



# **Understanding Major Analyses of H.R. 2454, American Clean Energy and Security Act of 2009**

EPRI Global Climate Program  
July 22, 2009

# Announcements

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**Please put your phones on mute unless you have questions**

**Please raise questions at any time**

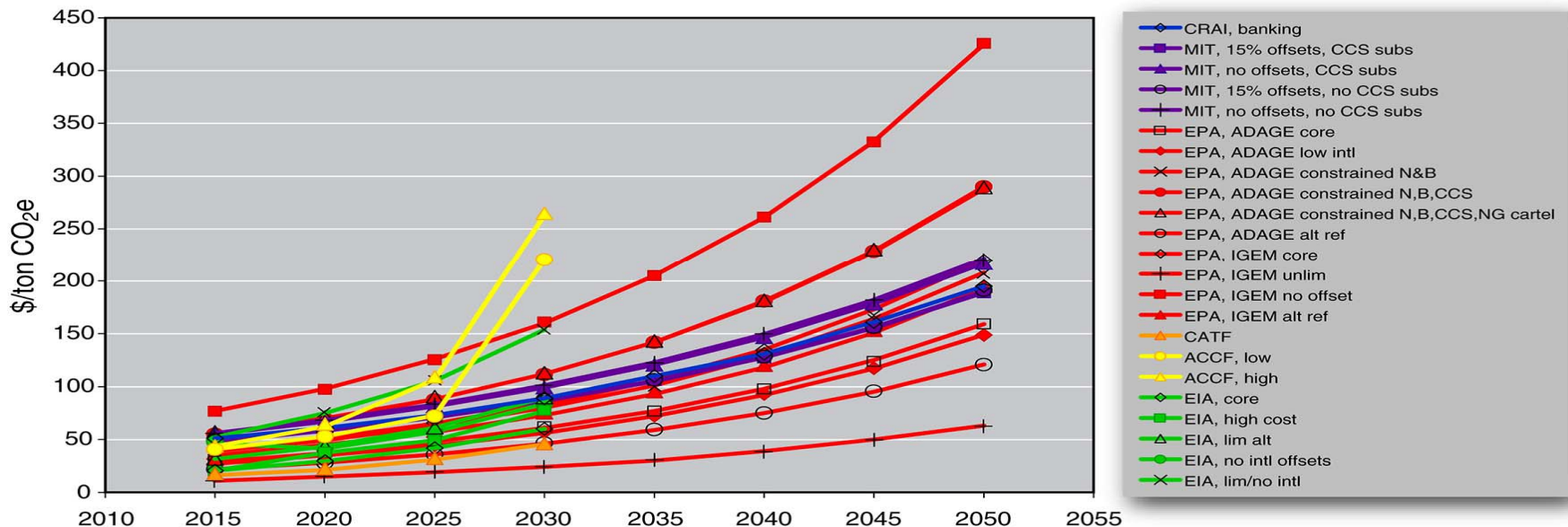
**Please do not put phones on hold**

## **Webcast Recording Notice**

- We are recording this webcast and its audio discussion.
- Your continuing participation in this webcast provides consent to the recording.
- If you do not consent, you should end your participation.
- We plan to make this recording available to members-only.

# Background

- May 2008, we held a Capitol Hill workshop to understand cost estimates of Lieberman-Warner
  - Estimates from 6 modeling teams + CBO
  - Differences due primarily to different baselines and different electric sector technology cost and deployment assumptions
  - Presentations and webcast available at EPRI Newsroom archive:  
<http://my.epri.com/portal/server.pt?open=512&objID=342&PageID=223366&cached=true&mode=2>



# Today's Webcast

- Is for members only (Climate Programs 102 and 103)
- Will help begin to understand the key assumptions that drive differences in analyses released to date
  - Unlike Lieberman-Warner, differences in \$/ton cost estimates are driven assumptions about the availability of international offsets
  - If offsets are limited, then the electric sector assumptions again become critical
- Is likely the beginning of a discussion – many more public analyses are on the way

Please participate actively!

What important questions/communication issues do you see?

# Webcast Overview

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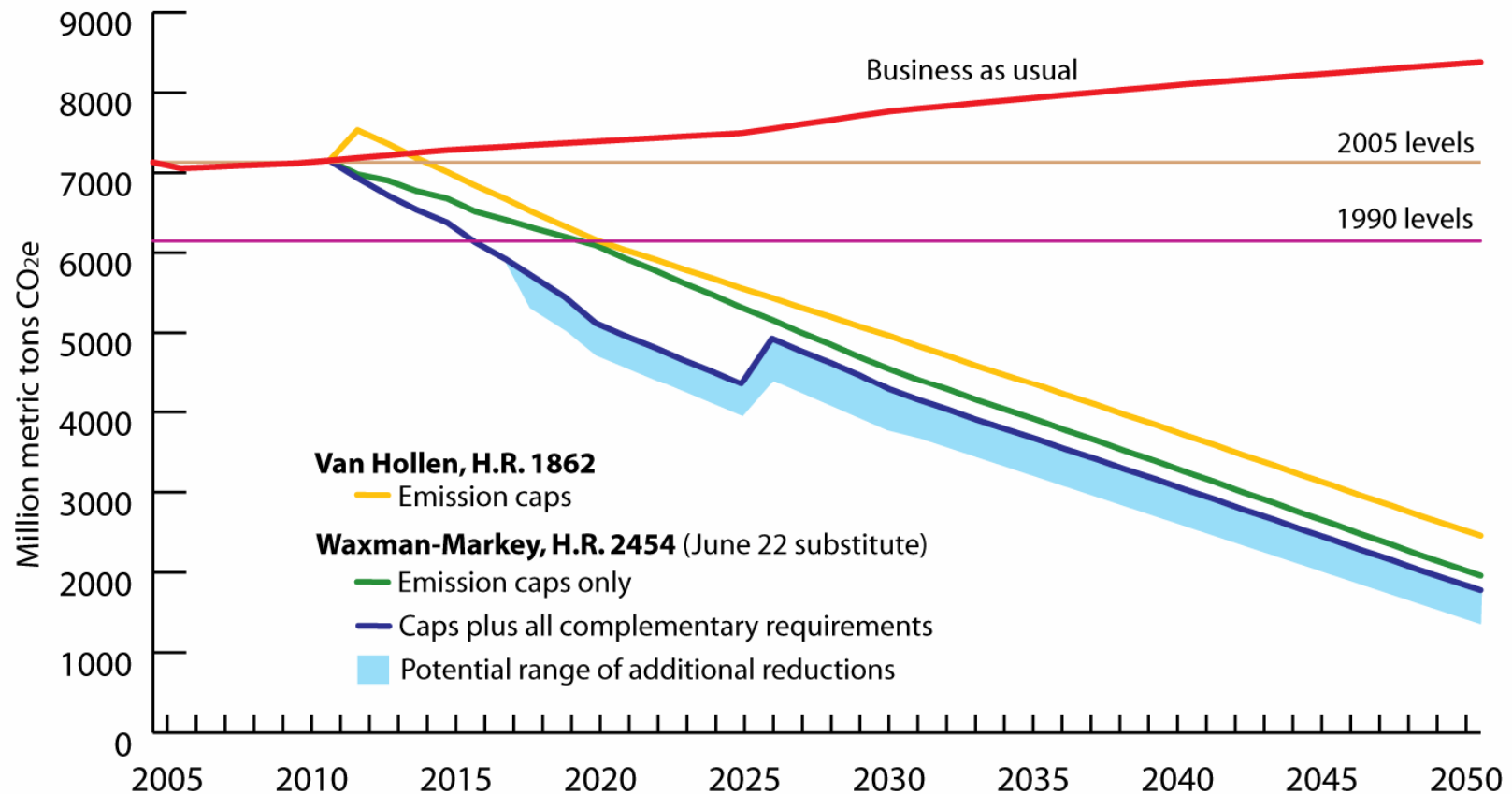
- Introduction to public estimates Tom Wilson
  - Private NEMS analysis Vic Niemeyer
  - Exploring EPA offset assumptions Francisco de la Chesnaye
  - Examining household impacts Tom Wilson
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- Thanks to Delavane Diaz and Adam Diamant for their help with the presentation

# H.R. 2454: Combination of Incentives and Mandates Plus Economy-wide Cap & Trade Program

- Titles I & II deal with clean energy and energy efficiency
  - CERES combines renewable electricity and energy efficiency standards
  - Energy efficiency programs, CCS and other technology programs
- Title III establishes a cap & trade system for greenhouse gas emissions
  - Cap decreases over time so that emissions are 17% below 2005 levels by 2020, 42% below by 2030, and 83% below by 2050
  - Unlimited banking of allowances, restrictions on borrowing
  - Strategic Allowance Reserve (1-3% of allowances withheld)
  - Offsets limited to 2,000 million metric tons CO<sub>2</sub> equivalent (MtCO<sub>2</sub> e) per year (actually less)
  - Supplemental reductions from reduced deforestation through allowance set-asides
- Title IV addresses competitiveness issues / transition to a clean energy economy
  - Creates an output-based allowance allocation mechanism based on H.R. 7146 (Inslee-Doyle bill)

# Waxman-Markey Passed House 219-212 on June 26th: Seeks to Cut CO<sub>2</sub> Emissions Well Below Historic Levels

Emission Reductions Under Cap-and-Trade Proposals in the 111th Congress, 2005-2050  
June 25, 2009

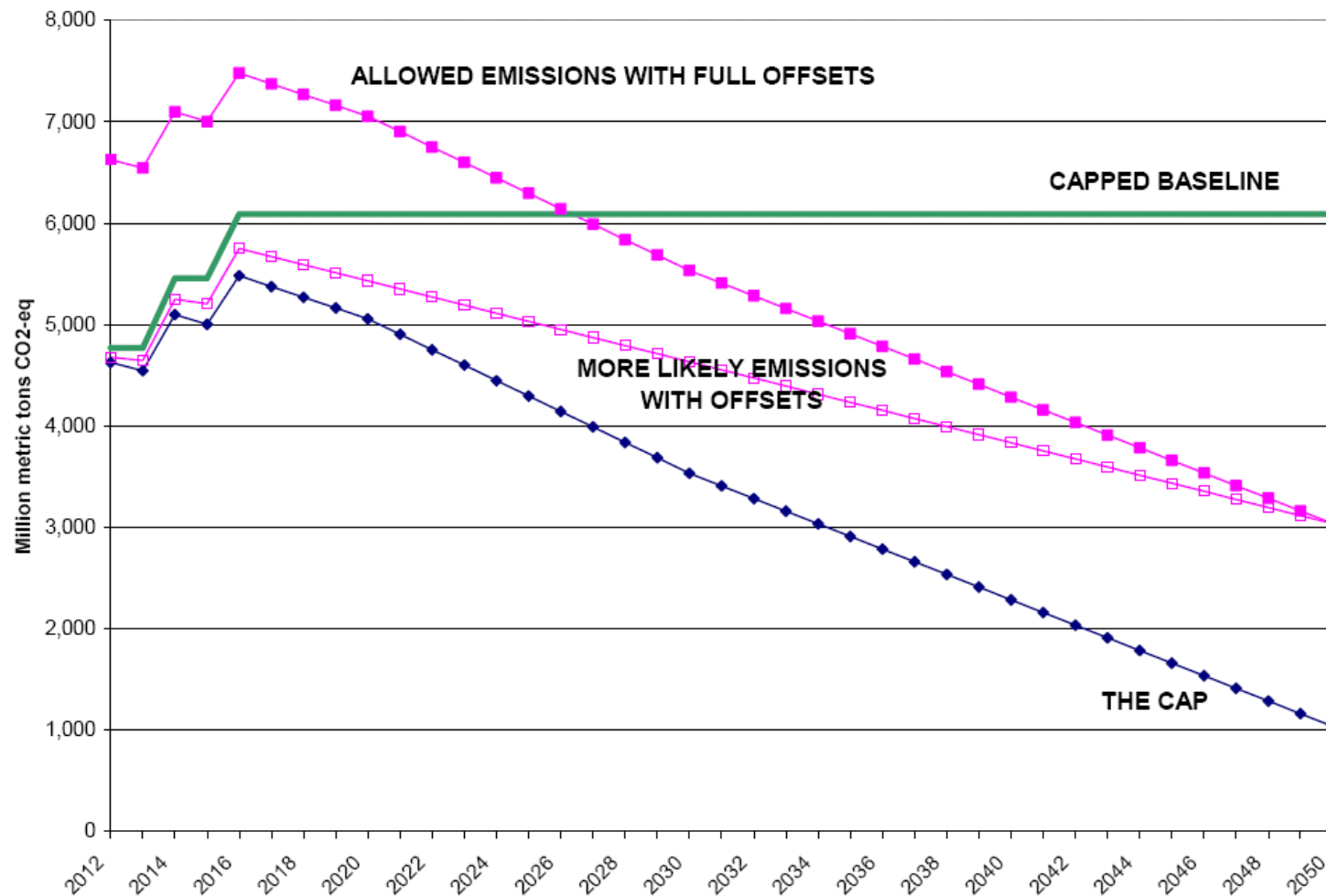


WORLD RESOURCES INSTITUTE

For a full discussion of underlying methodology, assumptions and references, please see <http://www.wri.org/usclimatetargets>.

# Generous Offset Provisions Could Loosen Emissions Cap (Adapted from MIT's Denny Ellerman)

## The Effect of Offsets: Practically Possible





# Very Limited Number of Public Analyses to Date

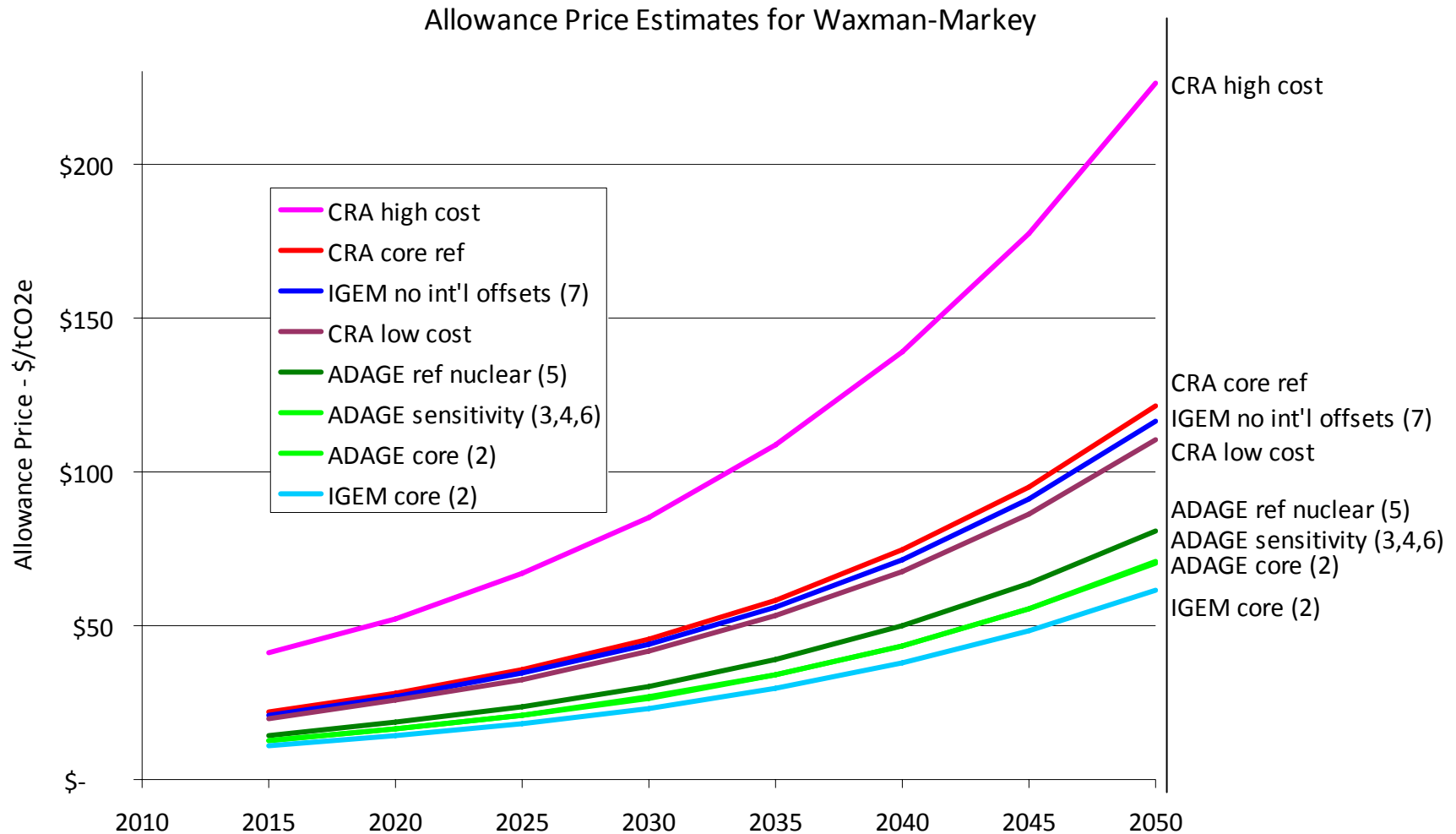
## Selected Analyses

- EPA – macroeconomic analyses with ADAGE and IGEM; electric sector analysis for “core” policy scenario with IPM
- CBO – input/output analysis that depends on EPA \$/ton permit costs
- CRA (Black Chamber of Commerce)
- Heritage Foundation – macroeconomic analysis using IHS Global Insight
- MIT and others – generic analysis of cumulative allowable emissions from 2012 to 2050
  - 167 billion metric tons == linear reductions to 80% below 2008 level
  - 203 billion metric tons == linear reductions to 50% below 2008 level

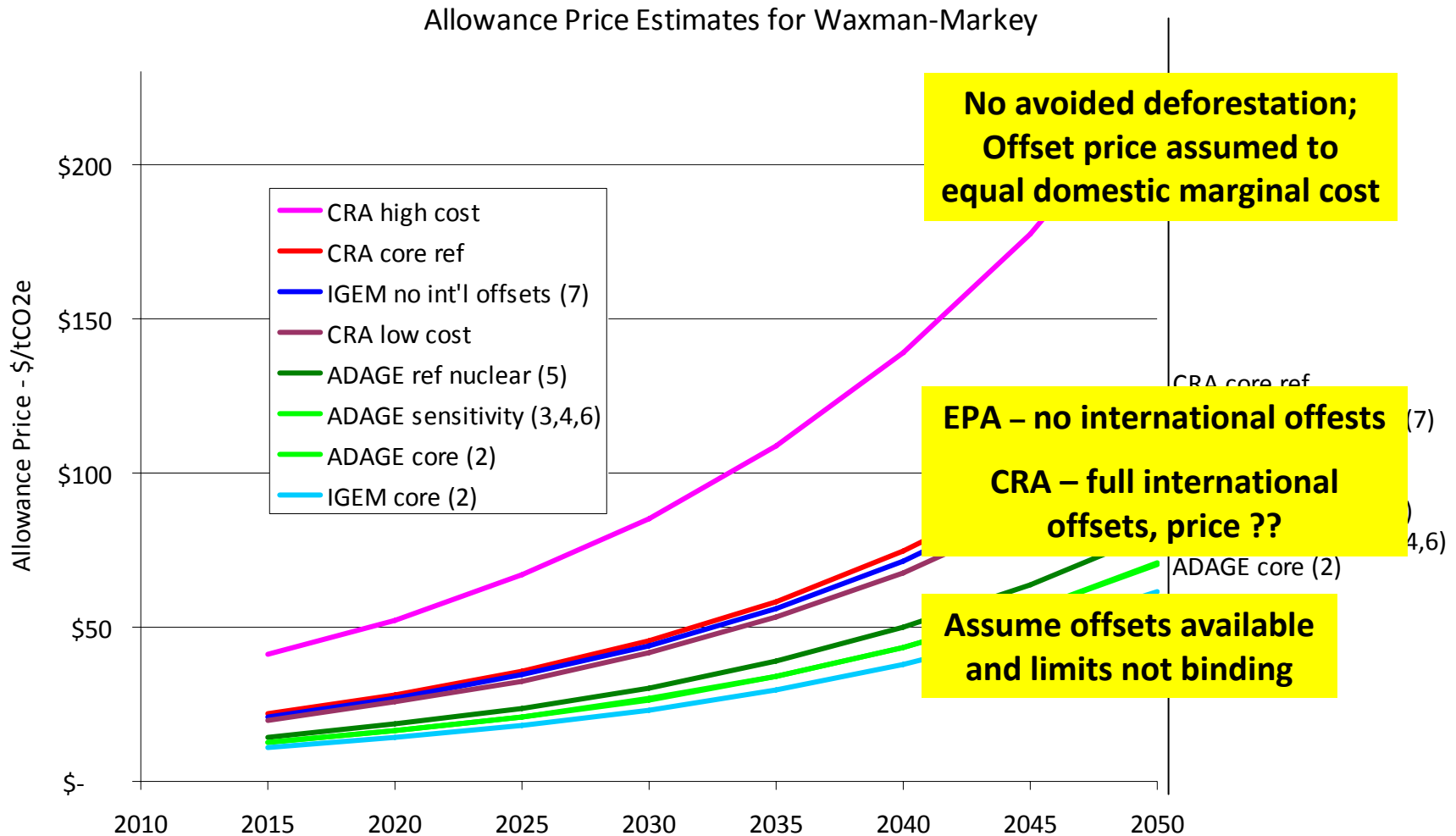
Analyses to date focus primarily on Title III cap-and-trade provisions

Heritage Foundation provides limited results/assumptions (e.g., no estimate of \$/ton allowance price reports); difficult to interpret

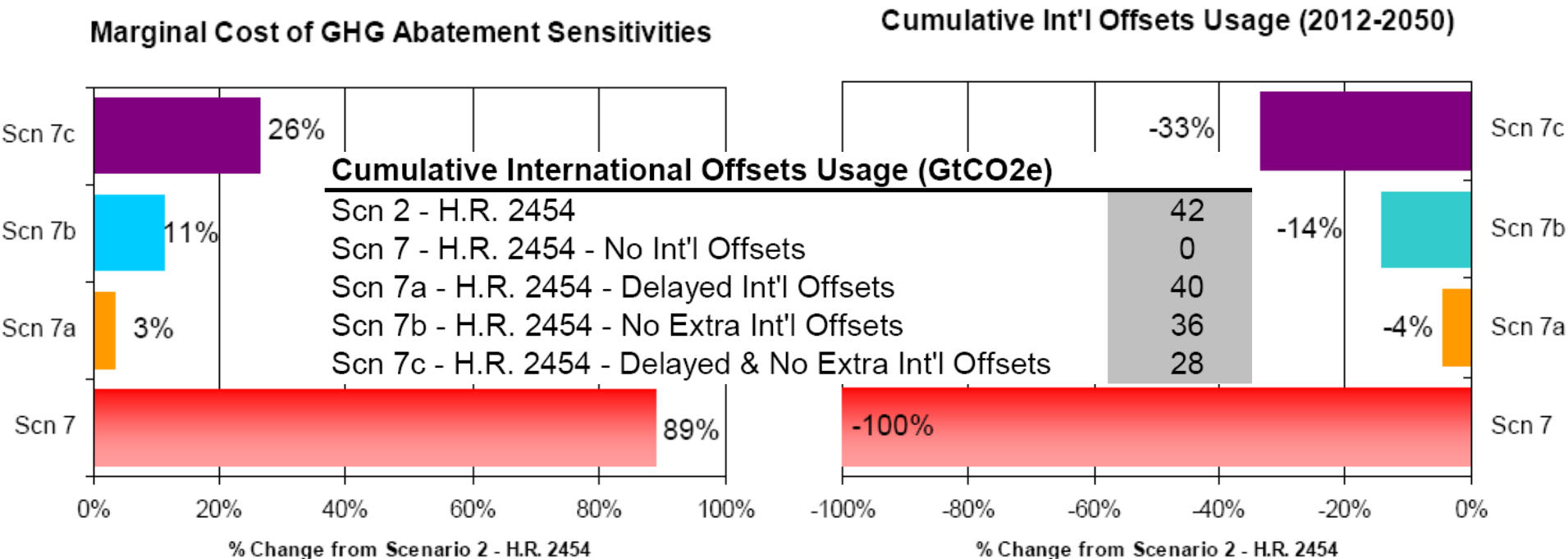
# Public Estimates of Waxman-Markey Allowance Prices



# Public Estimates of Waxman-Markey Allowance Prices



# EPA's Analysis Shows Access to International Offsets is Critical for Allowance Cost Containment

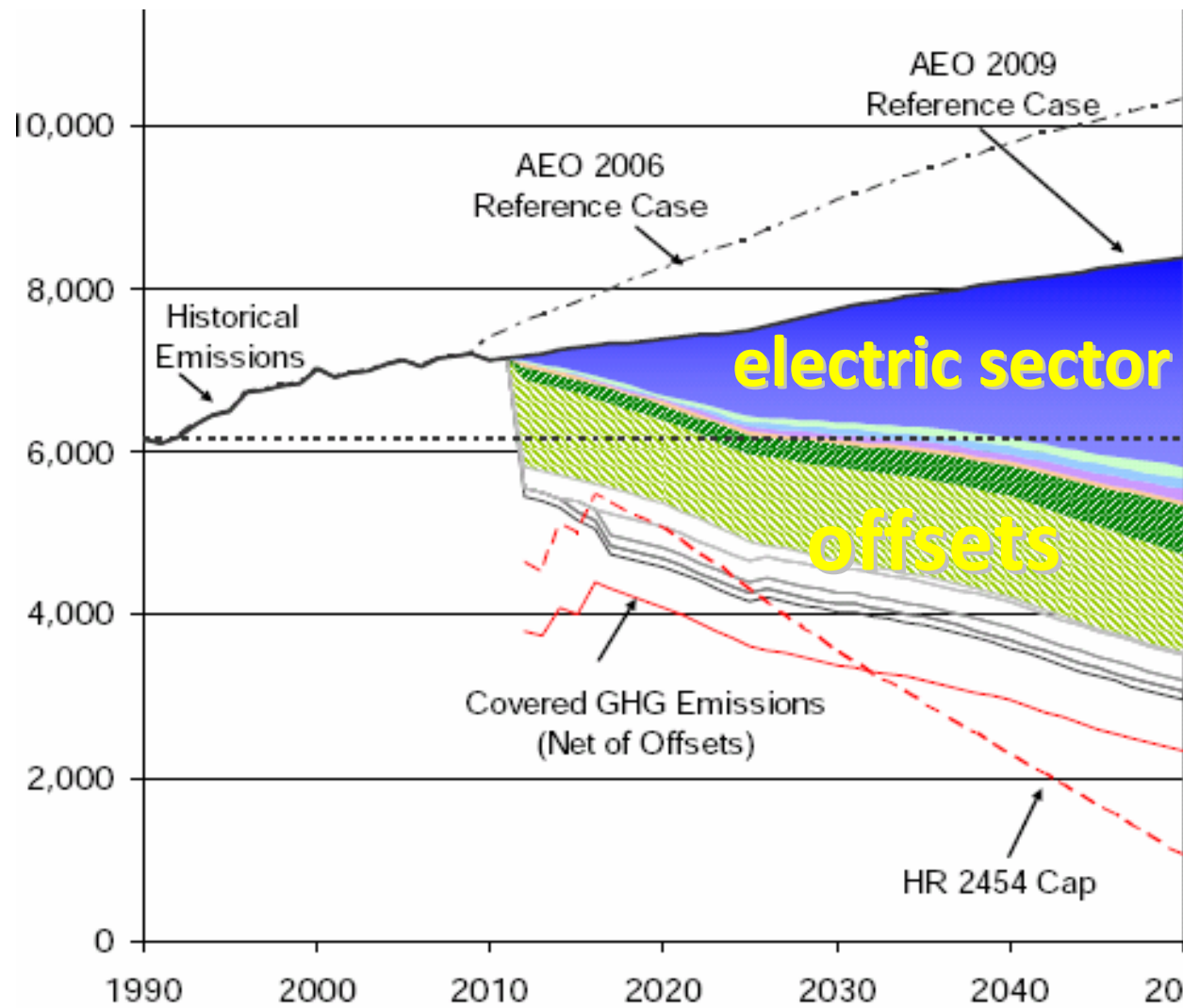


**Without international offsets, allowance price would increase 89% relative to H.R. 2454**

Source: EPA Analysis of the American Clean Energy and Security Act of 2009, H.R. 2454 in the 111th Congress, U.S. EPA, 6/23/09, Page 31.

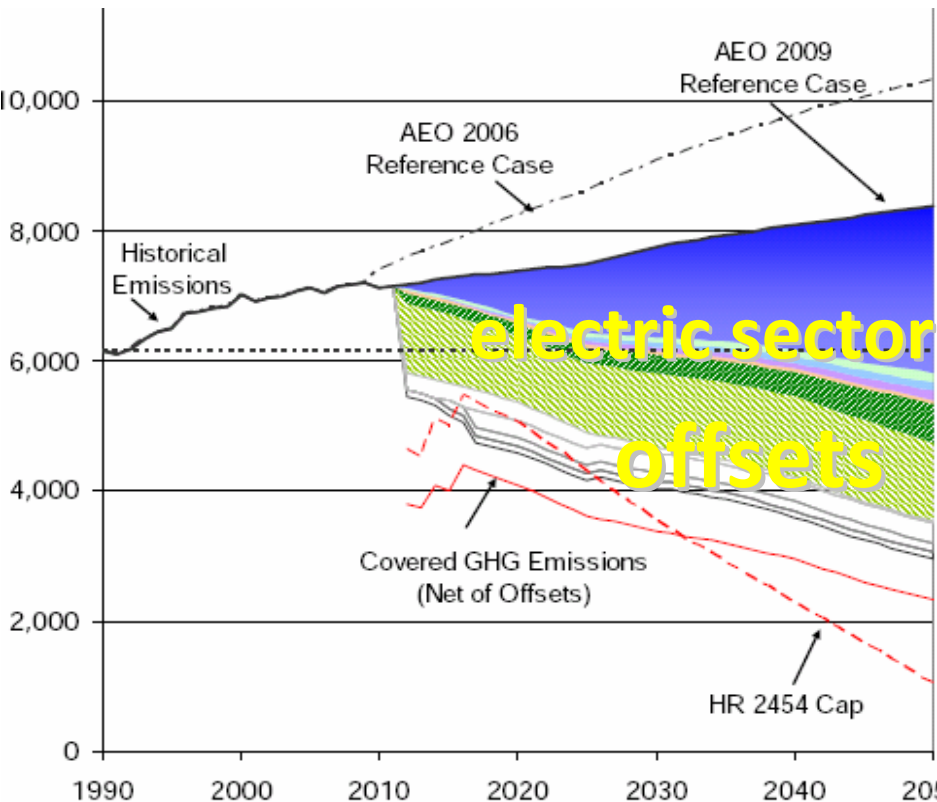
# Where do Emission Reductions Come From?

## EPA HR 2454 Core Case, June 23

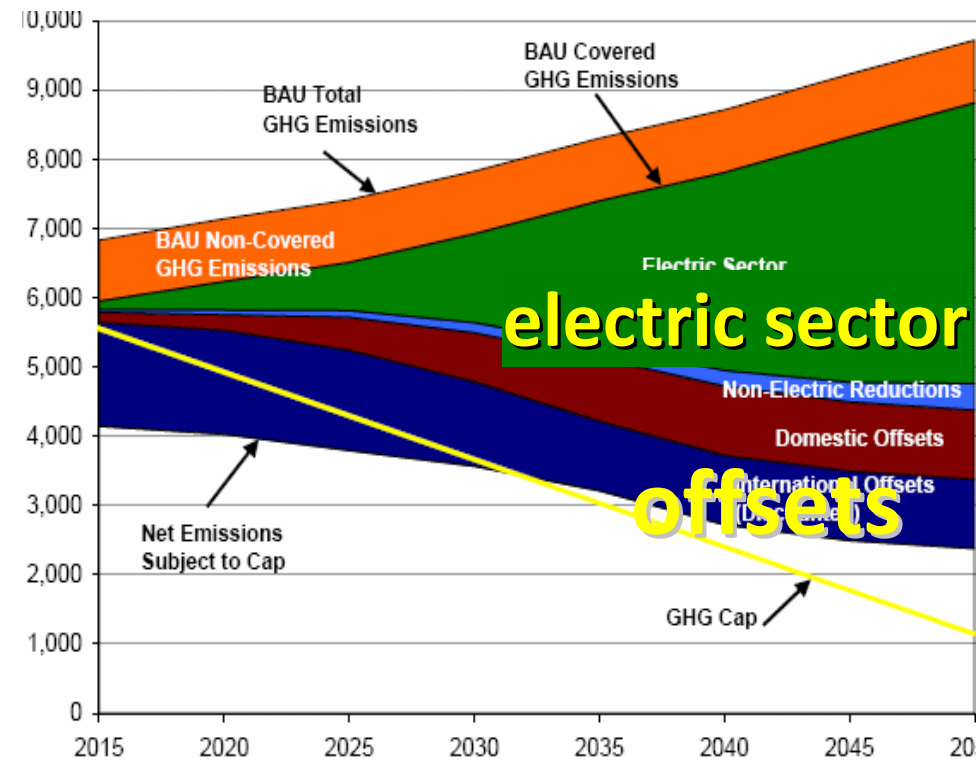


# Where do Emission Reductions Come From? Offsets (primarily international) and Electric Sector

EPA HR 2454 Core Case, June 23

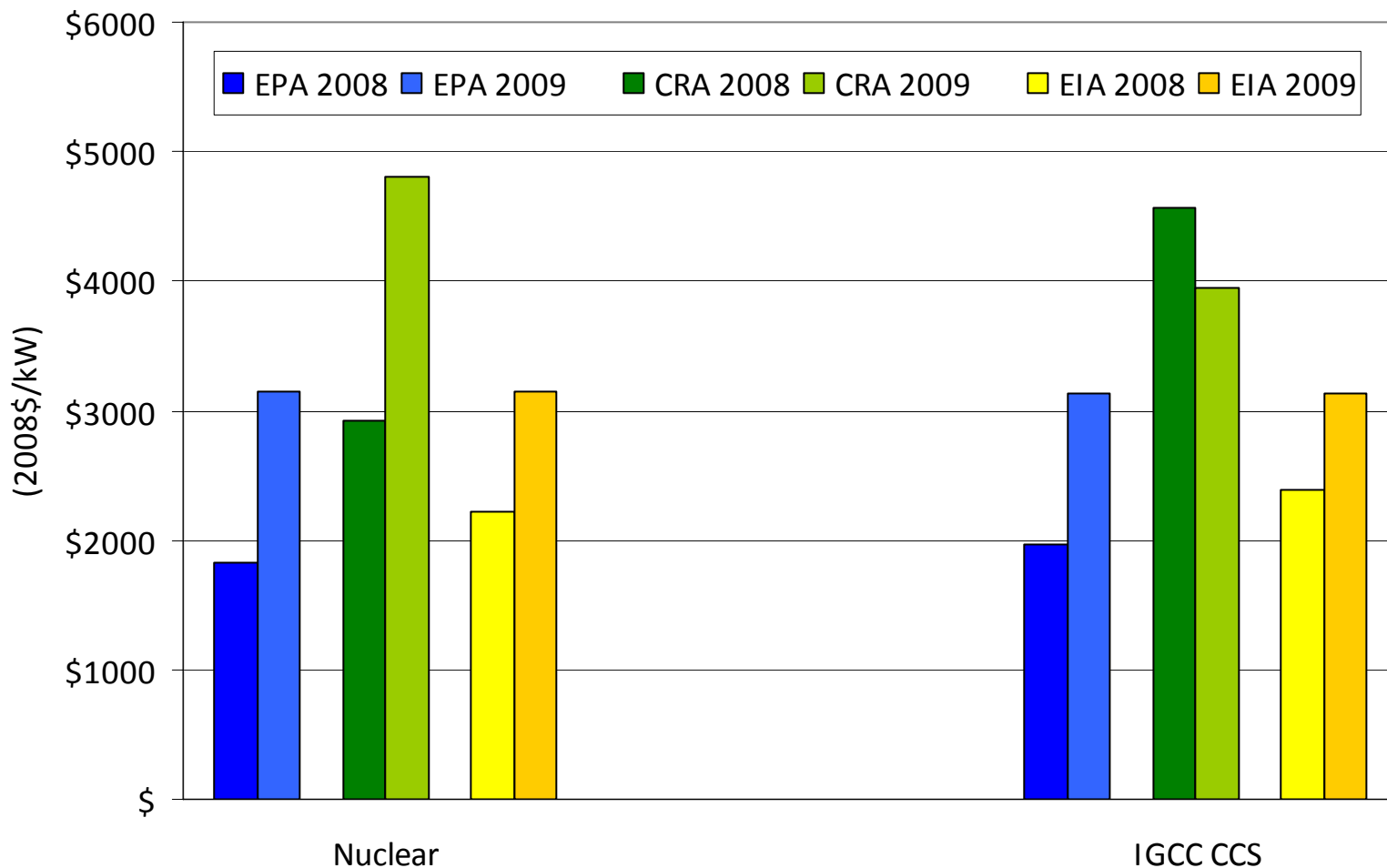


CRA Reference Policy Case, 2009

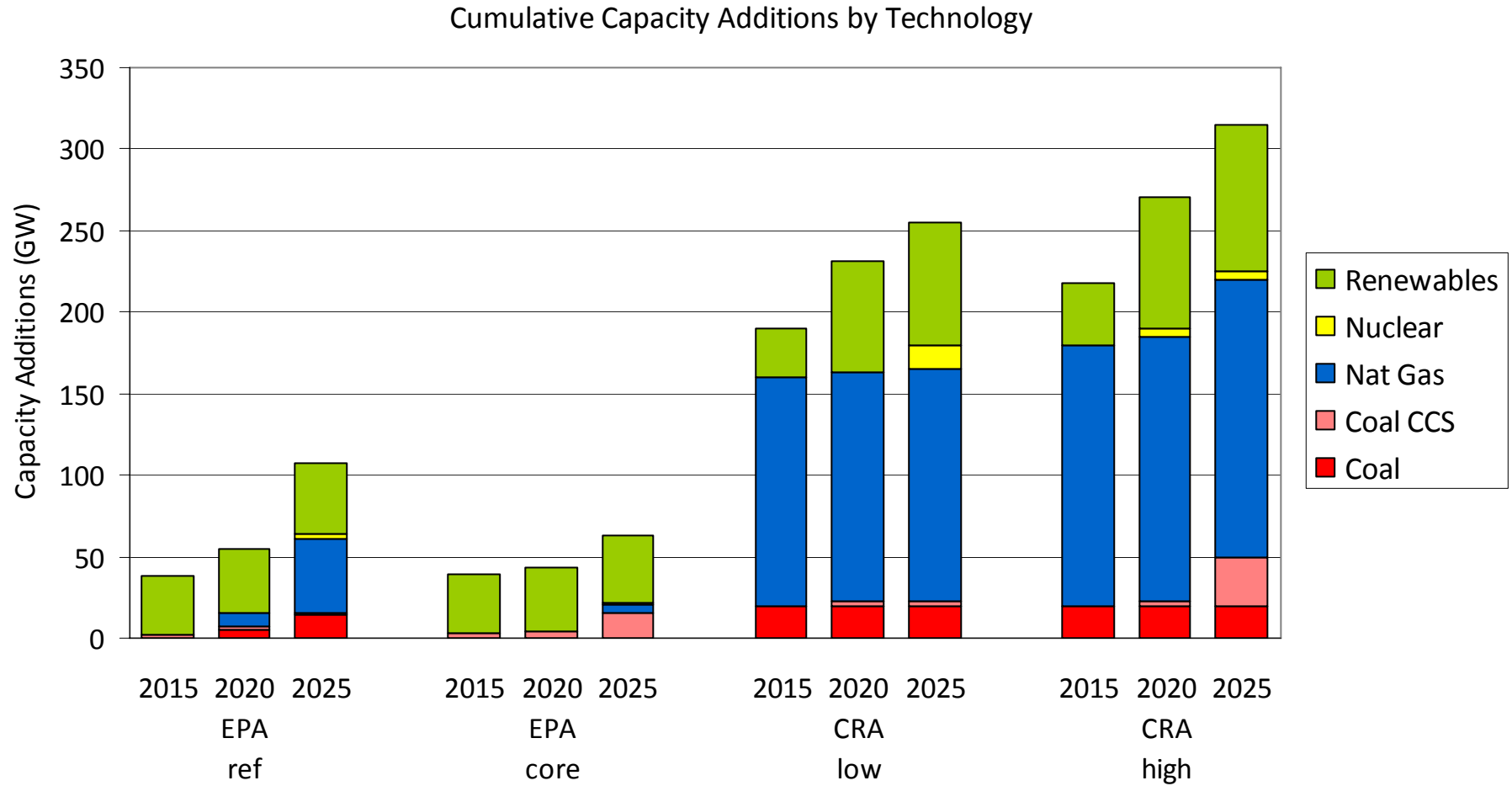


# When Domestic Capped Reductions Have to be Made, Capital Costs for Low-carbon Generation are Important

Overnight Capital Cost for 2020 Build



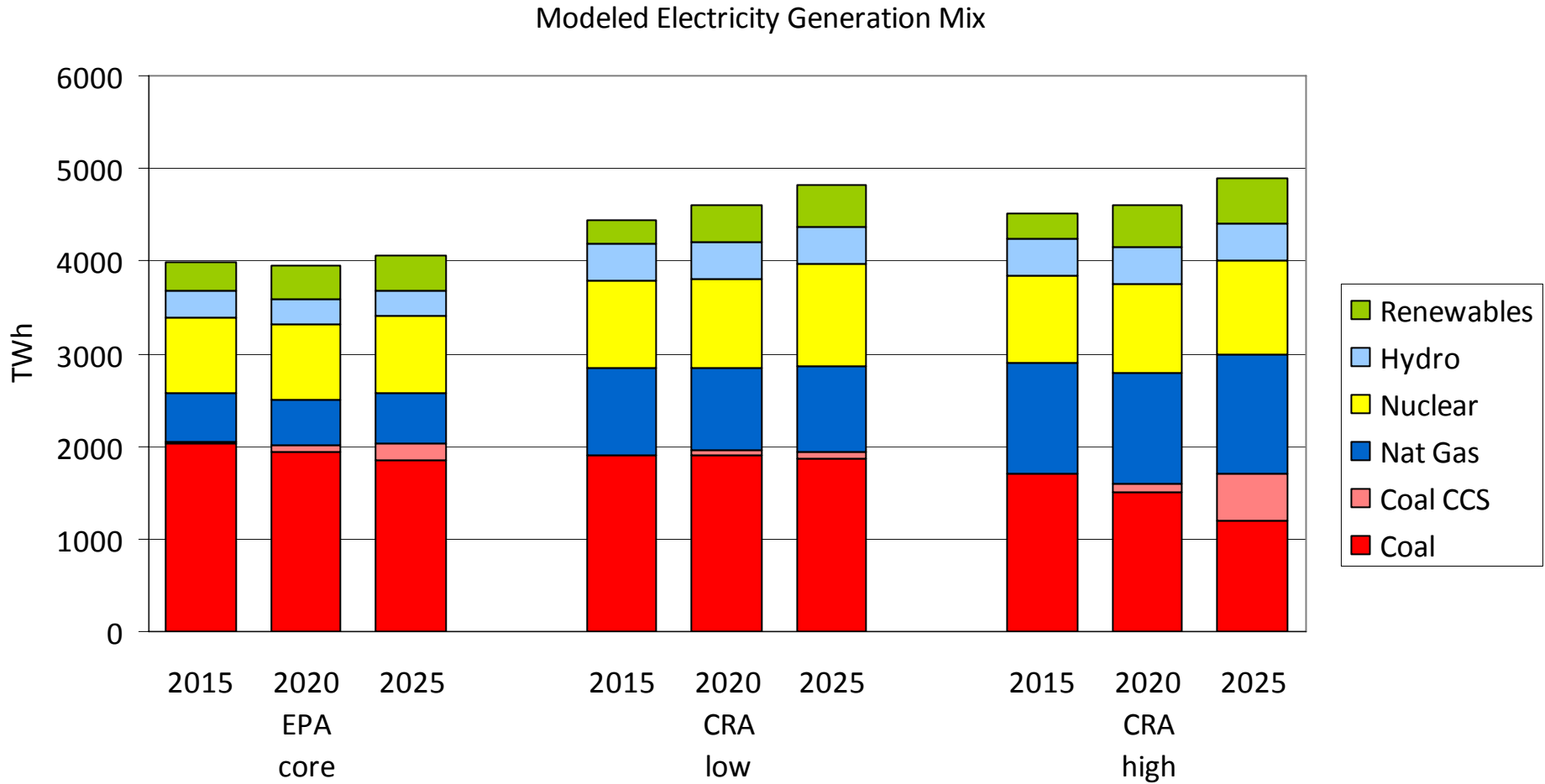
# EPA Analyses of Reference and Policy Cases Estimate Limited Electric Capacity Additions through 2025



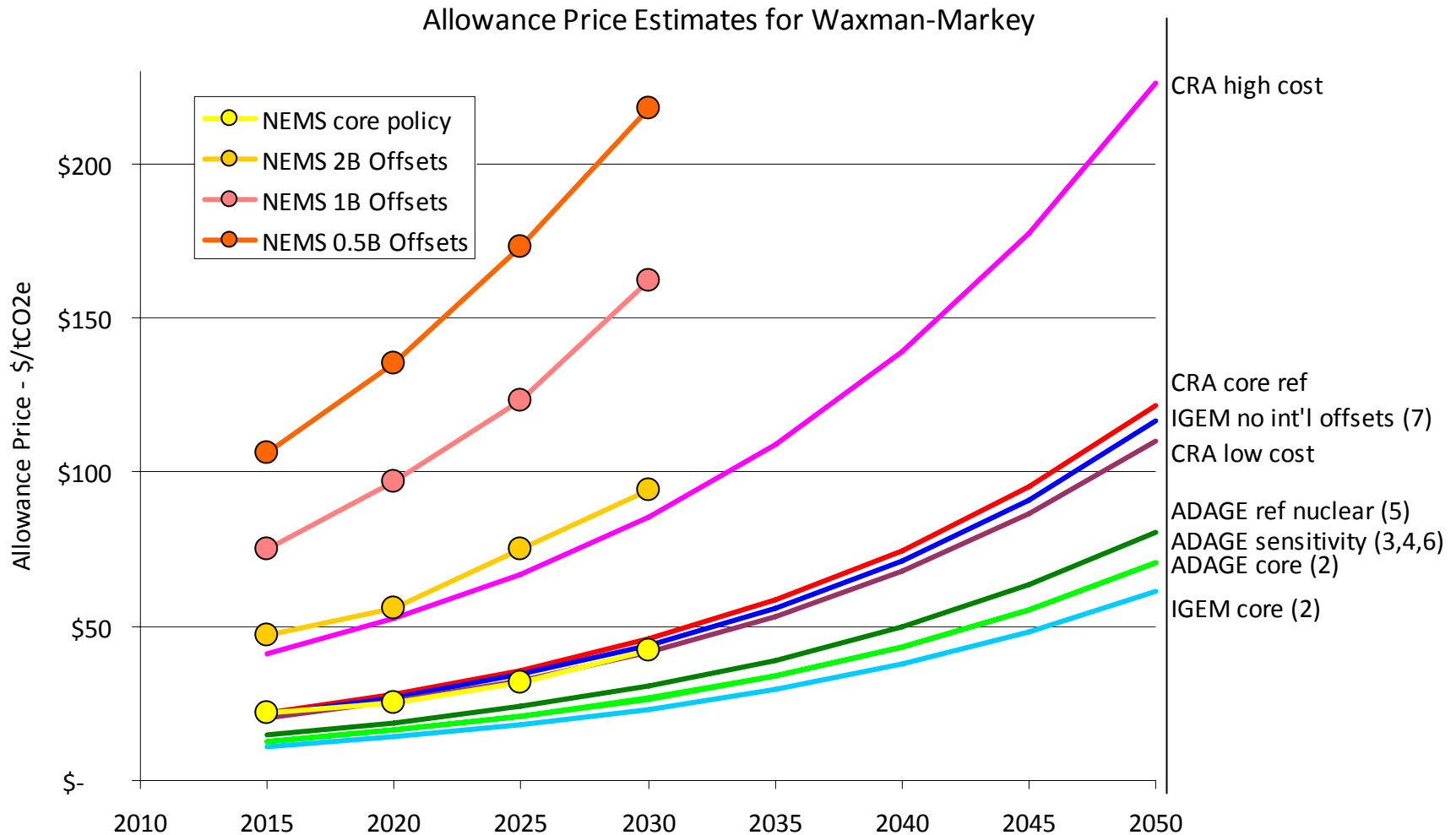
Note: EPA did not run their electric sector model for a case with limited international offsets



# Electric Sector Generation Mix Largely Unchanged in EPA Core Analysis



# Estimated Allowance Prices for Waxman-Markey Including EPRI/PacifiCorp NEMS Analyses



# Private NEMS Analysis for PacifiCorp

- Preliminary NEMS results courtesy of PacifiCorp, a subsidiary of MidAmerican Energy Holdings Company
- NEMS and AEO 2009 publicly available from EIA
- EPRI applied model to represent Waxman-Markey on behalf of PacifiCorp
  - PacifiCorp assumptions on power plant costs (2008)
  - PacifiCorp/EPRI team set scenarios

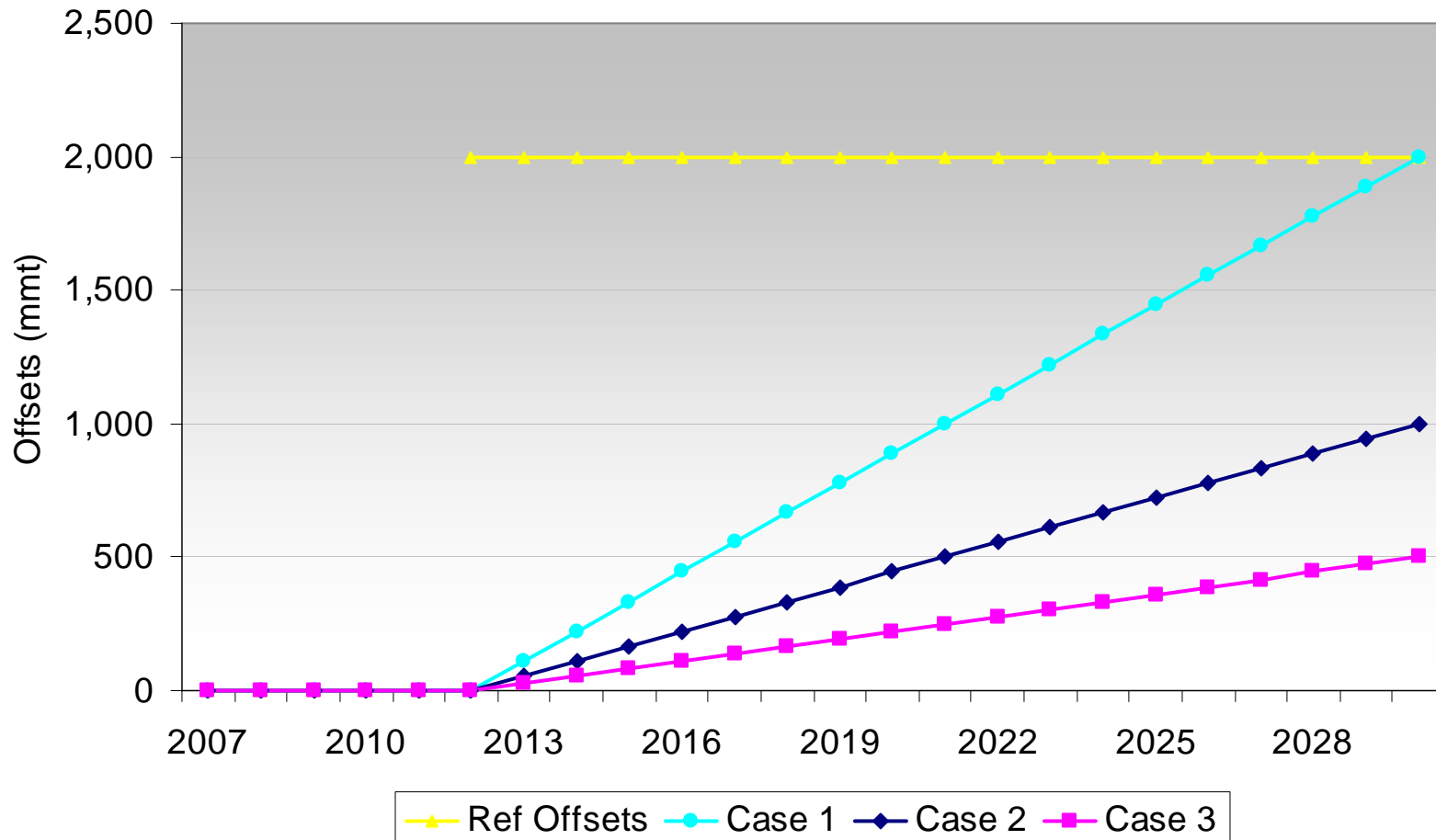


# NEMS Analysis Highlights Critical Role of Offset Availability Assumptions

- Based on AEO 2009 updated w. Stimulus Package and revised CAFE standards
- No link to macro economy
- Best-effort representation of H.R.2454 (E&C version)
  - Cap-and-trade program
  - RES and Energy Efficiency provisions (15% + 5%)
- Reference Case has full 2b tons of offsets availability
- Three offsets sensitivity cases phase-in offsets from zero
  - Case 1 “Plentiful” 2 Billion Tons by 2030
  - Case 2 “Scarce” 1 Billion Tons by 2030
  - Case 3 “Very Scarce” half Billion Tons by 2030

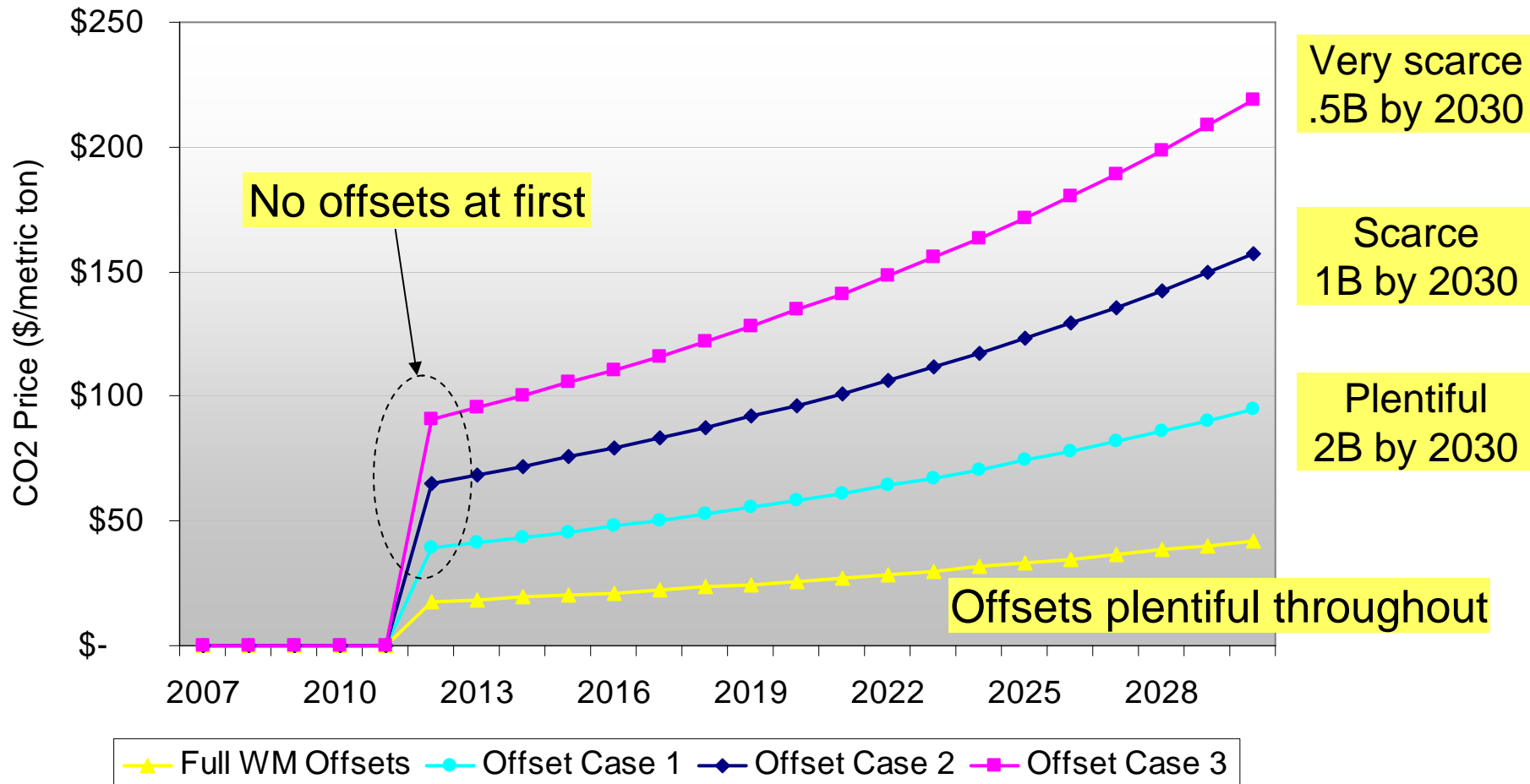
# Offset Sensitivity Cases

Scenario Offset Availabilities



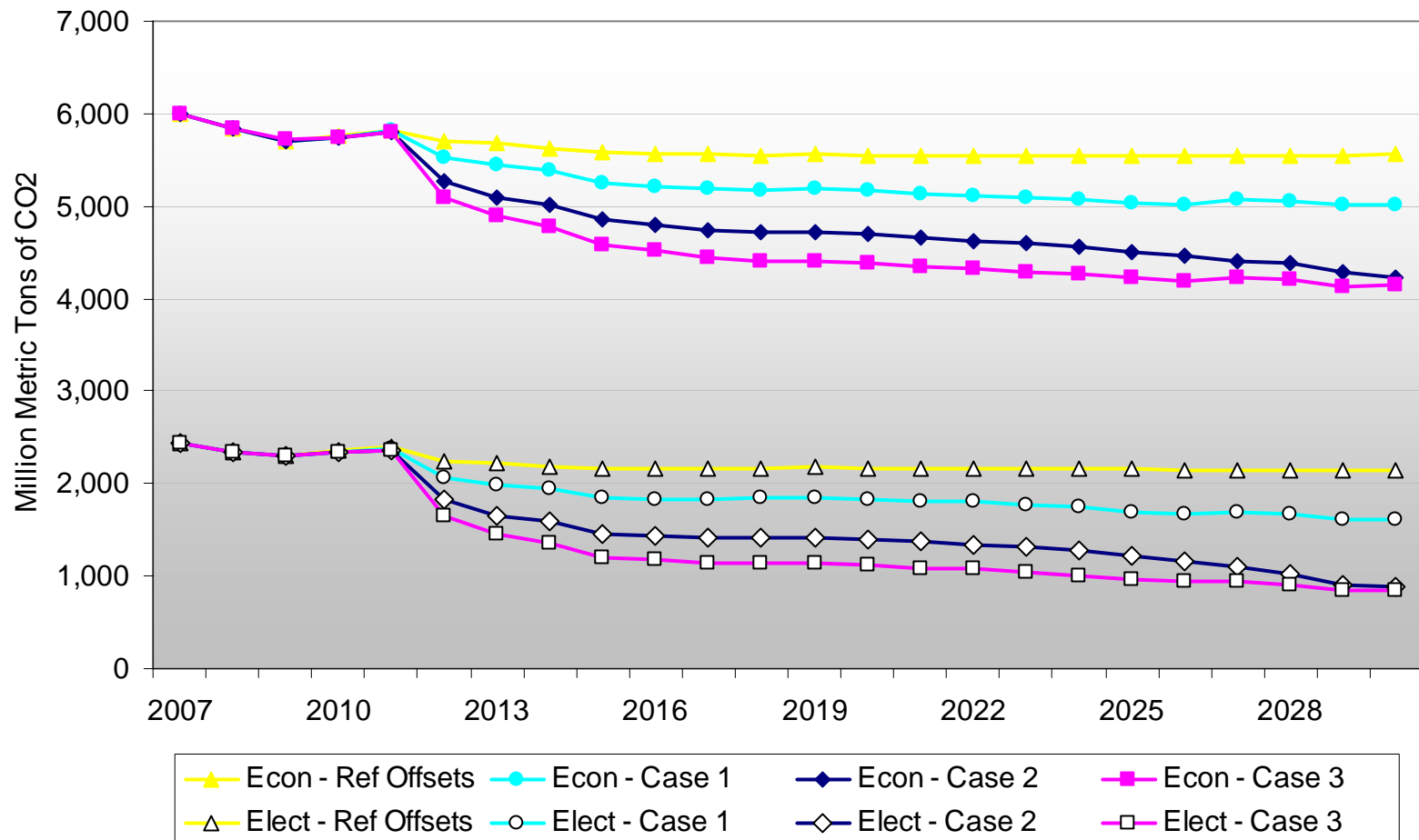
# NEMS Results Highlight Critical Importance of Offset Availability for Cost Containment

NEMS CO2 Price Path to Meet Abatement Target



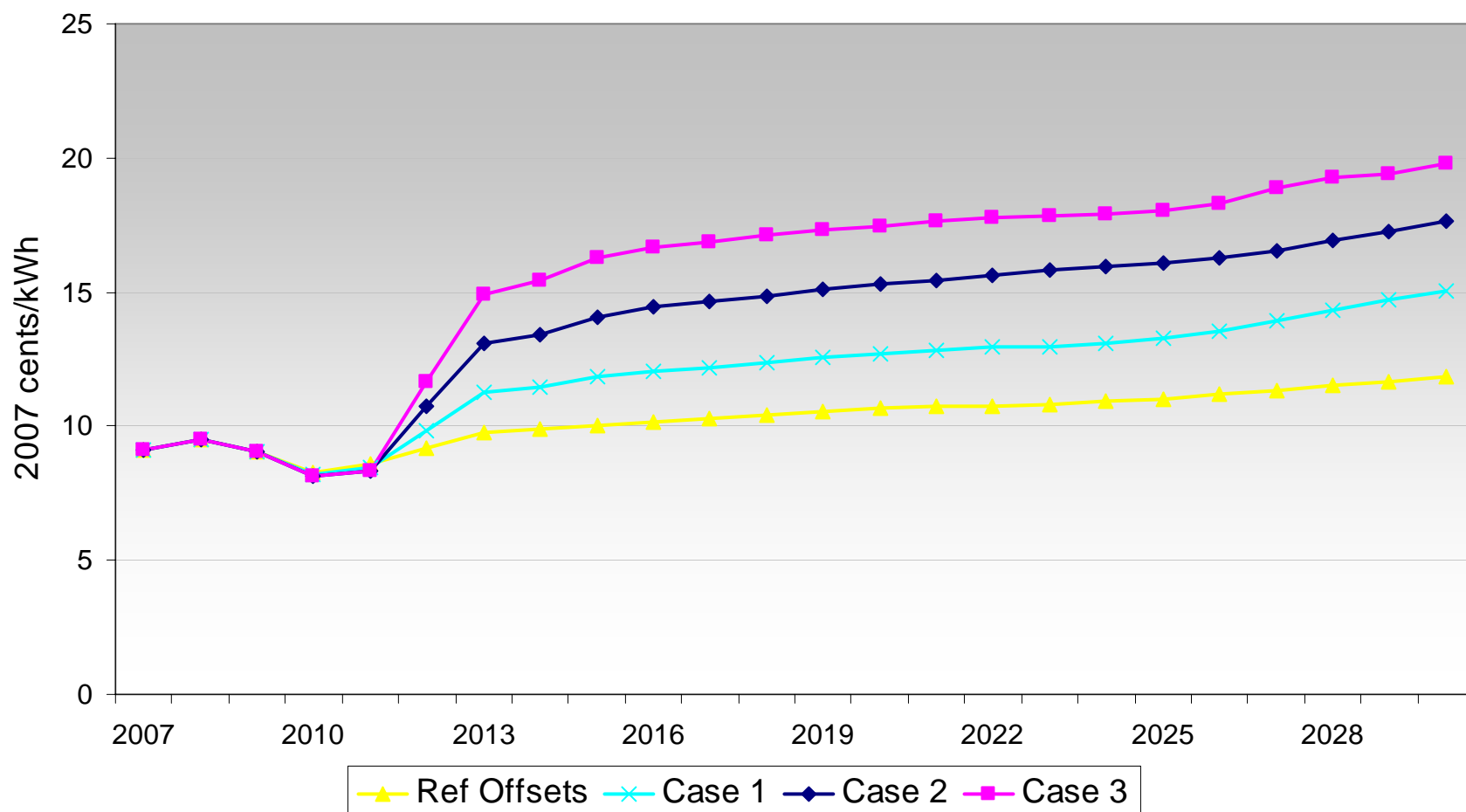
# Results Also Show Electric Sector Providing Over 90% of Economy's Total CO<sub>2</sub> Abatement

Economy-Wide and Electric Sector CO<sub>2</sub> Emissions



# Electric Consumers See Rate Increases (partly offset by allowance transfers – not shown)

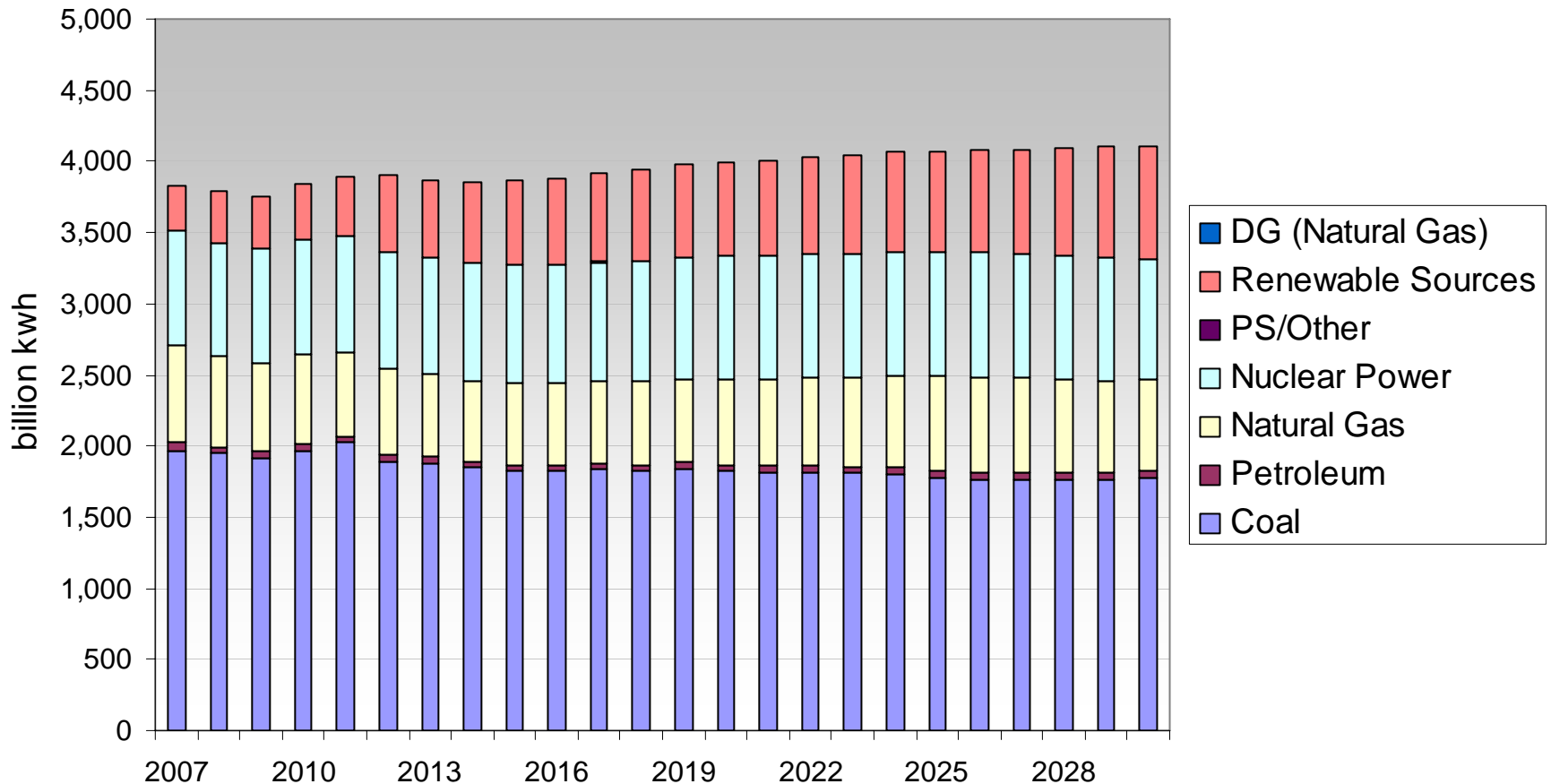
Average Electricity Price





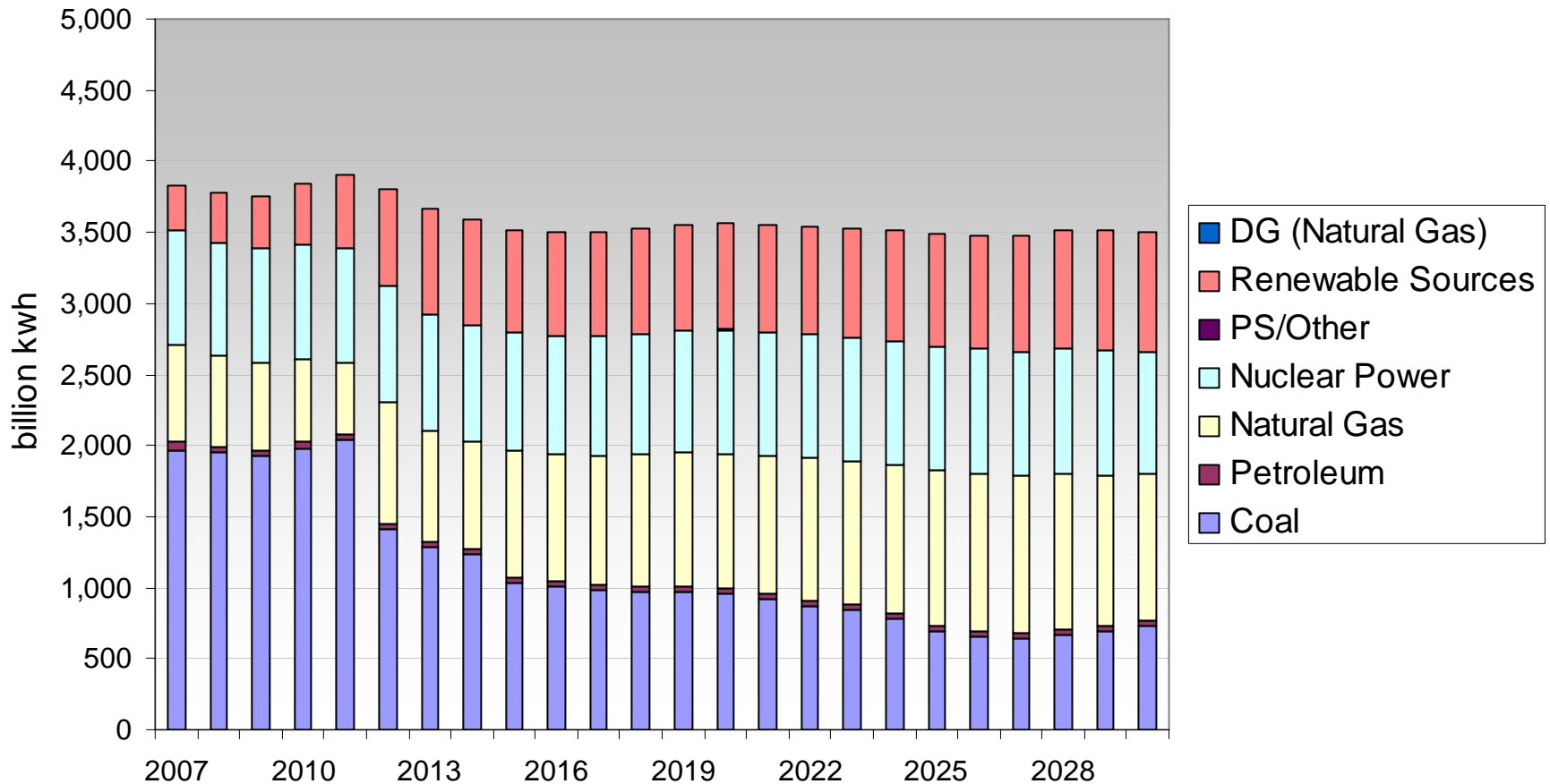
# Generation By Fuel Type – HR 2454 with Full Offsets

Generation By Fuel Type - Ref Offsets



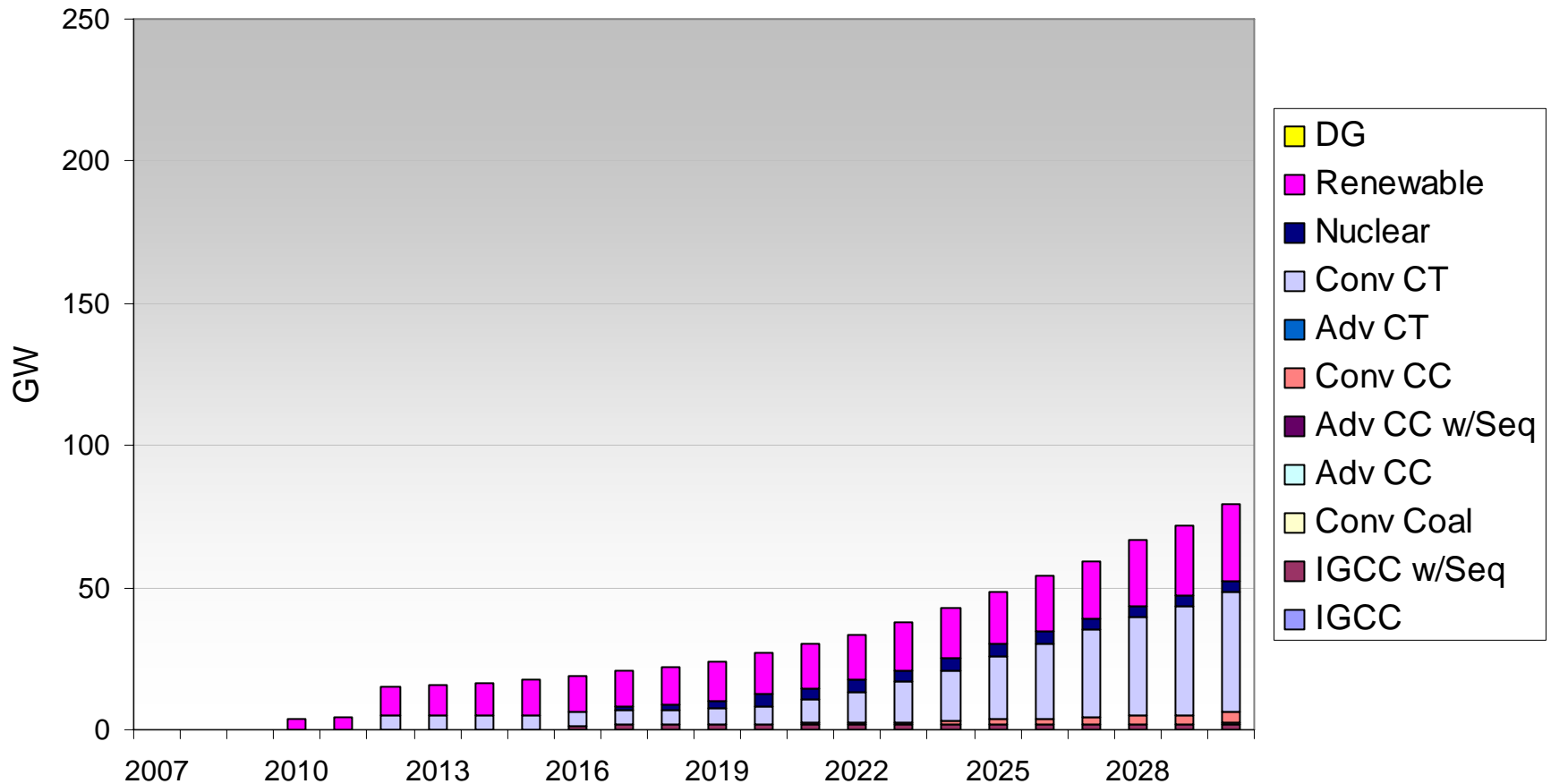
# Generation By Fuel Type – Offsets Limited to 1B (mostly burns more gas)

Generation By Fuel Type - Case 2



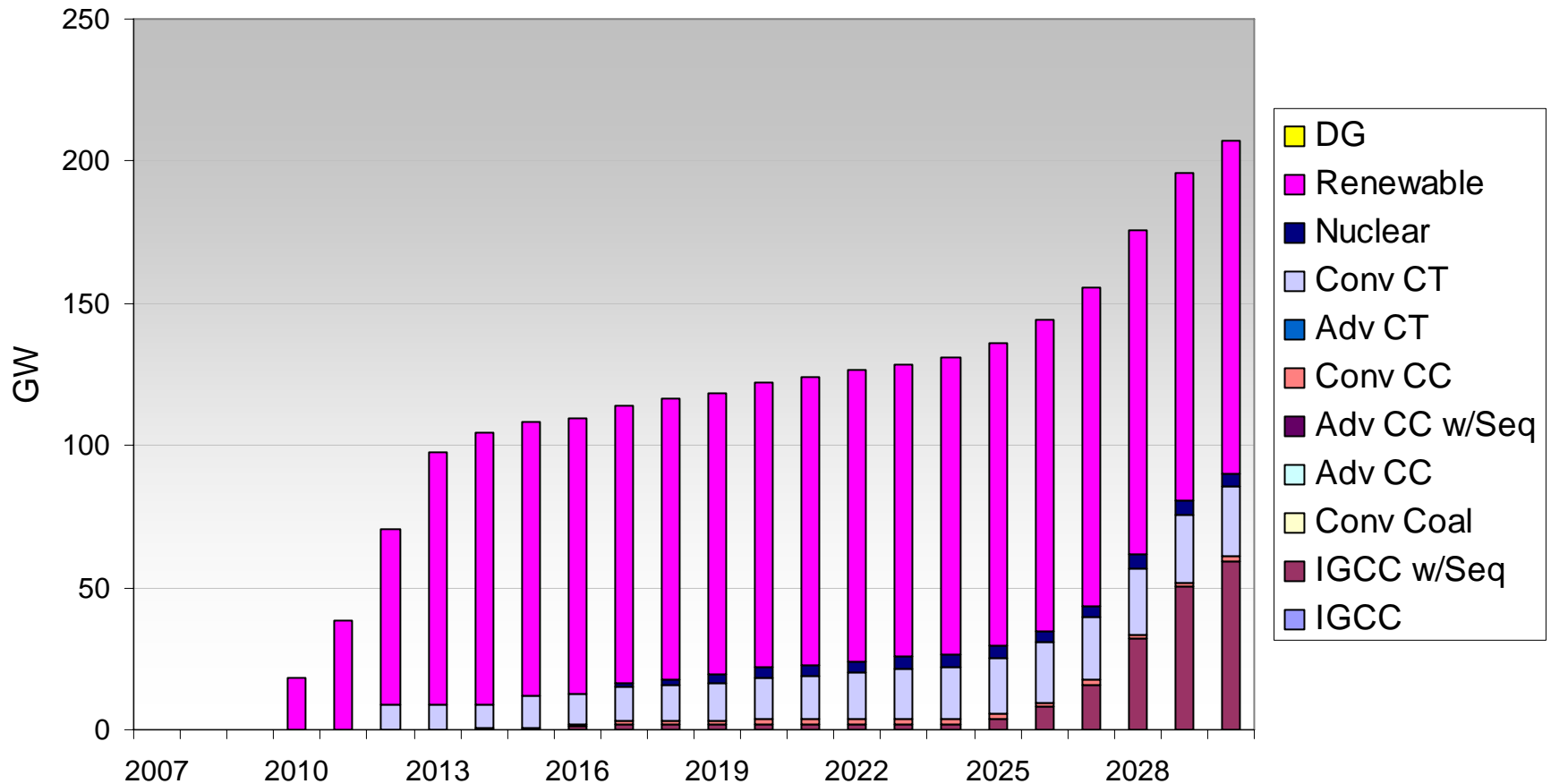
# Cumulative Capacity Additions – HR 2454 w Full Offsets

Cumu. Capacity Addition - Ref Offsets



# Cumulative Capacity Additions – Offsets Limited to 1B

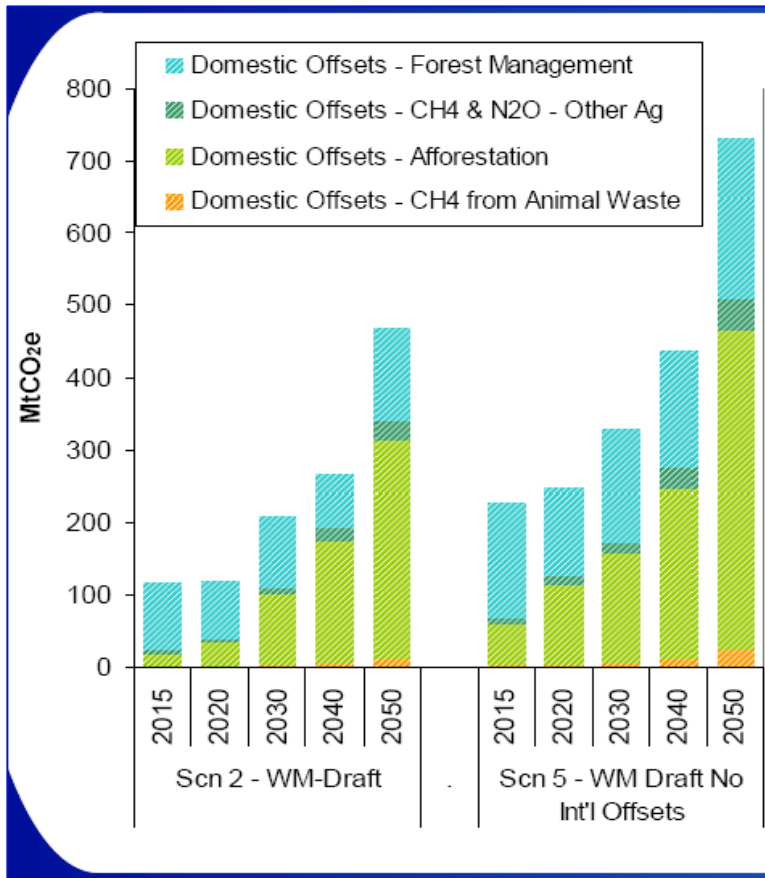
Cumu. Capacity Addition - Case 2



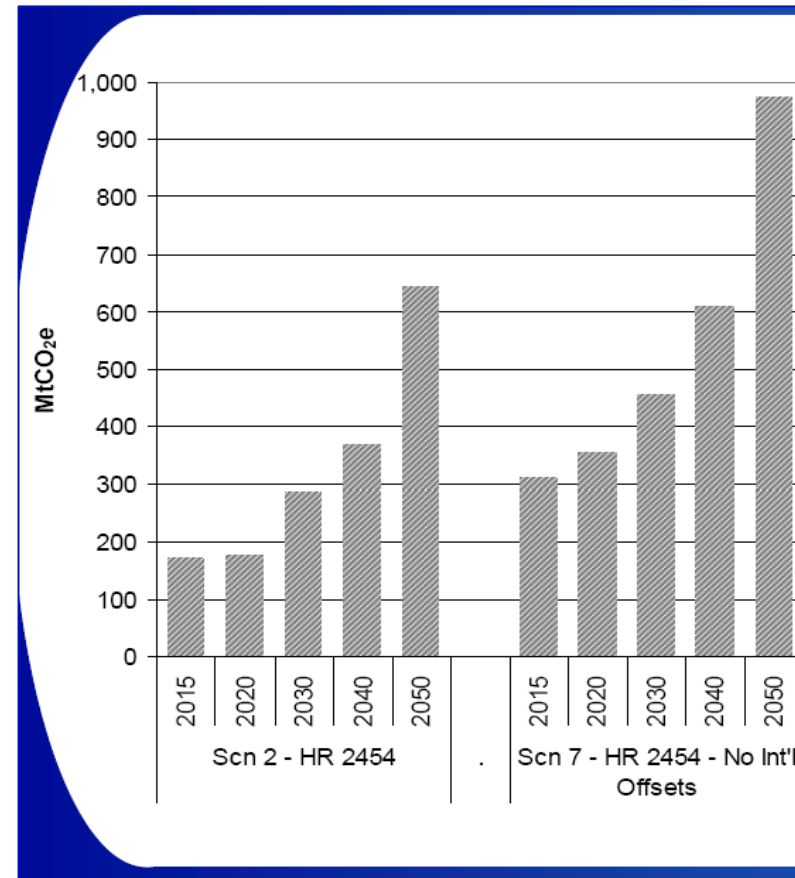
# Exploring EPA's Offset Assumptions



# Forest Management & Afforestation are the Largest Sources of Domestic Offsets



Source: Appendix to EPA Preliminary Analysis of the Waxman-Markey Discussion Draft, 4/20/09, P. 60



Source: EPA Analysis of H.R. 2454 6/23/09, P. 23.

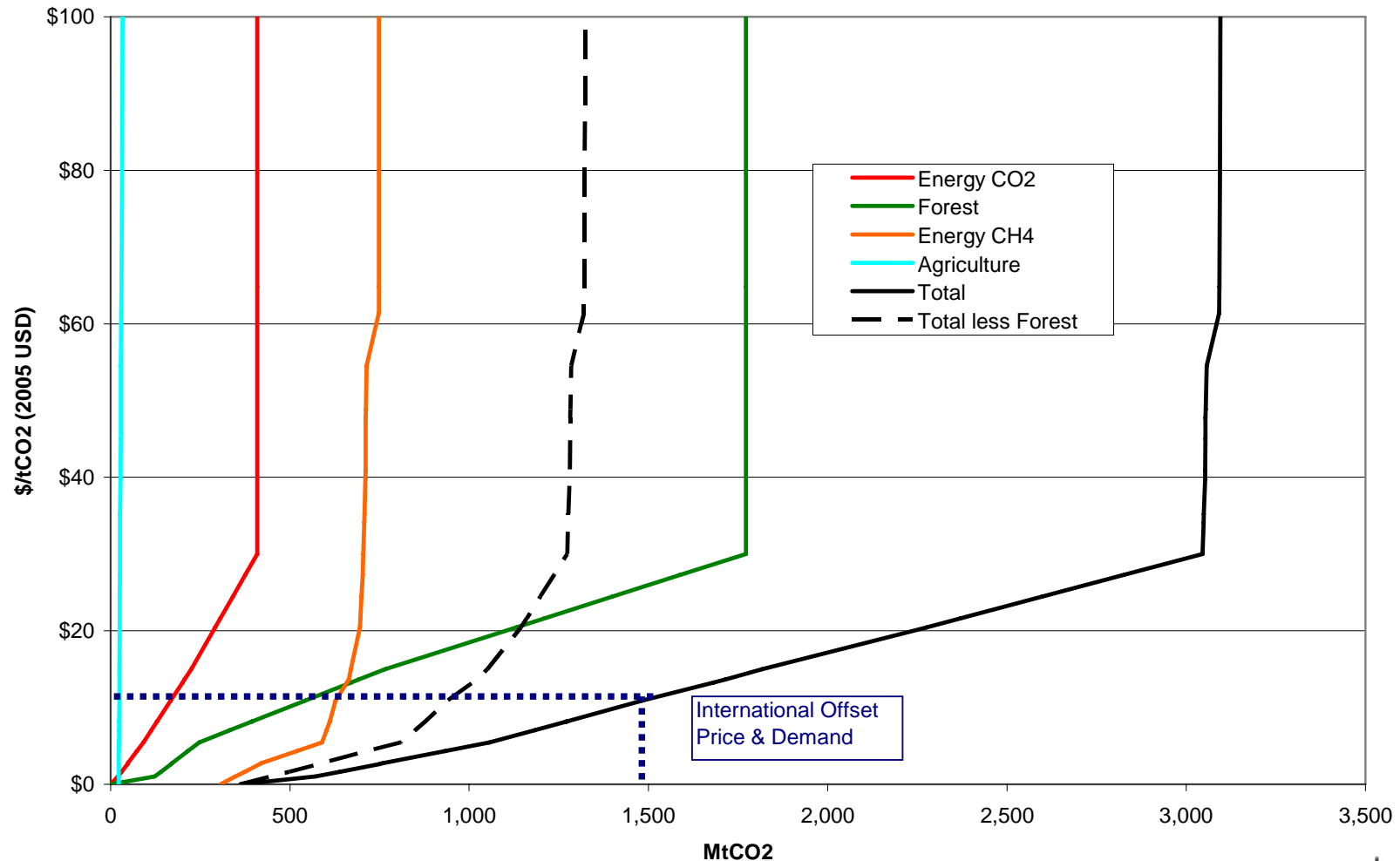
EPA's estimates are based upon Texas A&M's FASOM model;  
Recent EPRI re-analysis with FASOM suggests lower domestic offset availability

# EPA Estimates of International Offsets are Based Upon Three Primary Sources

- Forestry emission reductions – afforestation, forest management, and avoided deforestation -- are based upon analyses using Brent Sohngen's (Ohio State University) Global Timber Model (GTM)
- Energy sector CO2 reductions are estimated for an international climate policy scenario using Jae Edmond's MiniCAM model
- Non-CO2 emission reductions are based upon bottom-up studies of each of the relevant sectors

# Where Do Offsets Come From? EPRI Estimate of EPA Supply of International Offsets in 2010\*

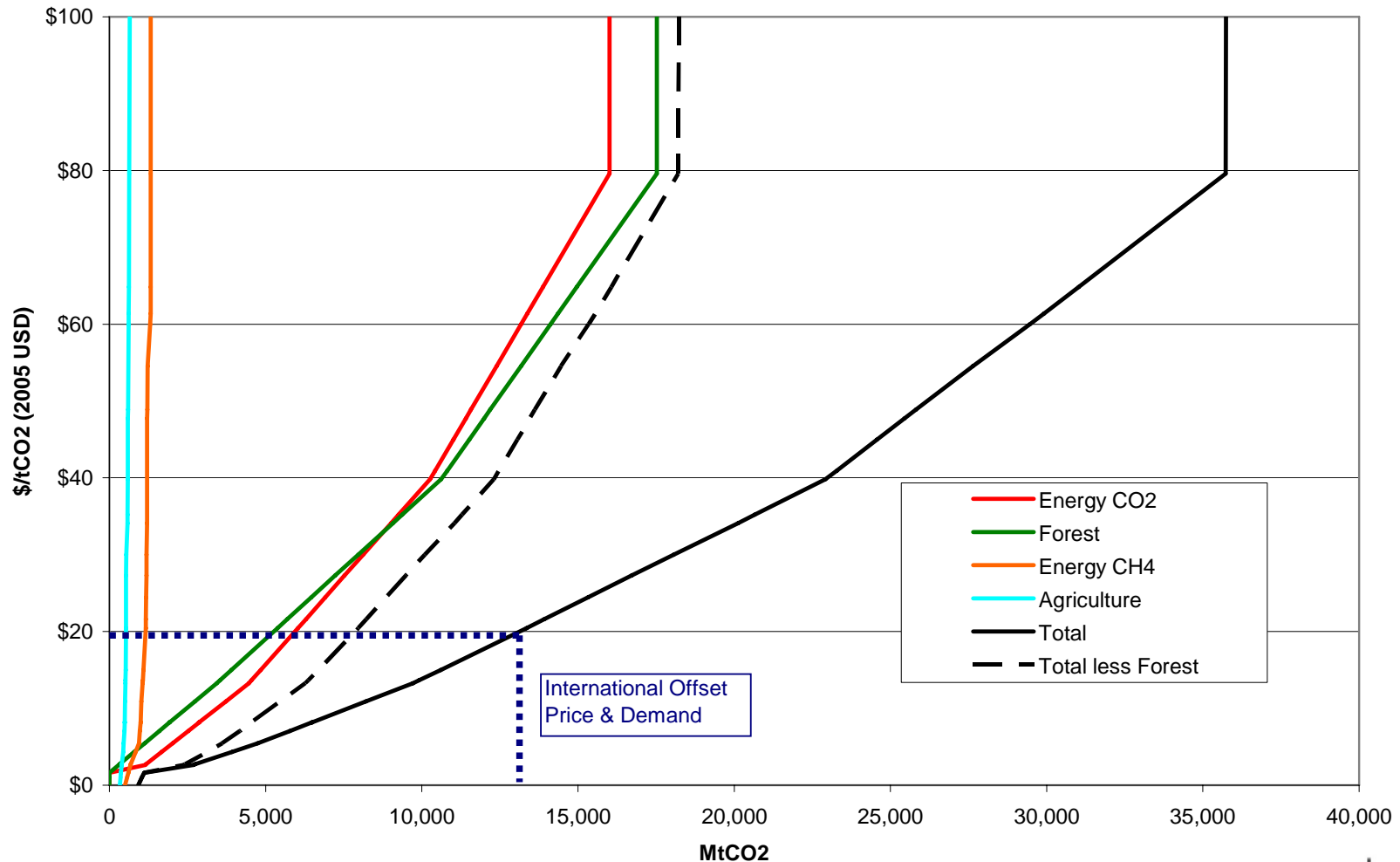
2010 Low-Middle Income Country MACs





# Where Do Offsets Come From? EPRI Estimate of EPA Supply of International Offsets in 2030\*

2030 Low-Middle Income Country MACs



# Critical Weaknesses in Committee Defined Scenarios: Potential Availability of Offsets is Overestimated

International energy CO<sub>2</sub> offset availability depends critically upon the international climate policy scenario

- EPA offset dataset based upon
  - Group 1 countries (Kyoto group less Russia) follow an allowance path that is falling gradually from the simulated Kyoto emissions levels in 2012 to 50% below 1990 in 2050.
  - Group 2 countries (rest of world) adopt a policy beginning in 2025 that returns each to 2015 emissions levels through 2034, and then returns and maintains them at 2000 emissions levels from 2035 to 2050.
- G8 has stated a much stronger position:
  - “the G8 Leaders agreed to reduce their emissions 80% or more by 2050 as its share of a global goal to lower emissions 50% by 2050, acknowledging the broad scientific view that warming should be limited to no more than two degrees Celsius.”
- If G8 goal is implemented, the current EPA analysis overstates availability of international energy offsets

# Offset Supply Curves Have Important Limitations: They Do Not Fully Reflect Implementation Challenges

- Domestic offsets – relatively small potential
  - EPA estimates only ~170MtCO<sub>2</sub> annually through 2020
  - Most to be derived from forest management & afforestation
  - CH<sub>4</sub> offsets largely not available due to new NSPS (CMM & LFG)
  - EPA may be underestimating N<sub>2</sub>O offsets in agriculture
  - Rulemakings / protocols / methodologies will take time to develop
- International Offsets – large potential, but hard to implement
  - Sectoral offsets
  - Offsets issued by an international body (e.g., CDM)
  - Reduced Emissions from Deforestation and Degradation (REDD)
  - All three categories are problematic!

# Bottom Line on Offset Analysis

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- Domestic offsets are expected to be very limited in the near term.
- The availability of international offsets depends on the assumption about international policies
  - the more stringent the international climate policy, the less international offsets available!
- Allowing extensive international offsets limits the ability of US-only models to give useful answers. You have to understand the international policy!
- Finally, EPRI is revisiting the EPA analyses of domestic and international forestry offsets ... results at Fall advisory meeting in Colorado

# Household Cost Impacts: A Postage Stamp a Day?

## Waxman-Markey Household Costs Make Headlines

- EPA: “Cost to households averaged over the years 2010 to 2050 will be between \$80 and \$111”
- CRA: “Costs per household could be from \$600 to \$1600 in 2020”
- CBO: “Cost average household \$175 in higher energy costs in 2020”
  - API’s Jack Gerard: “when faulty assumptions...are corrected, the annual cost to a household could be as much as \$3,300 by 2020”
- ACEEE: “Waxman-Markey could save approximately \$1,050 per household by 2020 and \$4,400 per household by 2030”
- Heritage: “Raise average family's annual energy bill by \$1,500”
- MIT’s John Reilly often misrepresented 2008 analysis: Claims that climate policy will cost +\$3000 are incorrect → \$800 is correct

This year, \$1000 media and interest groups have grabbed hold of household impacts, not allowance price, to either attack or defend the climate bill. ACEEE EPA CBO CRA HE API

– Differences are large \$0 driven by analytic approach and interpretation of allowance allocation, we will return to this later...

# Household Impacts Depend Upon ...

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- Estimated cost of the policy – some say High, others, Low
- Particular cost estimate that is used – e.g., lost consumption, GDP loss, cost of making reductions, size of the allowance market, bottom-up partial estimate of cost
- Assumptions about where permit revenue goes

# EPA versus Heritage Foundation

- EPA assumes extensive availability of low cost offsets so costs/household are low
  - In 2020, EPA estimates policy cost to be \$28 billion
    - \$ 7 billion of reductions in sectors under the cap
    - \$ 2 billion for domestic offsets
    - \$20 billion for international offsets
  - Size of allowance market -- \$79 billion
- Heritage Foundation
  - Limits the use of offsets to 15% of cap which necessitates extensive reductions from the electric sector
  - Limits electric technology availability, which necessitates a big demand response
    - limits renewables to current state requirements
    - does not allow significant penetration of CCS
    - limits nuclear to 16GW of growth through 2050
  - Gets much higher policy cost

# John Boehner (House Minority Leader) vs. John Reilly (MIT)

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- Boehner used 2007 MIT estimate of the size of the allowance market and divided by households to get \$3000+
- Reilly pointed out that allowance revenue gets recycled back into the economy – directly to households, to households via businesses, or to households via government .
  - Reilly argued that the cost per household from the analysis was \$800 – the cost of making reductions



# CBO Analysis – Assumptions about Where Permit Value Goes

CBO starts with a low cost based on preliminary EPA analysis -- \$28/ton CO<sub>2</sub> in 2020 with 83% of allowances gratis

- Rising energy costs and consequent rises in costs of goods and services that households consume -- \$110 billion or \$890/household
- Emission allowances increase household purchasing power via
  - Benefit payments
  - Rebates
  - Tax decreases or credits
  - Wages
  - Returns on investments
- CBO estimates household benefits of
  - \$28 billion to offset higher energy costs
  - \$47 billion to businesses, that will increase return on household investments
  - \$10 billion to Federal and state government for technology development and energy efficiency, which will increase wages, decrease energy bills, etc.
- Bottom line -- \$175/household

# Concluding Thoughts

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- We hope the webcast has helped improve your understanding of the key assumptions that drive differences in analyses released to date
  - Unlike Lieberman-Warner, differences in \$/ton cost estimates are driven assumptions about the availability of international offsets
  - If offsets are limited, then the electric sector assumptions again become critical
  - International offsets make this an international modeling issue
- Many more public analyses are on the way ... given your interest, we will plan to continue the discussion
- Hope to see you October 6-7 in Colorado!



## For more information:

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