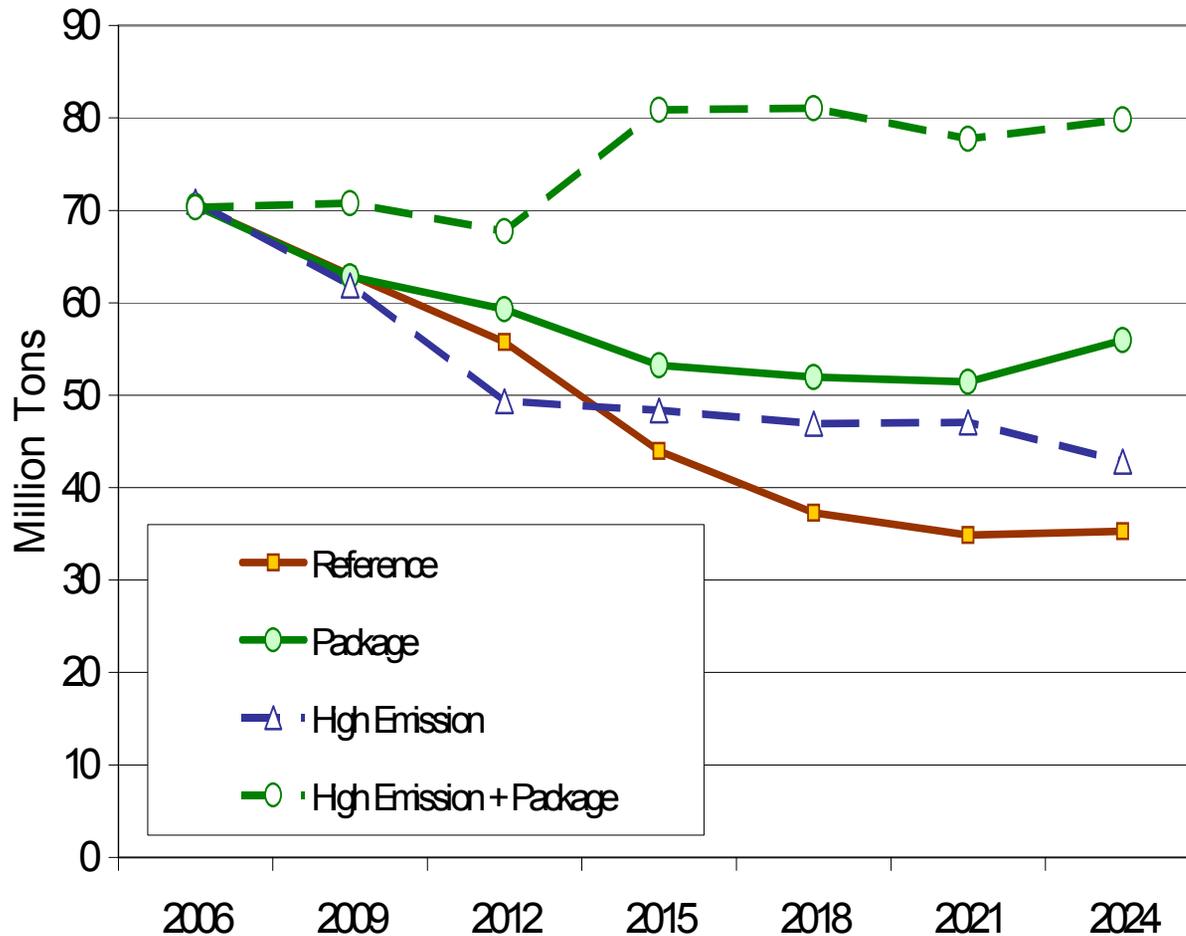
## RGGI CO<sub>2</sub> cap:

- 10% below 2006 levels by 2024
- 21% below reference case levels in 2024
- Package case slightly higher than cap because of offsets
- High emission case assumes higher gas prices and allows new coal builds in RGGI

# RGGI Cumulative Capacity Additions by 2024

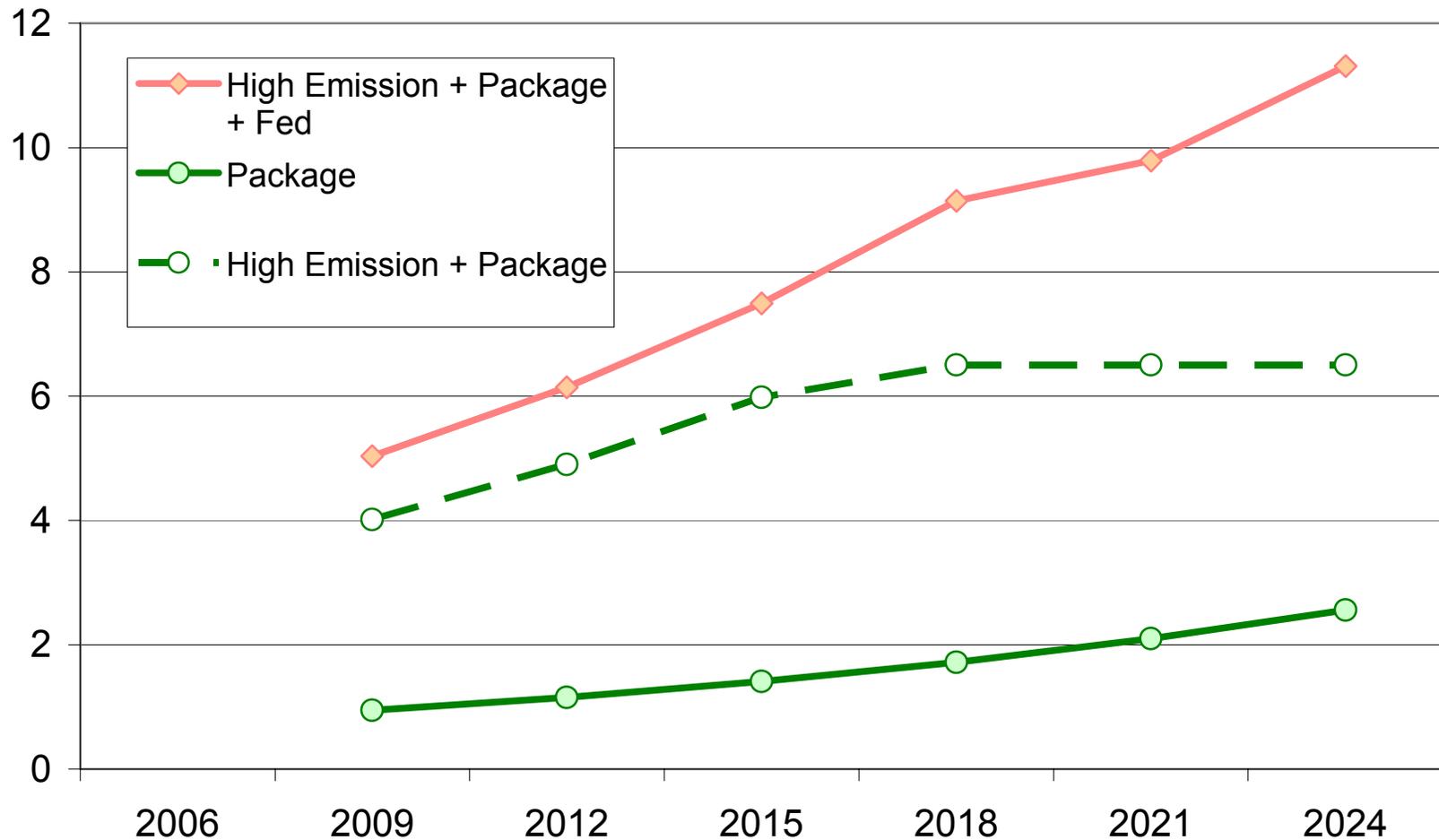


# RGGI Net Imports



- CO2 from imports increase in policy cases because of leakage
- Mainly new PC coal plants outside of RGGI
- Need to prevent or will completely undermine the program

# RGGI CO<sub>2</sub> Allowance Prices (\$/ton)



# Implied Annual Household Bill Changes

Before Energy Efficiency Savings	Household Bill Impact (\$/yr)		After Energy Efficiency Savings	Household Bill Impact (\$/yr)			
				Participating Households*		If all EE savings distributed equally across all households	
Direct Impact of RGGI due to retail price change	2015	2021	Impact of RGGI after assumed EE Programs resulting in reduction in household energy usage	2015	2021	2015	2021
<b>Standard REF Case</b>			<b>Standard REF Case</b>				
Package	2.90	5.45	Package	-92.54	-153.67	-30.51	-50.24
Package + Fed	36.84	45.99	Package + Fed	-61.95	-119.81	2.26	-12.04
Package + 2X EE	0.77	2.16	Package + 2X EE	-189.59	-314.99	-65.85	-108.84
<b>Hi Emissions REF Case</b>			<b>Hi Emissions REF Case</b>				
Package	16.02	22.44	Package	-86.15	-147.43	-19.74	-37.02
Package + Fed	31.93	38.04	Package + Fed	-71.60	-133.97	-4.31	-22.17

\* Assumes 35% Participation rate across households reached over time

## EE Programs under RGGI Scenarios are assumed to be incremental to EE in IPM REF case.

Incremental end-use energy efficiency savings were modeled as part of the RGGI policy scenarios for multiple reasons. There is uncertainty regarding how much of current and future energy savings due to ratepayer funded energy efficiency programs are incorporated into and fully captured by the ISO load forecasts used in the reference cases. A number of RGGI participating states have also enacted or are moving to enact improved building codes and energy efficiency standards for appliances that will reduce load growth and also lower household electricity bills. The SWG has also proposed that RGGI allowance revenue could be used to fund additional support for end-use energy efficiency programs.

Source: Lisa Petraglia & Dwayne Breger (MA DOER), presentation to RGGI Stakeholders, Nov. 17, 2005.

*Bill impact considers change in residential retail price and reduction in energy expenditures by the residential sector due to Energy Efficiency measures as projected by the corresponding IPM scenario run.*

*Household data (typical bills, households) from 2003 EIA at: [www.eia.doe.gov/cn/eaf/electricity/esr/tab1abcd.xls#Table1!A1](http://www.eia.doe.gov/cn/eaf/electricity/esr/tab1abcd.xls#Table1!A1). Analysis does not consider escalation in energy expenditure or number of households over time.*



# Treatment of Renewables in RGGI

- **CO<sub>2</sub> reduction from state RPS programs factored into baseline projection – lowers cost of meeting the cap**
- **RGGI model rule does not recognize CO<sub>2</sub> reduction benefit of additional renewables from voluntary market, economic, or other reasons**
- **UCS and CRS recommends retiring CO<sub>2</sub> allowances to recognize this benefit**

- **Future limits on greenhouse gas emissions are coming soon**
- **These limits pose a significant financial risk to utilities and ratepayers and will raise the cost of using fossil fuels to generate electricity**
- **Wind power can provide an affordable hedge against this financial risk**
- **Mandatory market based limits on CO<sub>2</sub> with complementary policies for efficiency and renewable energy is the approach with the lowest costs and greatest benefits**