



**CEE**

CENTER FOR  
ENERGY  
ECONOMICS



# North, South, Texas and the Rest

*CEE Annual Meeting 4-5 December 2013*

# Welcome!

- Agenda highlights and other logistics
- Introductions – “Up at Night” rules of the game and Chatham House rules for meeting

“To sleep: perchance to dream: ay, there's the rub”

# WHAT KEEPS ME UP AT NIGHT

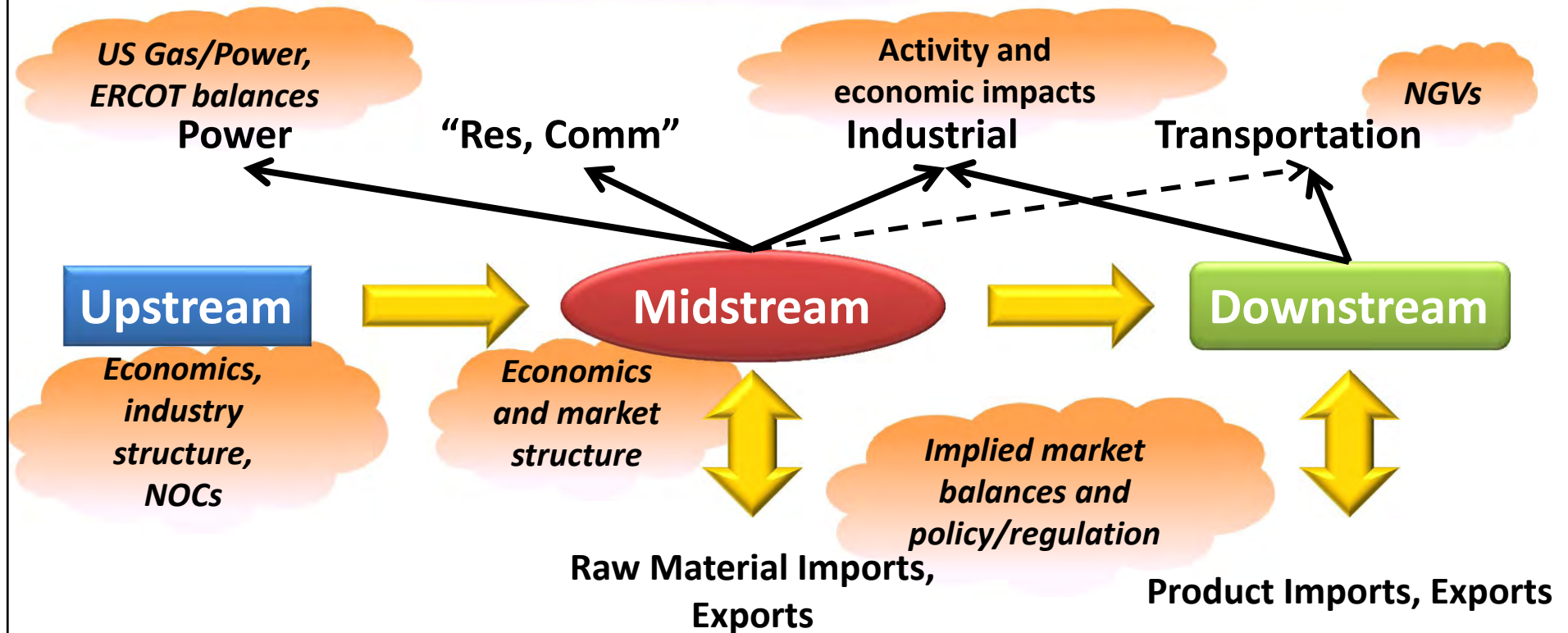
# What Keeps Us Up at Night

- Rapid changes and increasing complexity of commodity markets
- Reconciling project announcements and status
- Fuzzy data
  - On macroeconomics, OPEC, climate (!), etc
- Science, technical, economic literacy; human factor literacy
  - *How can we achieve more impact from CEE research?*

# (Not So) Simple Value Chains

*"Thought  
Clouds"*

*How do we do this??? Commercial frameworks*

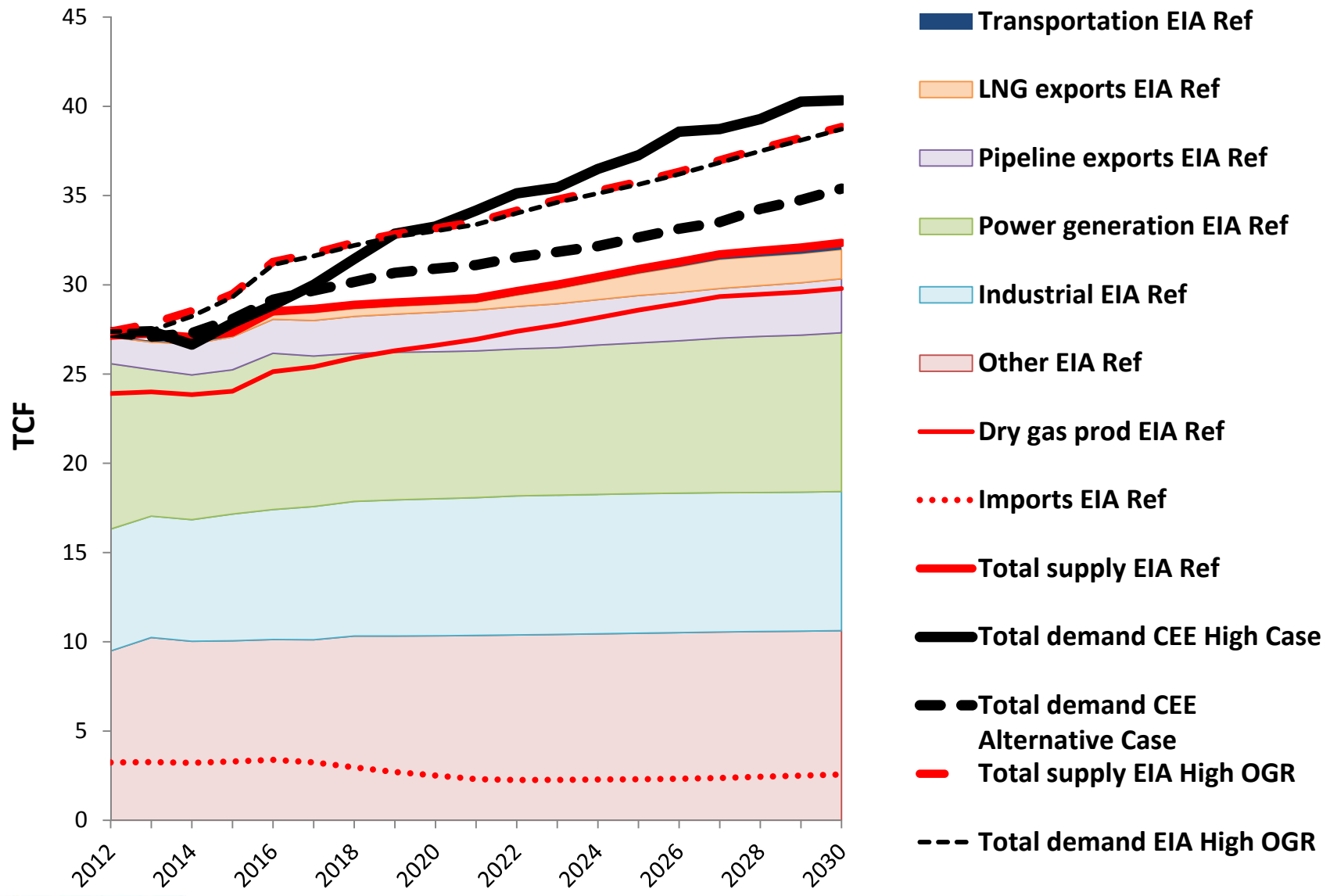


*Interaction of:*

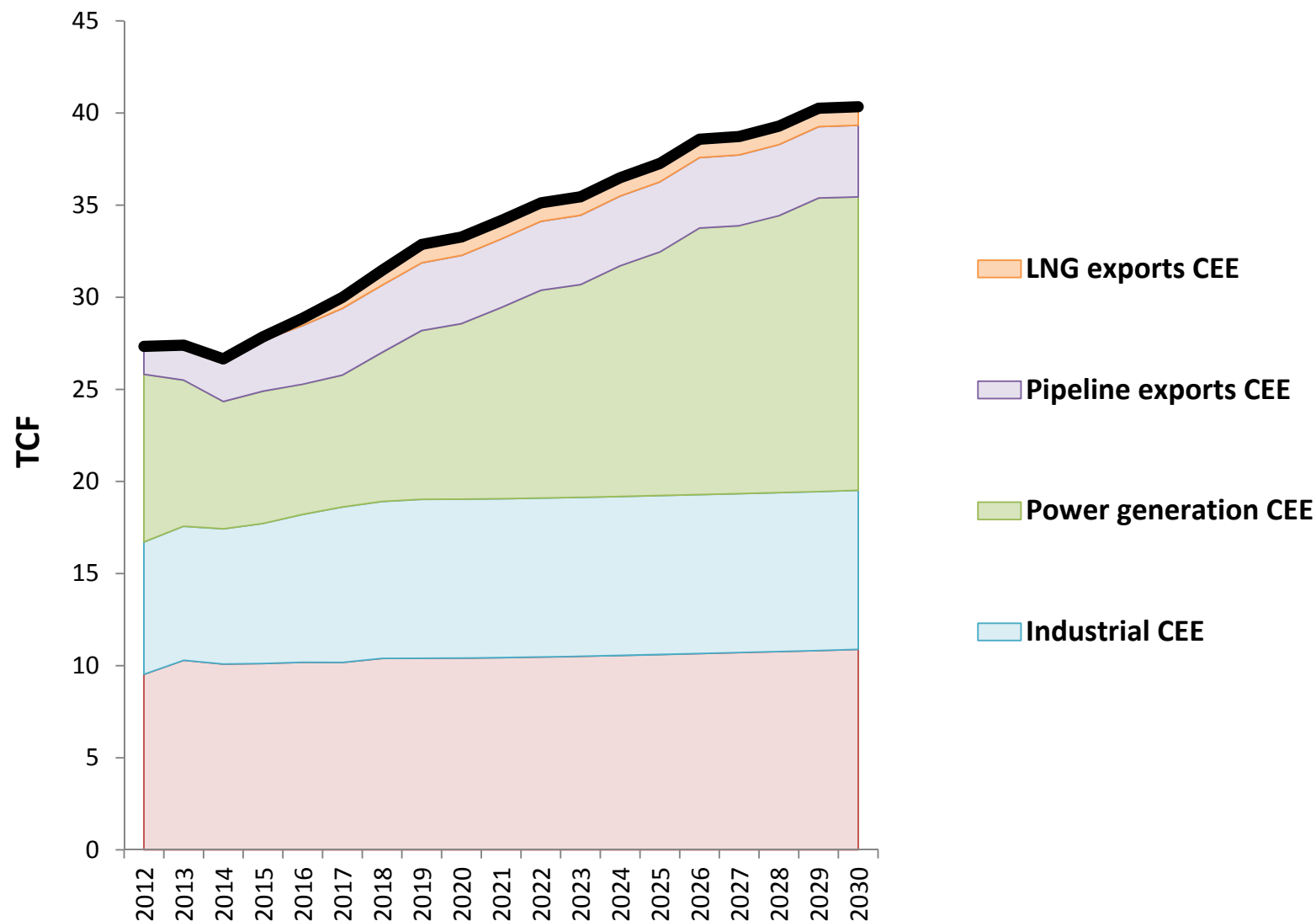
- *Substitute fuels and competing alternatives*
- *Sectoral fundamentals, macro conditions, stakeholder perceptions*

*Energy  
Webs*

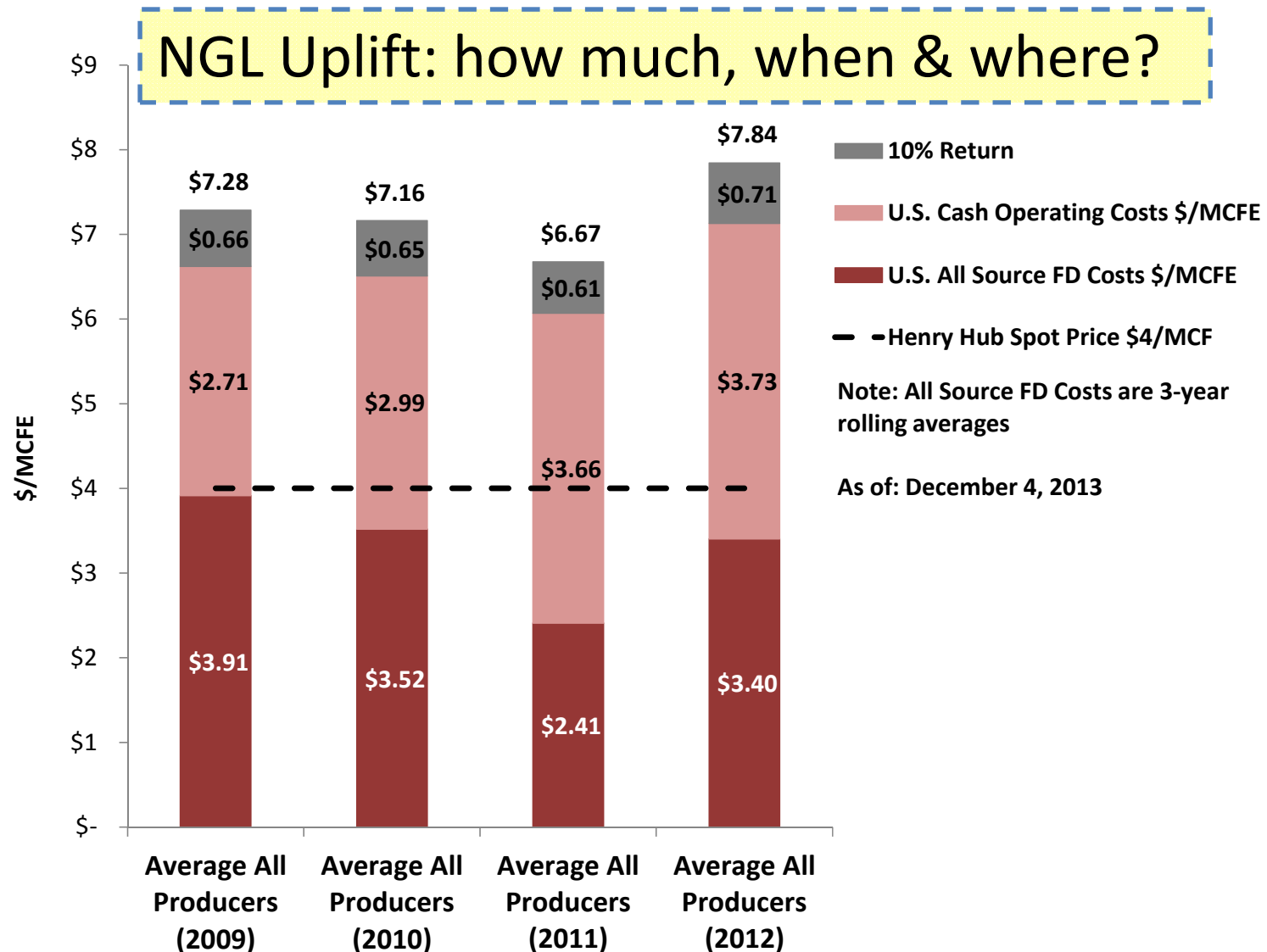
# Putting It All Together



# CEE High Case Demand Stack



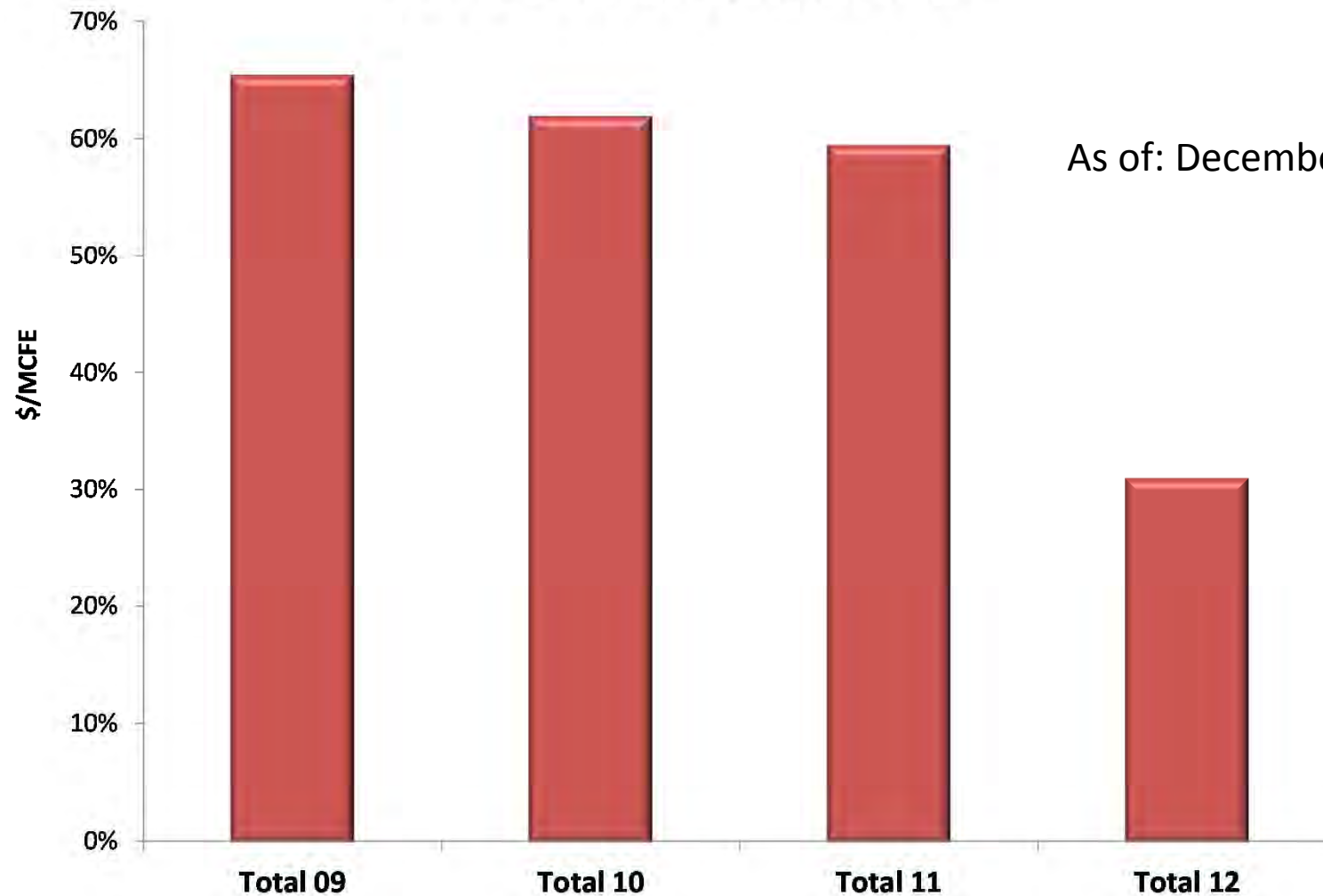
# At What Price Can Producers Deliver?



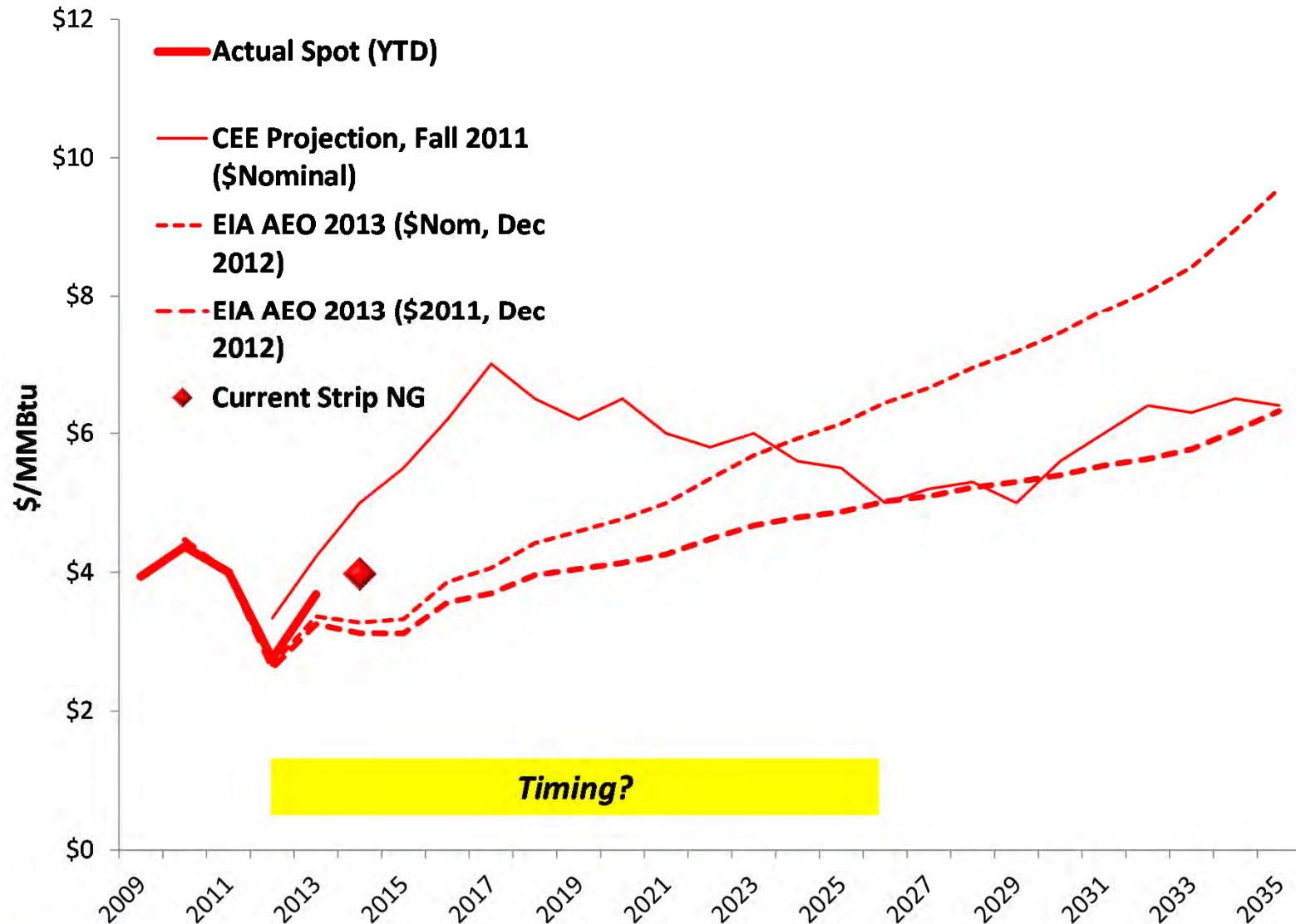


# Resource – Reserve - Deliverability

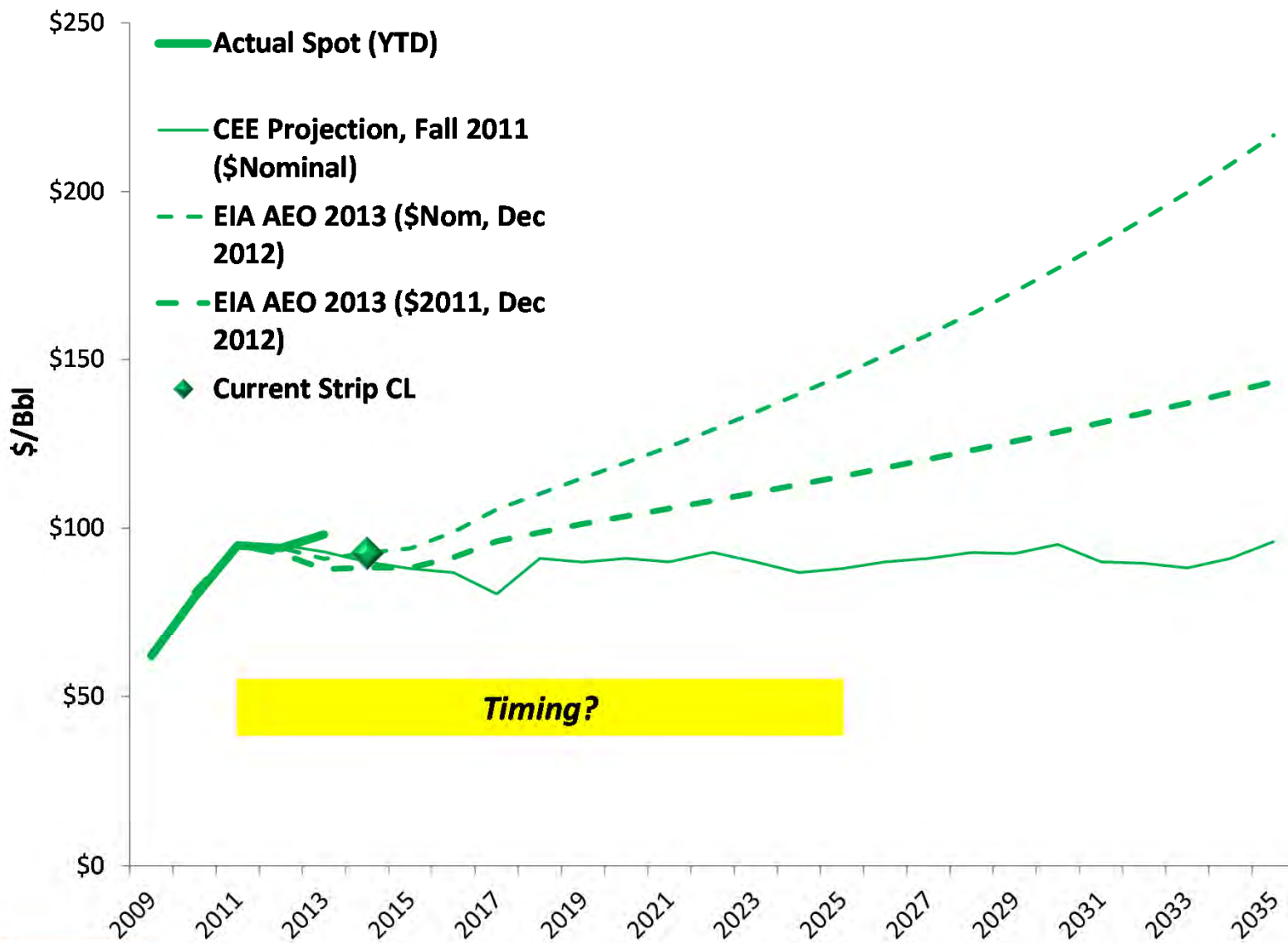
Nat. Gas % of U.S. All Source Additions

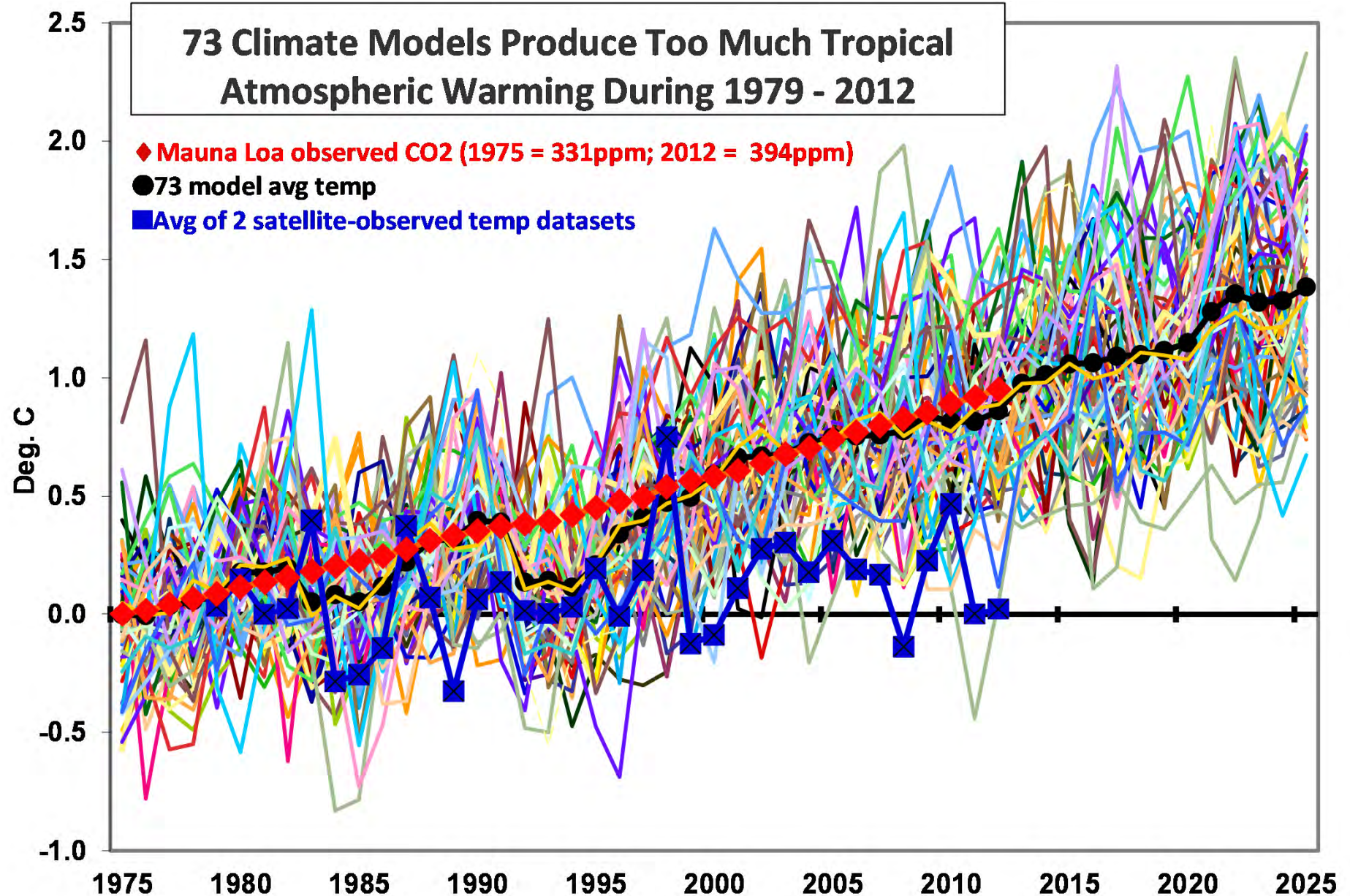


# NG Price Deck (OIES NG 58)



# CL Price Deck (OIES NG 58)





North

**O[H] CANADA!**



# North America Energy Integration, 1998

## *Cliff Notes Version*

- **Finding:** Given the treatment of energy in the NAFTA, the lack of clarity with respect to provisions that indirectly impact on energy and the historical, economic, political, legal and technology considerations associated with North American energy, the NAFTA provides only a weak framework for North American gas and electricity integration.
  - *Consequently, trends toward integration are and will be more heavily influenced by other factors – the historical, economic, legal, political and technology contexts for natural gas and electricity development and trade.*

# NAEP, cont.

- *A “CUS” system for electricity: Will the process for electricity restructuring parallel natural gas restructuring in Canada and the U.S.?*
  - Our analysis of Alternative Future 1 led to a qualified “yes,” within our ten-year time frame, electricity integration would proceed in a manner similar to that of natural gas.
- *Mexico joins the “CUS”: How does Mexico fit into the Canada-U.S. (CUS) market relationship and process?*
  - Alternative Future 2 failed under the criteria we established.

## Alternative Future 1

	CANADA	U.S.	ISSUES
Industrial Customers	+	+	Industrial customers are positive forces for electricity restructuring; they benefit most from technology change that allows decentralized power purchases
Ratepayers	+>	+	Customer choice in residential markets may occur more quickly in Canada because of the longer, more intense winter heating season
Existing energy industries (gas and electric utilities)	->	-	Existing electric utilities are barriers to electricity restructuring, more so in the case of Canada's Crown corporations
Potential new players ("energy entrepreneurs")	+<	+	Energy entrepreneurs, companies that will drive the direction and pace of restructuring, can play a more effective role in the U.S.
Federal vs. state/provincial regulators, policy makers	-<	-	In the CUS, decentralization is both a strength and a weakness but Canada could reach consensus among federal and provincial officials more quickly than the U.S. may among federal and state officials
Environmentalists	->	-	Strategies, focal issues ("the North") and the level of conflict in Canada appear to be stronger negative influences. Many environmental groups in the U.S. view electricity restructuring to be a strike against policy-mandated alternative fuels and conservation programs long imposed on utilities.



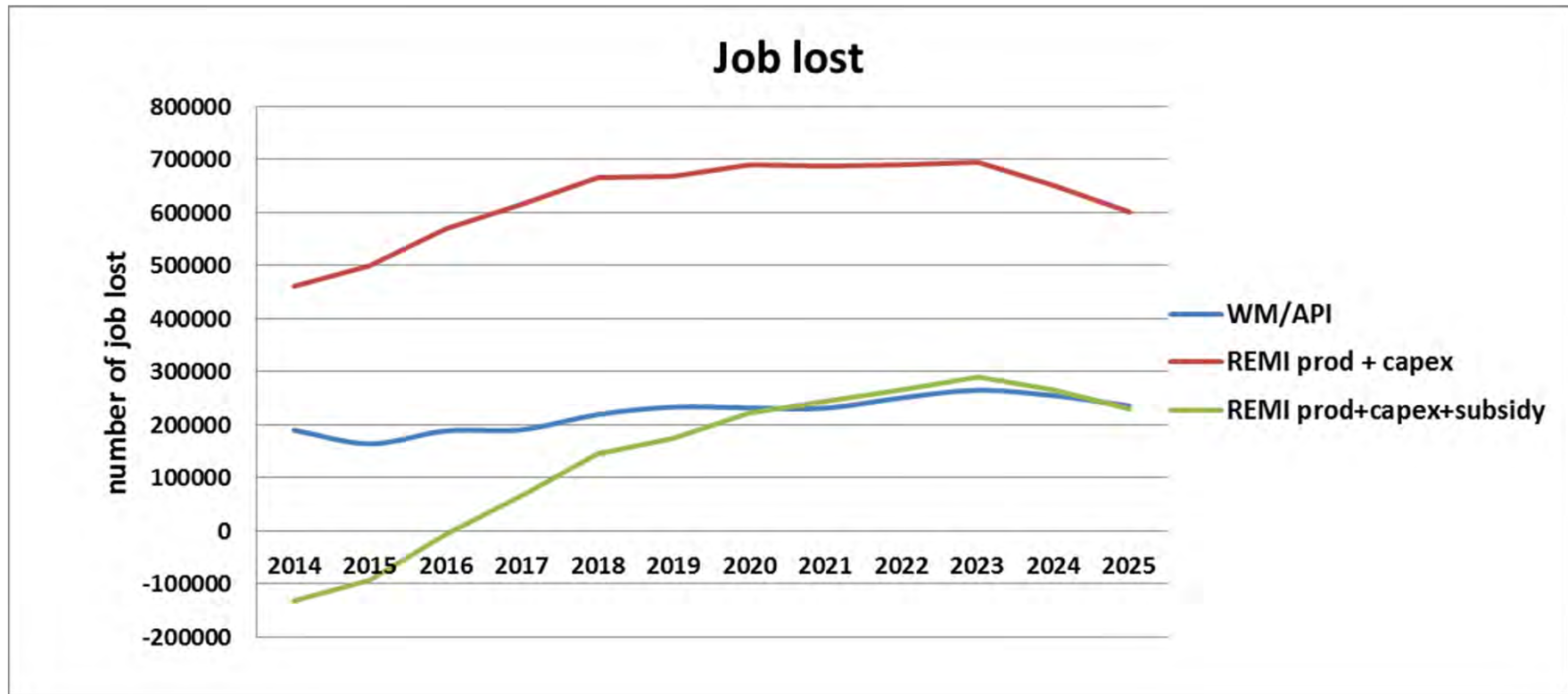
# Alternative Future 2

- Technology is a constraint in every dimension
- Attitudes toward the national monopolies and natural resource endowments create untenable political constraints
- Centralized control of investment and decisions relative to infrastructure and resources
- Pace of change is slow enough that opposing coalitions are able to restructure themselves
- **Political elites** are much more important in Mexico than Canada and the U.S. with respect to energy
- **Industrial customers** play much the same role as in Canada and the U.S. in driving energy sector restructuring; strong relationships with the national energy monopolies complicate analysis
- The external **financial community** may be a force for change; worldwide competition for private capital for energy
- **Elite influence from northern Mexico** may be an interesting variable

Texas

# MILES AND MILES....

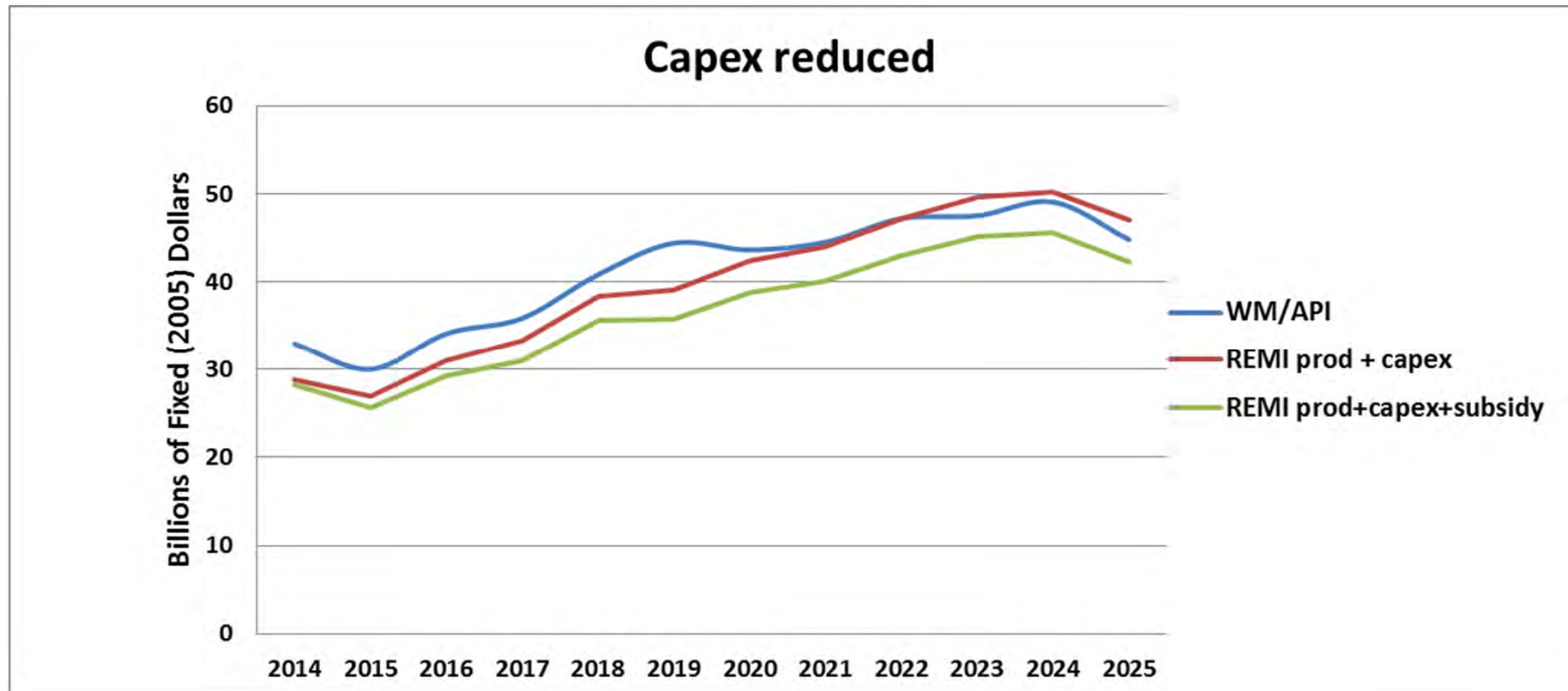
# The Complicated World of Oil & Gas Taxes, I



Employment impacts relative to base case of reduced oil and gas capex with IDC treatment eliminated.

- WM = WM/API results
- REMI prod+capex = CEE results
- REMI prod+capex+subsidy = CEE results with all federal energy subsidies returned to consumption (all categories)

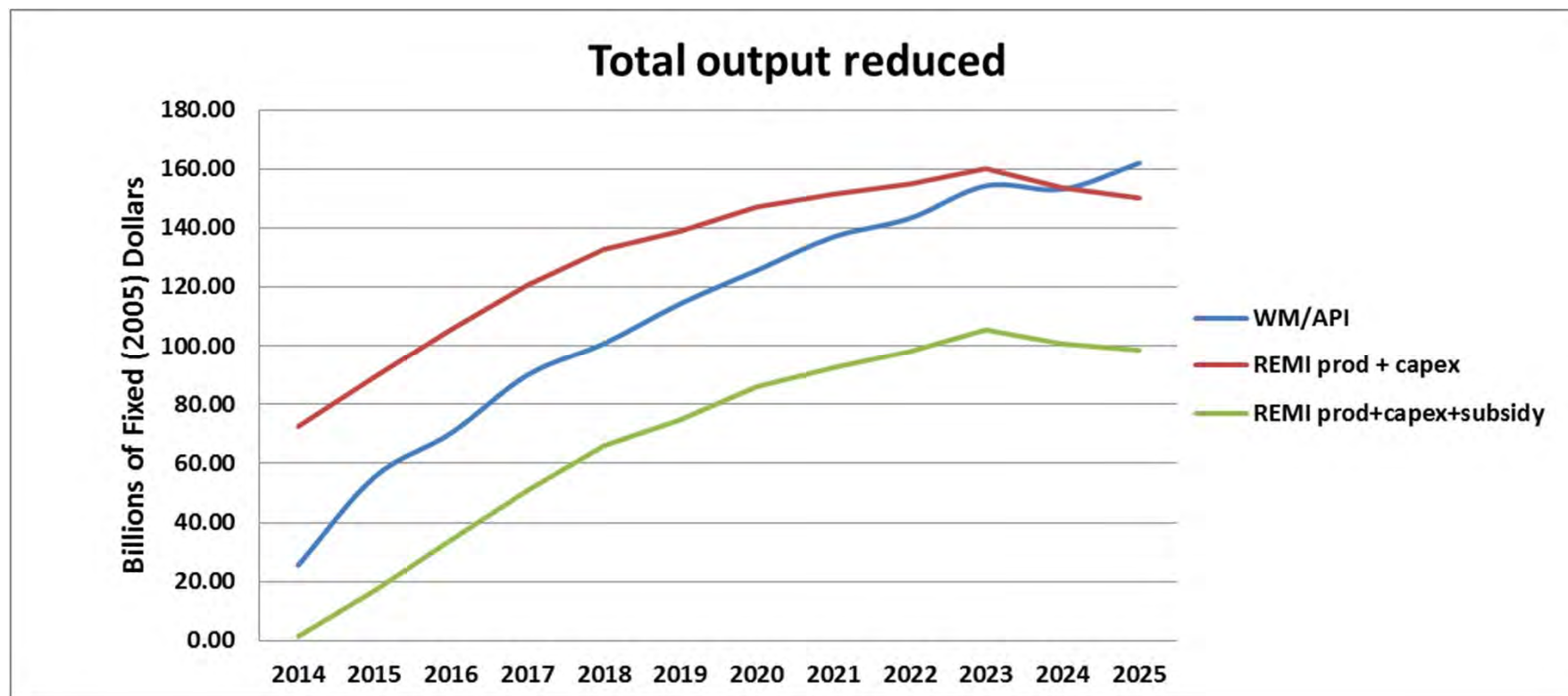
# The Complicated World of Oil & Gas Taxes, II



Impacts on capex relative to base case of reduced oil and gas capex with IDC treatment eliminated.

- WM = WM/API results
- REMI prod+capex = CEE results
- REMI prod+capex+subsidy = CEE results with all federal energy subsidies returned to consumption (all categories)

# The Complicated World of Oil & Gas Taxes, III



Impacts on output relative to base case of reduced oil and gas capex with IDC treatment eliminated.

- WM = WM/API results
- REMI prod+capex = CEE results
- REMI prod+capex+subsidy = CEE results with all federal energy subsidies returned to consumption (all categories)

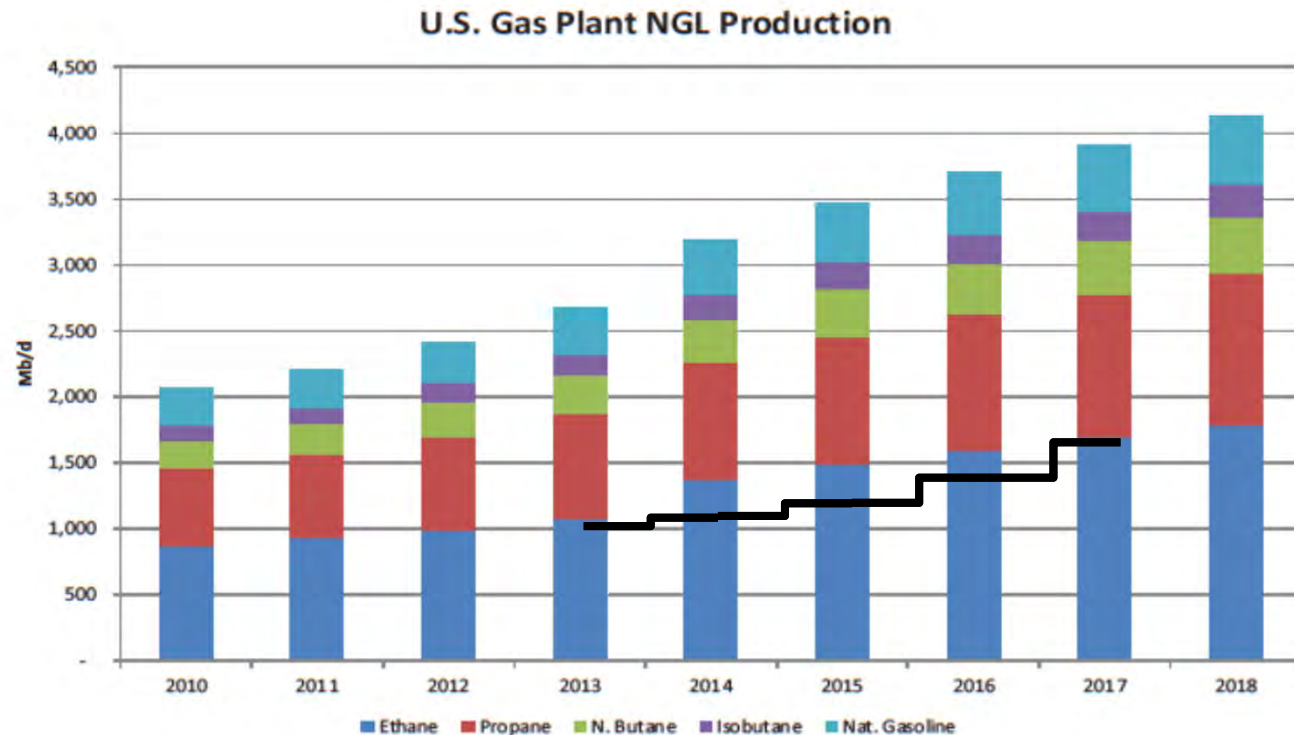
# Midstream:

## We Care About NGLs. Why?

- NGL uplift has been helping upstream economics
- ~40% of NGL yield is ethane
  - Ethylene crackers
    - Need capacity expansion, 2017-18
    - Need export markets
  - Methane stream: limited due to pipe gas specs
- ~15% condensate
  - Cannot blend all with crude oil due to refinery specs
  - Need to export

# NGL Production-Source of Ethane

## NGL Production Is On The Rise



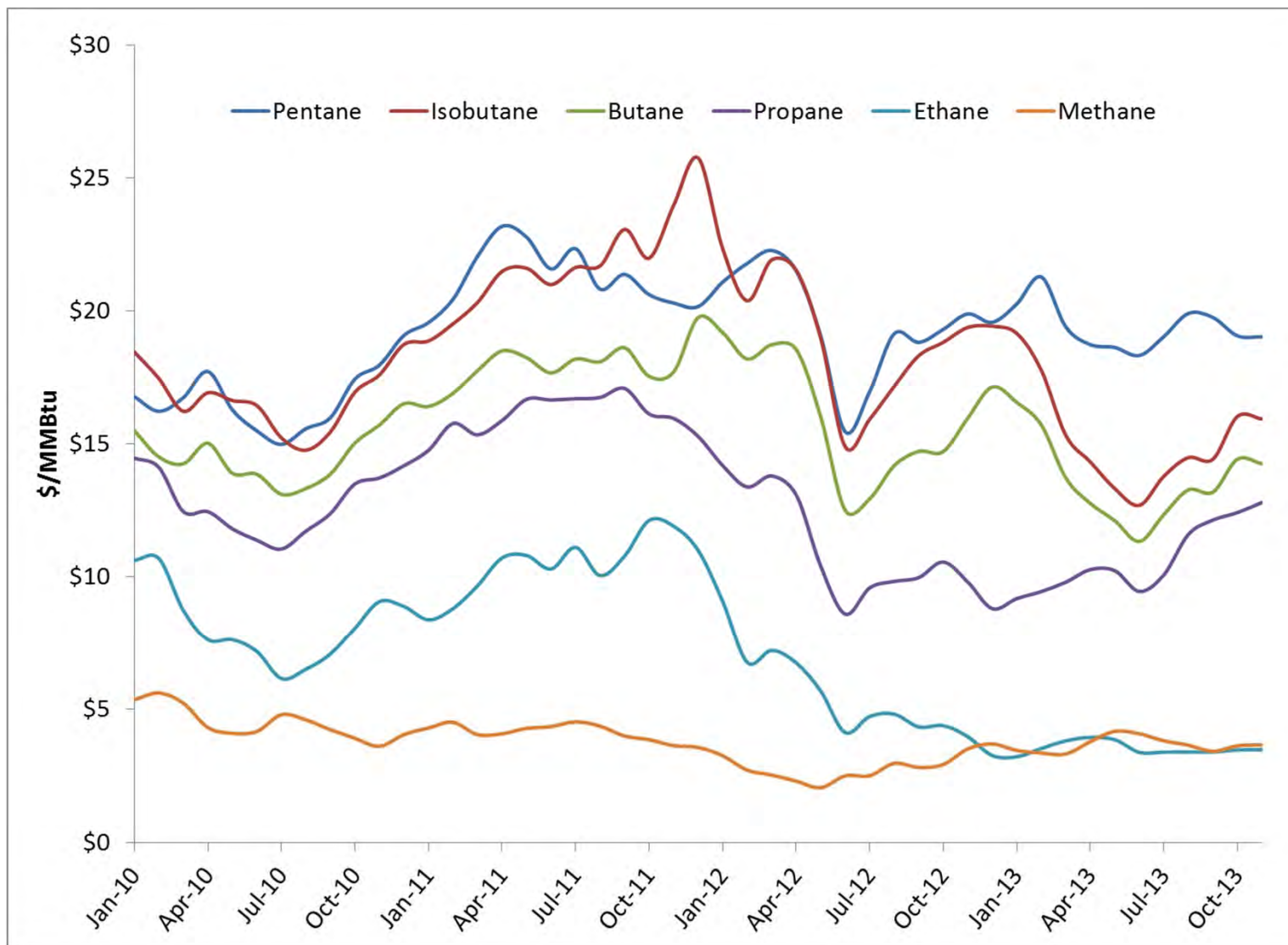
56 Source: Bentek.



- Excess ethane supply until at least 2017
- 2013 S is about 1 MMBPD + 300-350 MBPD rejected, flared or blended

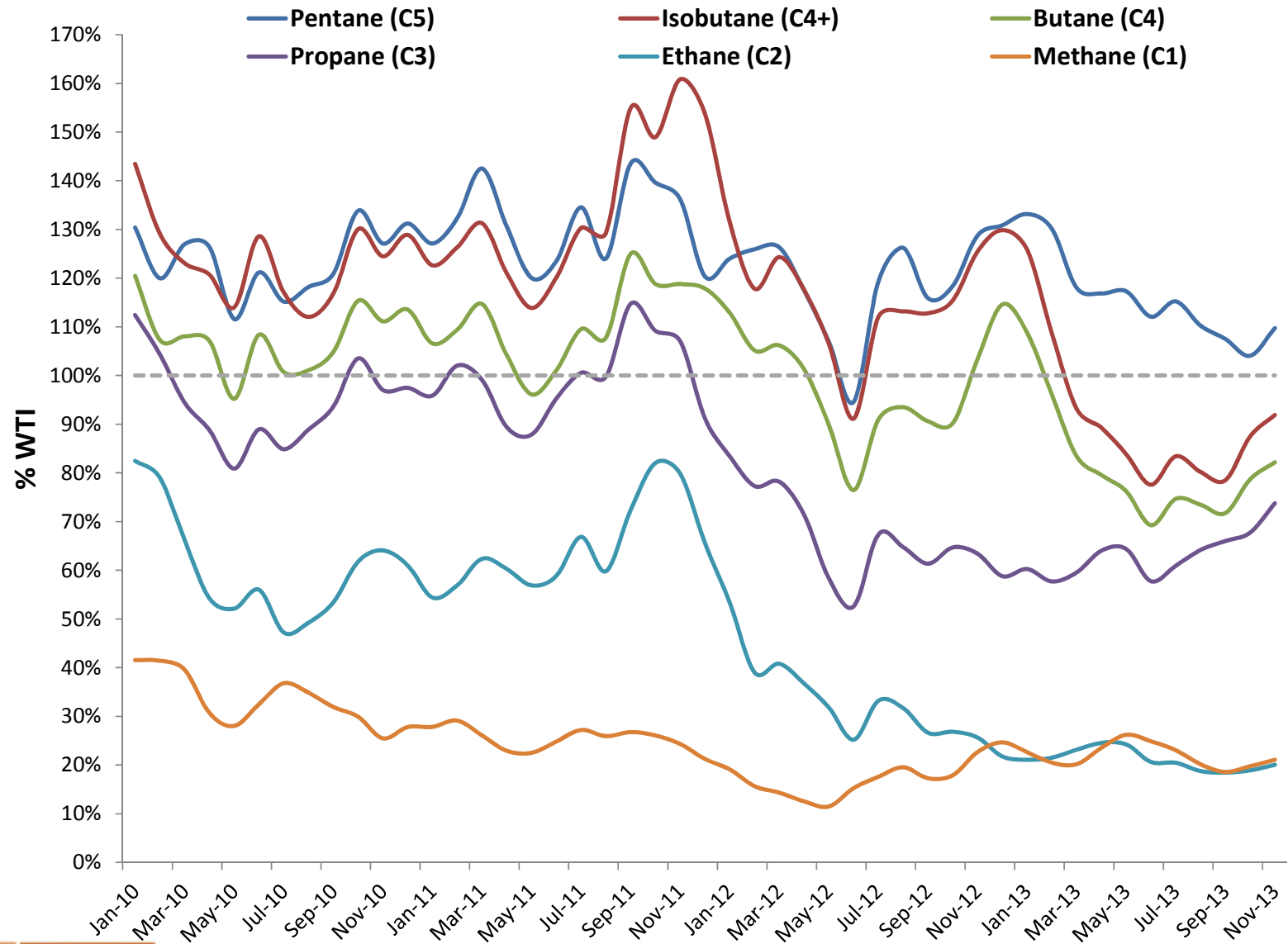


# NGL Prices

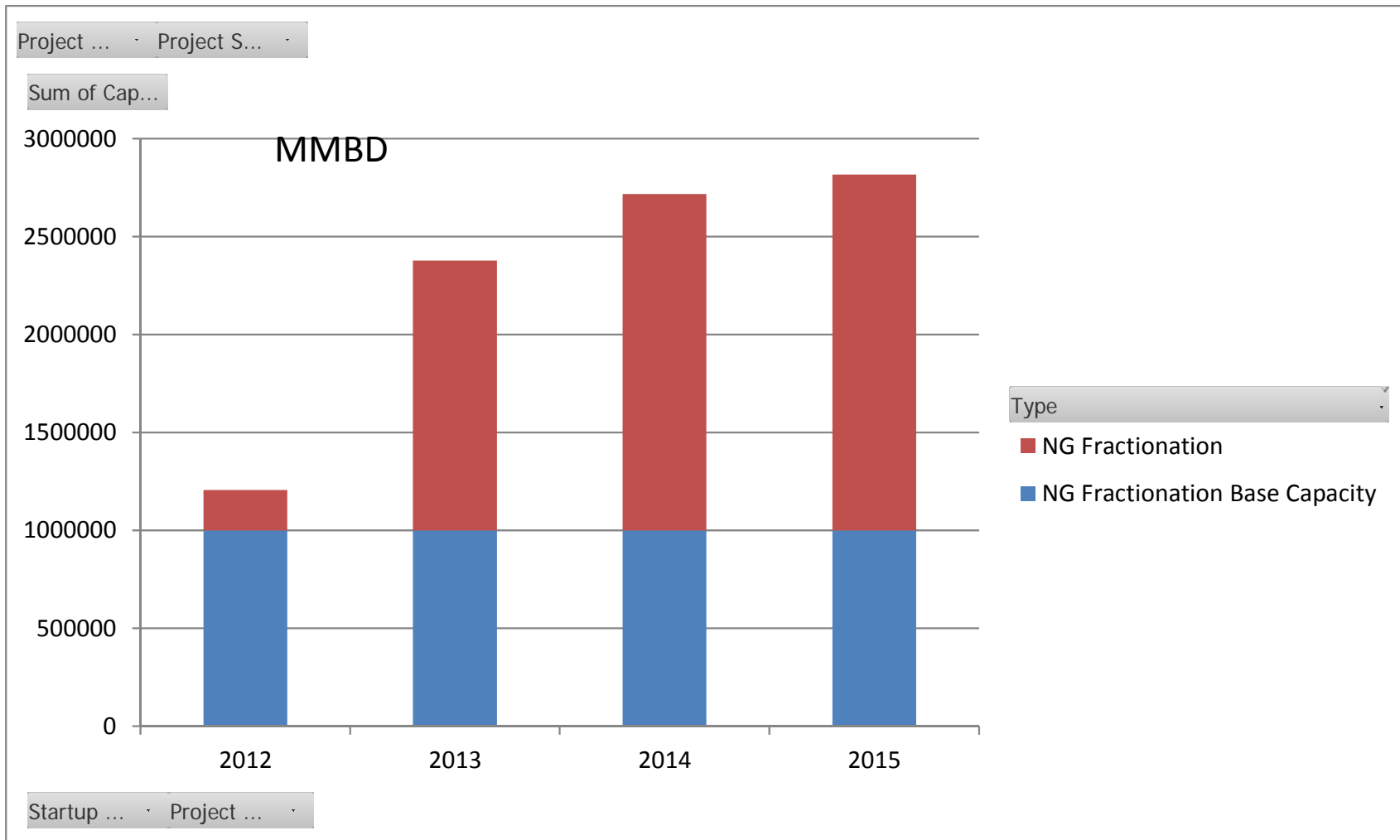




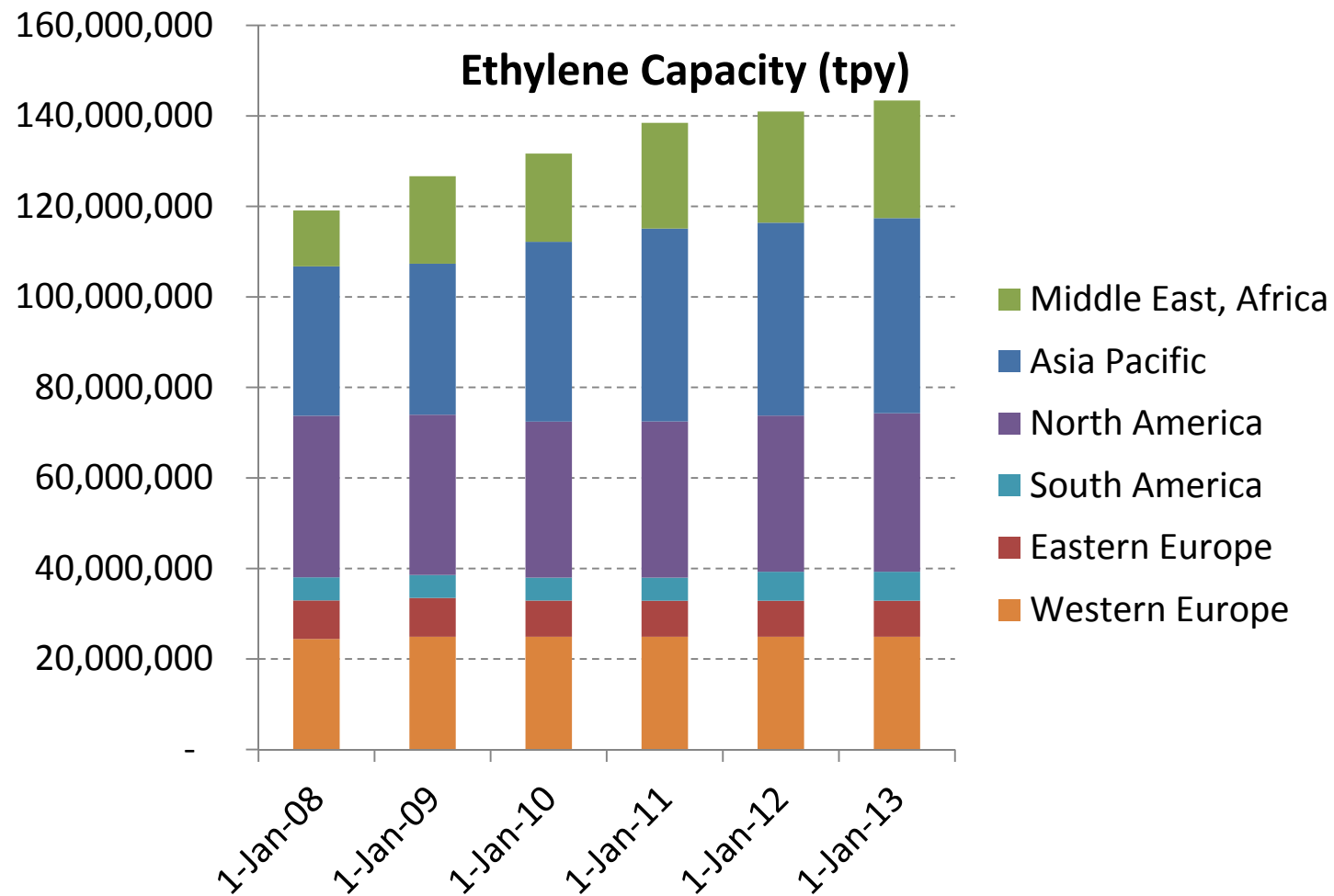
# NGLs Values Relative to Crude Oil



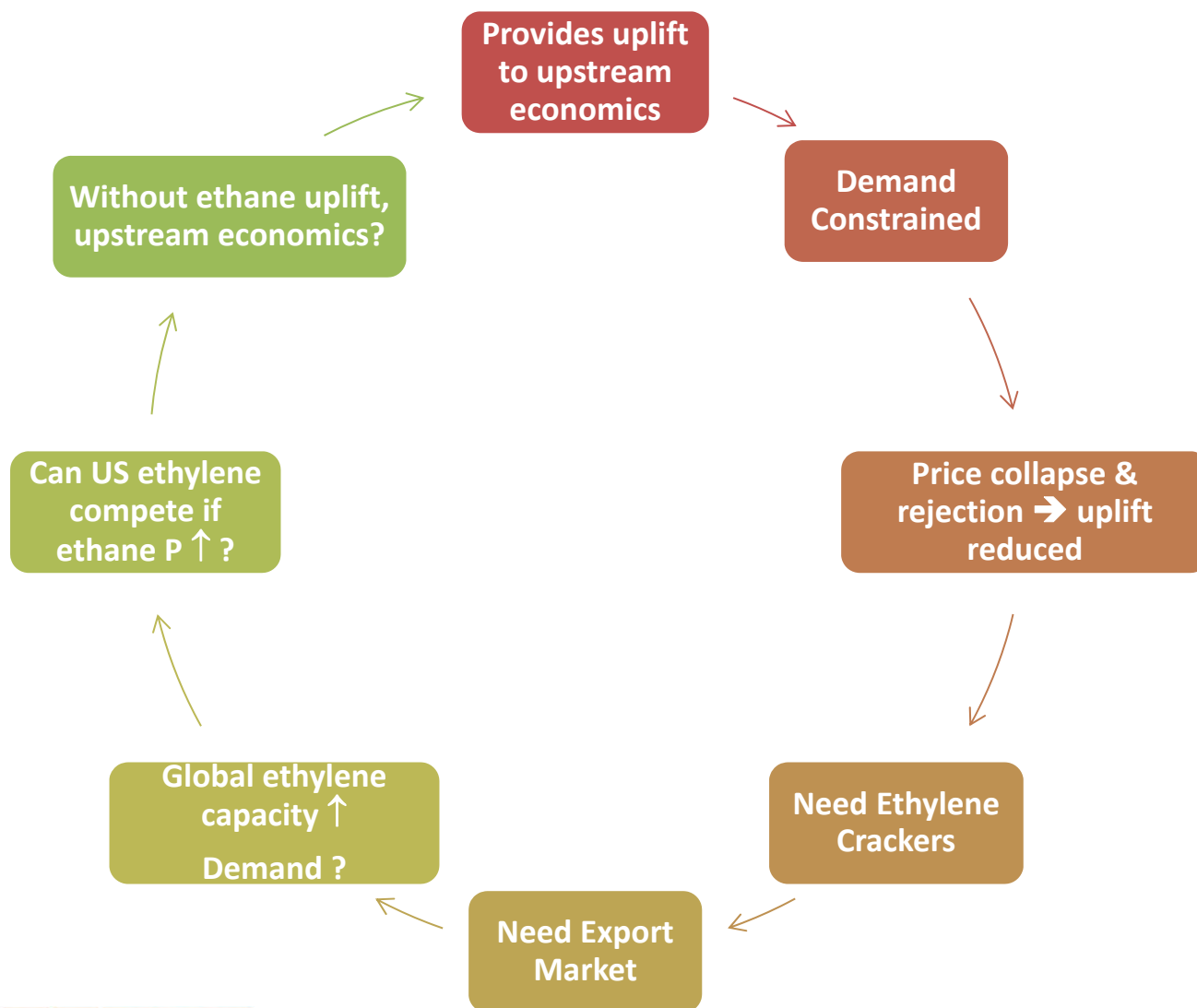
# CEE NG Fractionation Inventory



# Global Ethylene Capacity



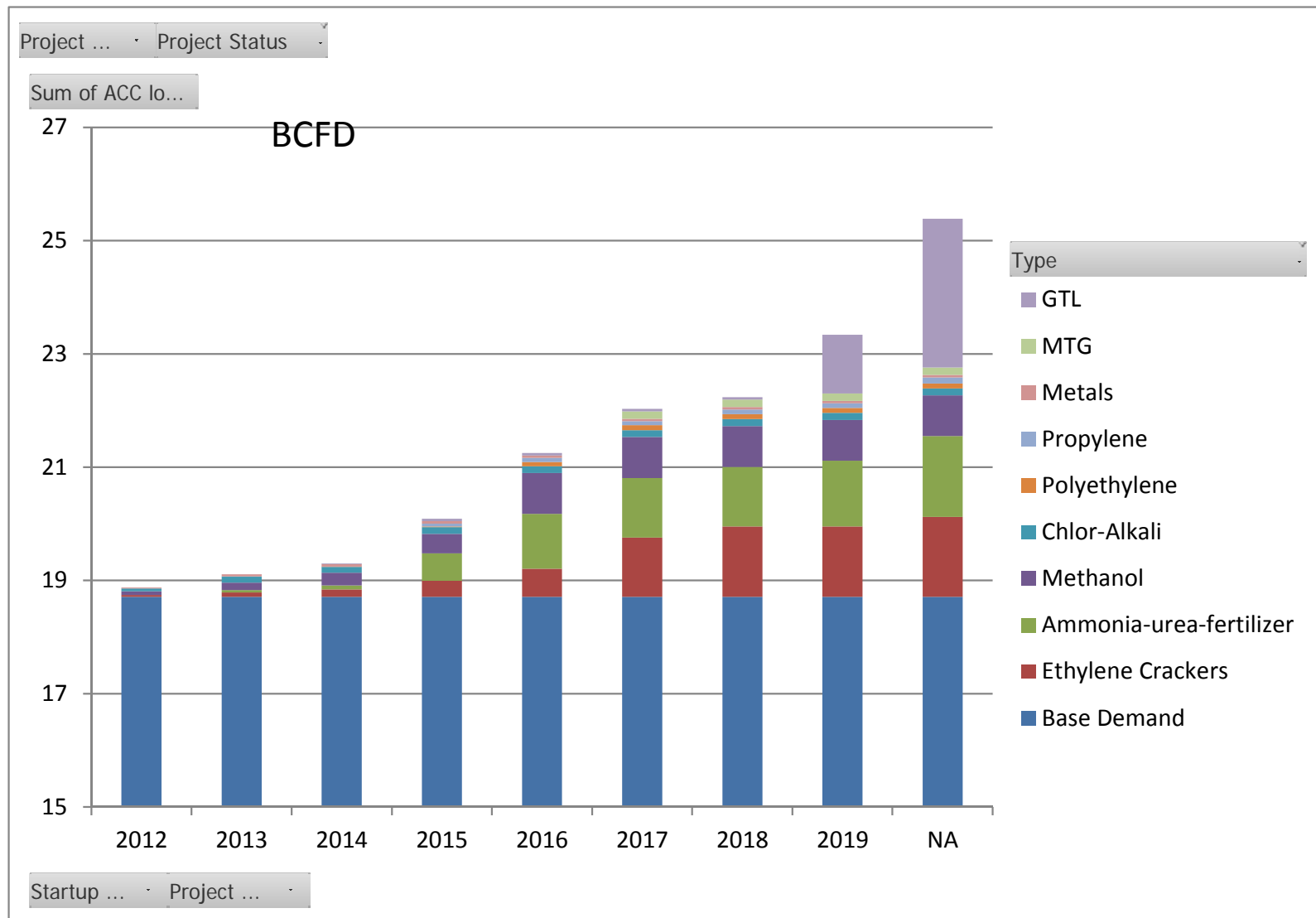
# Ethane (and many other) Questions



*Is there a fundamental difference today in how production streams are considered and, if so, implications for: producers, midstream, downstream, customers.*

*Is there more market exposure for production streams that once were embedded in integrated business models?*

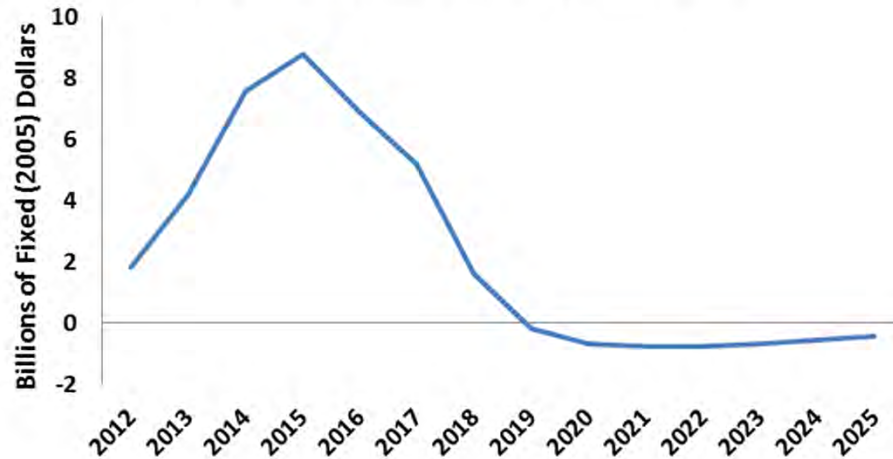
# CEE Industrial (very) High Case



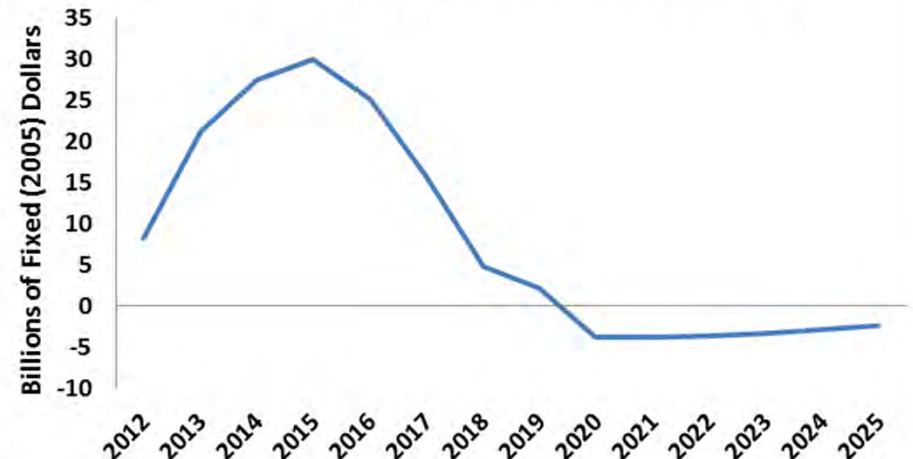
# High Case Construction Impacts Only

Total capex: US \$98.9bn, Texas \$38.4 bn

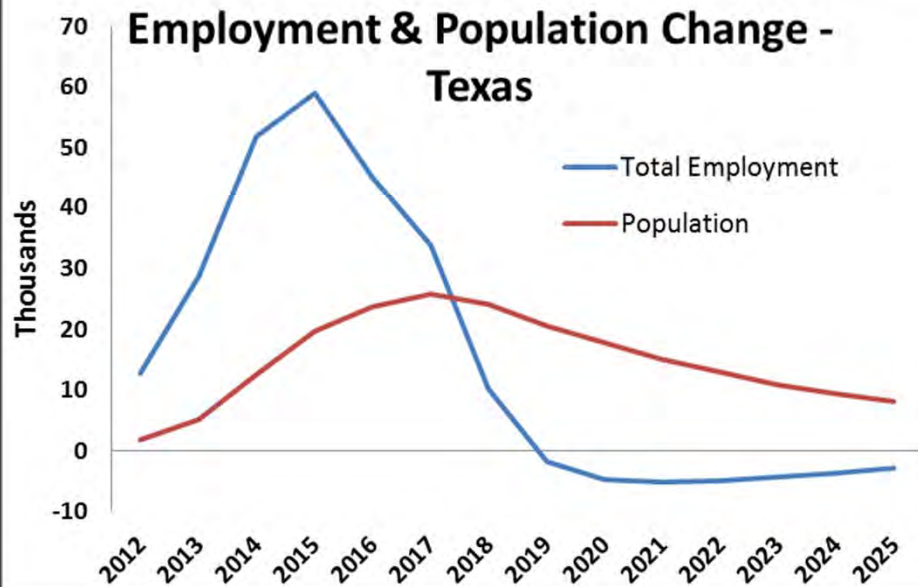
## Total Output Change - Texas



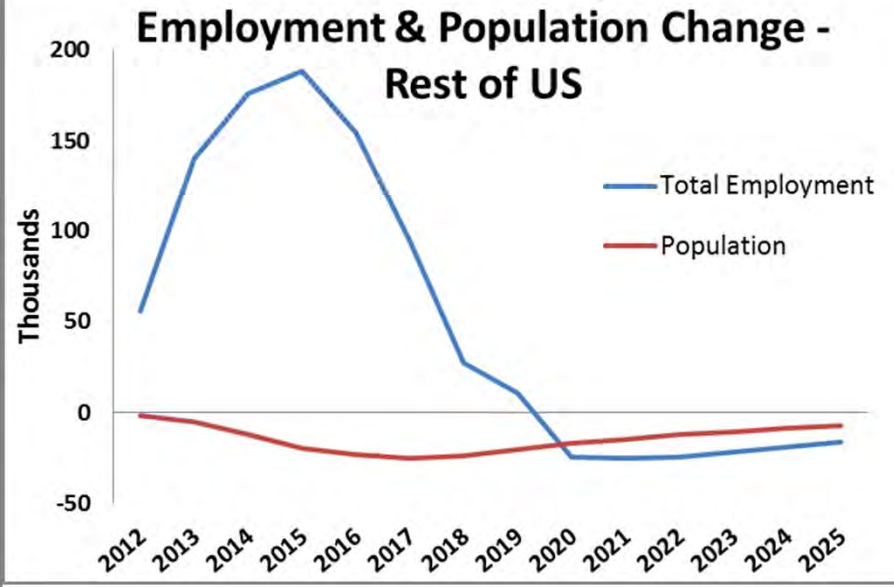
## Total Output Change - Rest of US



## Employment & Population Change - Texas



## Employment & Population Change - Rest of US



The Rest

# GLOBAL ENERGY VIEWS

# Energy Exports

- Crude oil, product exports – US DOC is gatekeeper
  - White House has final say
- Any product leaving has to have incoming of like volume or quality
  - Issue lately with crude shipments by rail
- Fact: Light sweet crude is stuck
  - Lease condensate as test case
- DOC “tests” are subjective
  - DOC appetite to review applications is a consideration
- End game – strip DOC of authority
  - “Outmoded, outdated, inefficient”

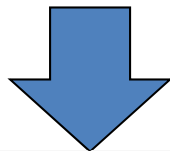


# Regulatory Chain

U.S. Department of Commerce



Bureau Of Industry and Security  
(BIS)



Commerce Control List  
(CCL) of ECCNs



Part 754 of EAR

*(Export Administration Regulations)*



Supplement No. 1  
ECCN 1C984



DOE



Supplement  
No. 1: 1C981-983

# Ramifications of Not Allowing Exports

- Forward curve already collapsed
  - Reserves reporting and NGLs: At what point do constraints on what can be produced and sold affect reserves bookings?
- Producer effects
  - Rash of overleveraged producers collapsing?
- Market effects
  - Associated gas heavily affected (low oil: high nat gas)
- Oil:gas implications
  - Vanishing spread – impact on investments
- Geopolitics
  - OPEC backlash (Iran/Iraq, Iran/Saudi)? Impact on country fiscal balances? But NOCs are expensive and “cost of political stability” is high
- Volatility will be worse because regulatory context will create difficulty in achieving market response
  - Includes inexperience of new registered futures traders as well as less liquidity

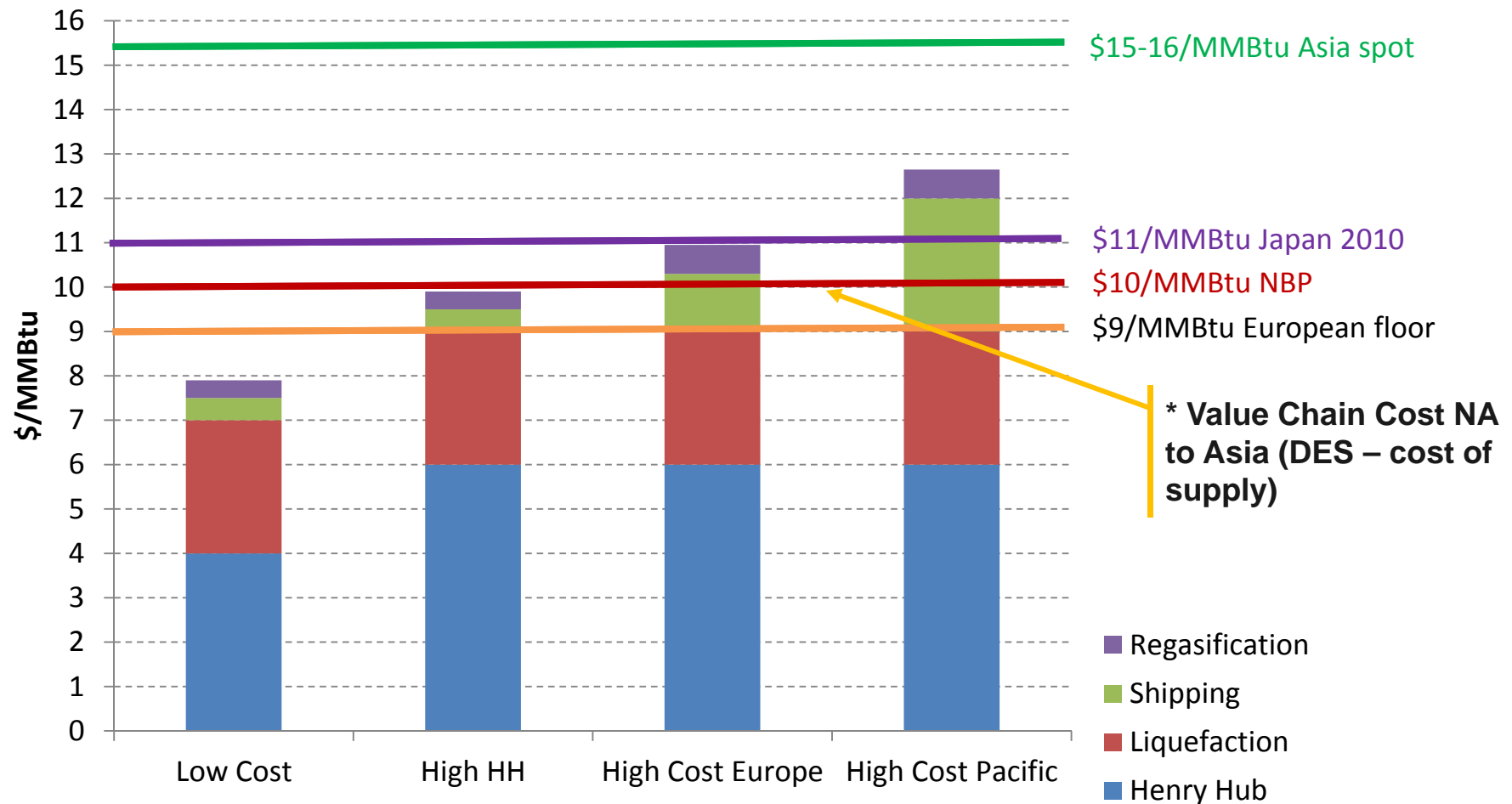
# Ramifications of Allowing Exports

- No infrastructure needed – new capacity already under development
- Refiner positions are mixed
- Price of refined products won't change (except in OK?)
  - international prices for products will prevail
- National security? Is there a “lobby” for national security?
  - Outdated laws, regulations
  - Will FDI sponsors support exports to get higher value for light crude production? What are their real interests?

# Conclusions

Clear as mud

# Is U.S. LNG Competitive?



South

**“MÉXICO LINDO Y QUERIDO”**

Workshop/Scene Setting

# **GAS-POWER**

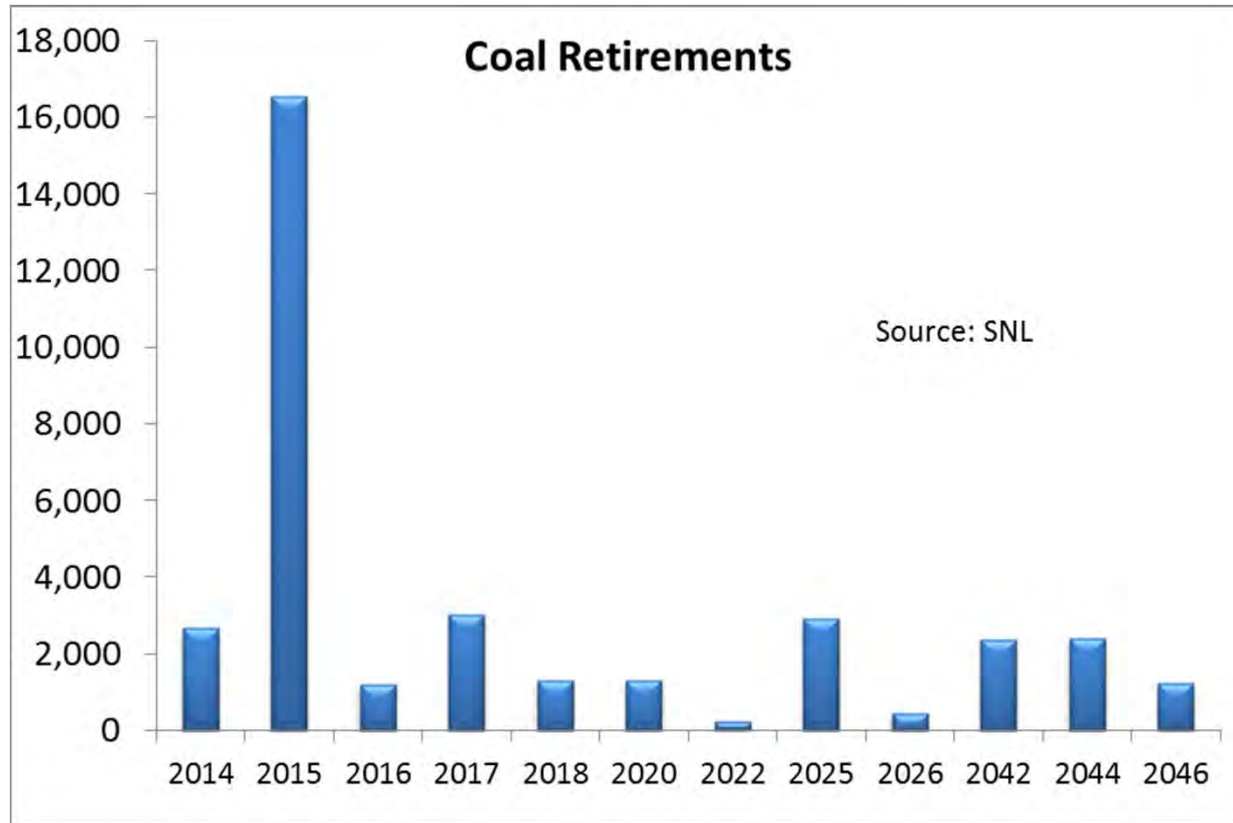
# CEE Research Portfolio

- Potential for gas use in power generation
  - Coal risks: CSAPR/CAIR, MATS, 316 (b) - water use for cooling, coal ash, GHG (federal and/or state)
  - Nuclear retirements
  - Renewables: capacity and capacity factor
  - Demand response, energy efficiency
- ERCOT resource adequacy
  - Competitive and mostly isolated ERCOT market is a good testing ground for above-listed factors as well



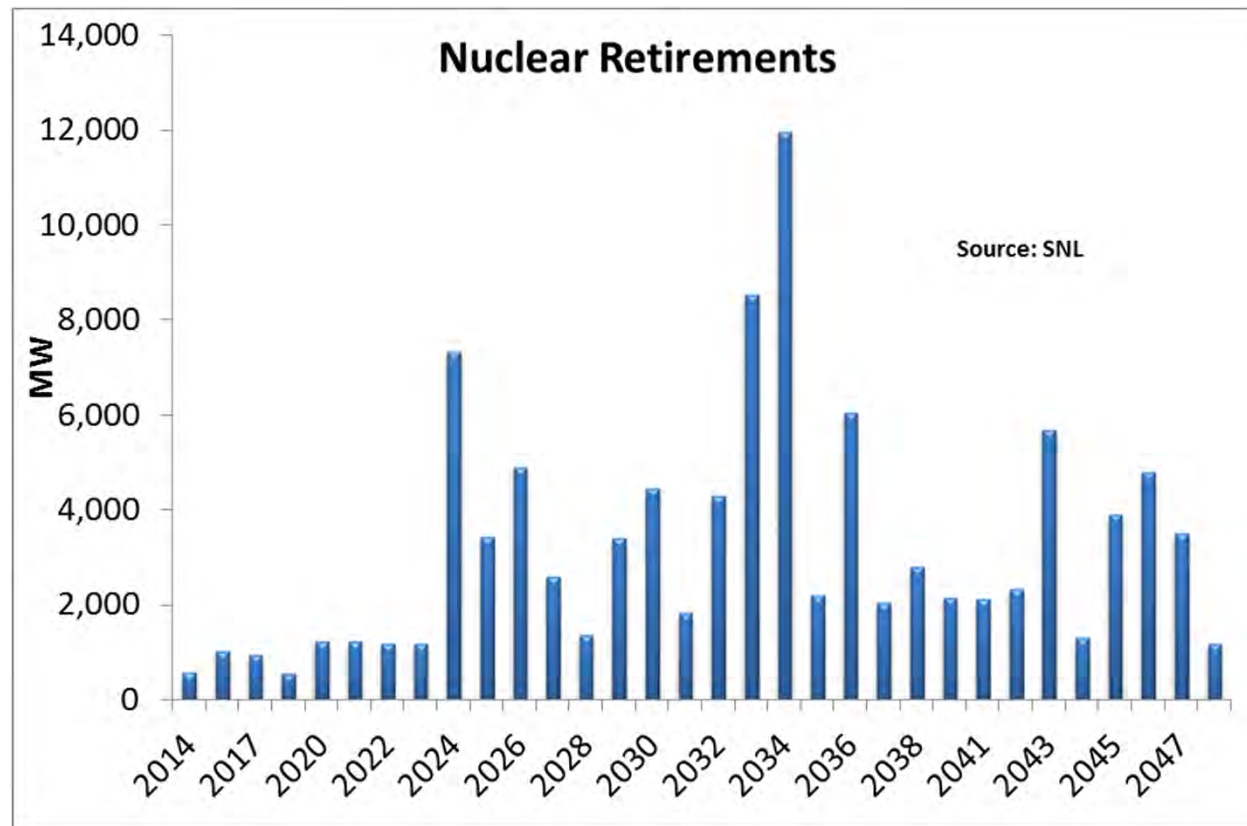
# Coal Retirements

- Up to 80 GW of coal capacity may retire by 2020
  - announced about 26 GW (2014-2020)
  - 2.6 GW in 2011; 8 GW in 2012; 2 GW by mid-2013 already retired (mostly older, smaller units)



# Nuclear Retirements

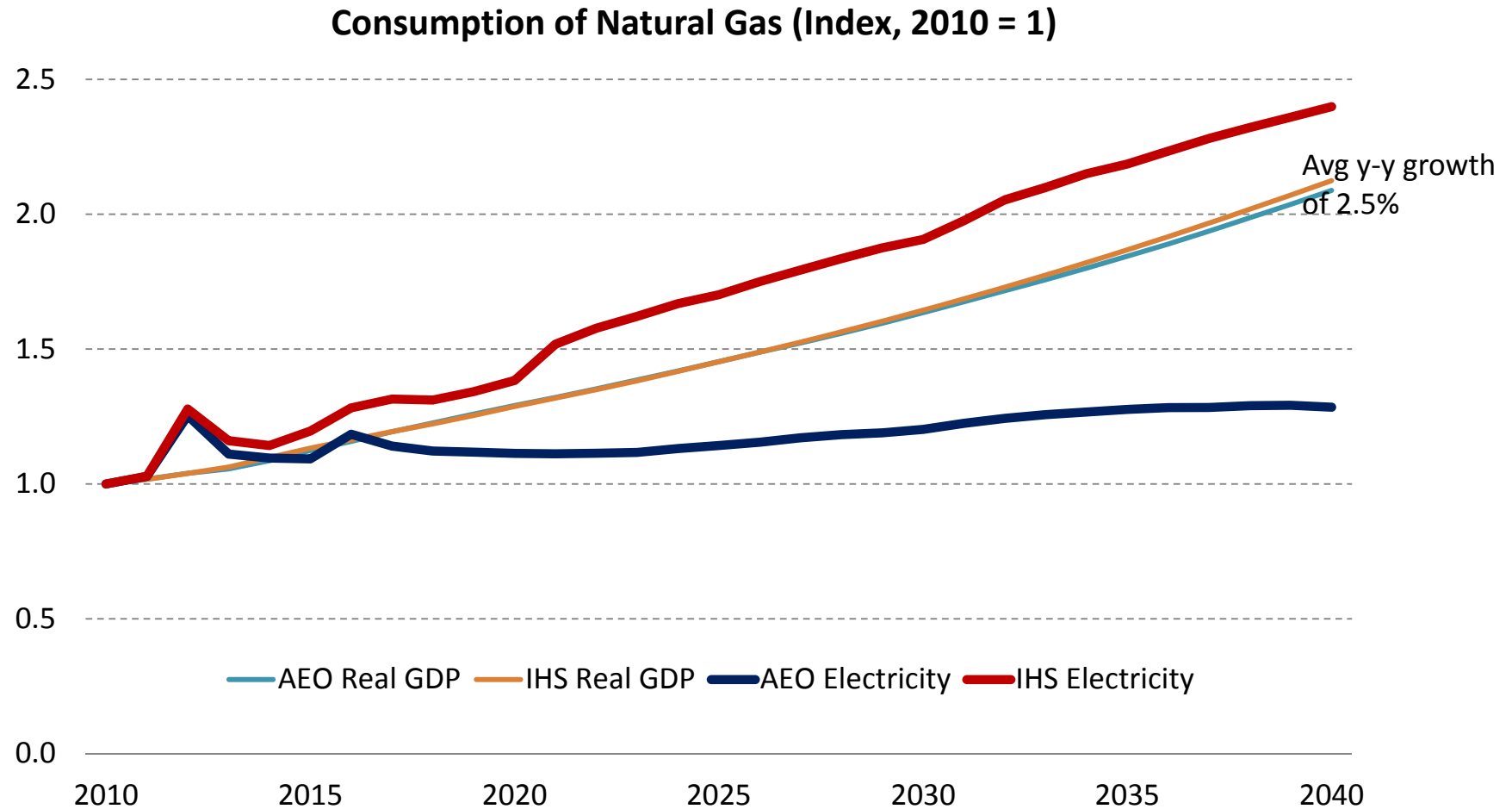
- 4 recent announcements; more on the way?
- Only 1-2 new plants under construction



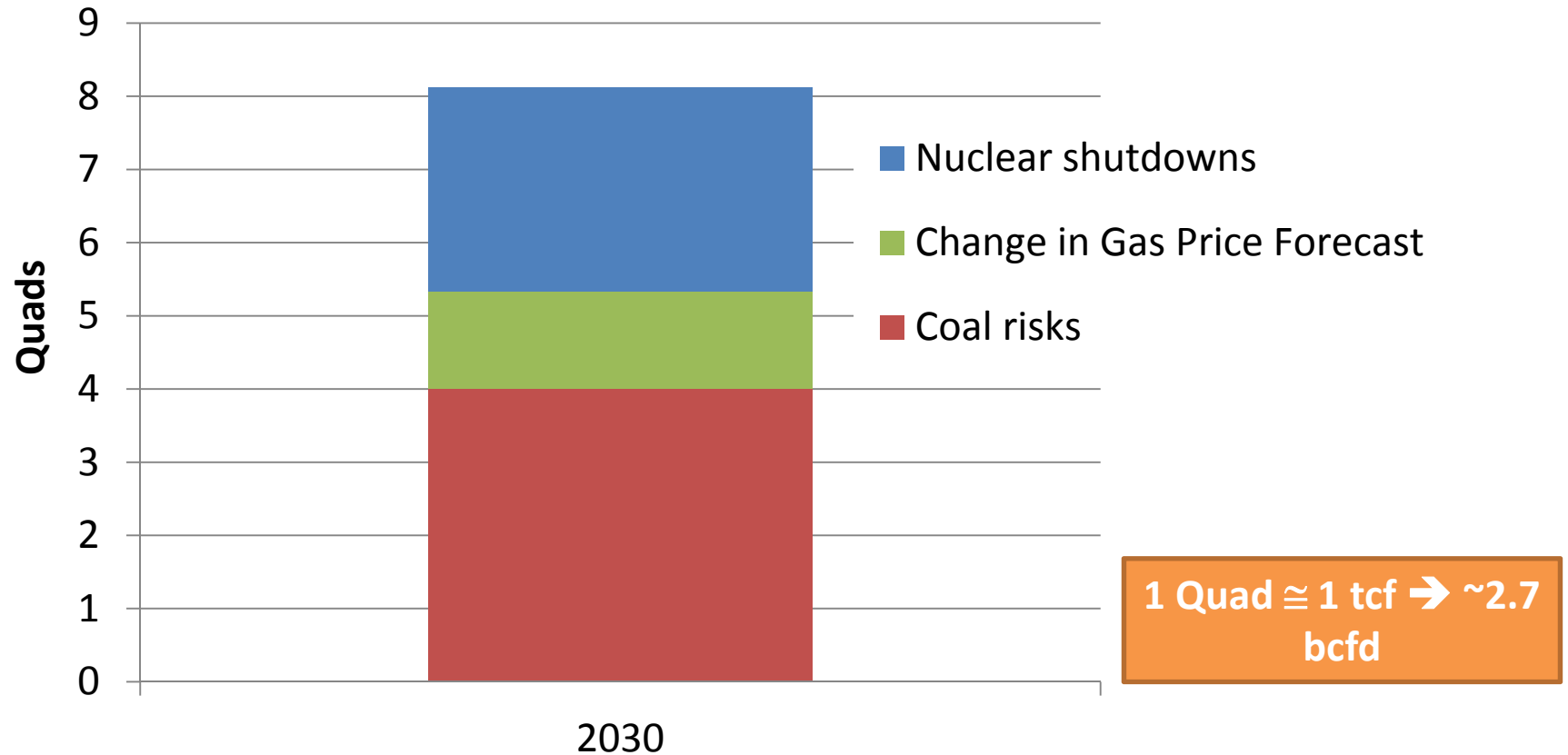
# Dampers on Gas Use in Power

- Currently, coal is competitive with gas at \$3-4/MMBtu of gas price
- Renewables capacity has been growing
  - Better capacity factors for wind
  - Declining cost of PVs
  - Storage projects seem to be moving forward
- Smart grid and demand response
- Energy efficiency and conservation (EIA AEO 2013 Reference Case: 0.9% annual demand growth; 0.2% in “best technology available” case)

# Competing Views of the World



# A CEE Scenario on Gas Use in Power



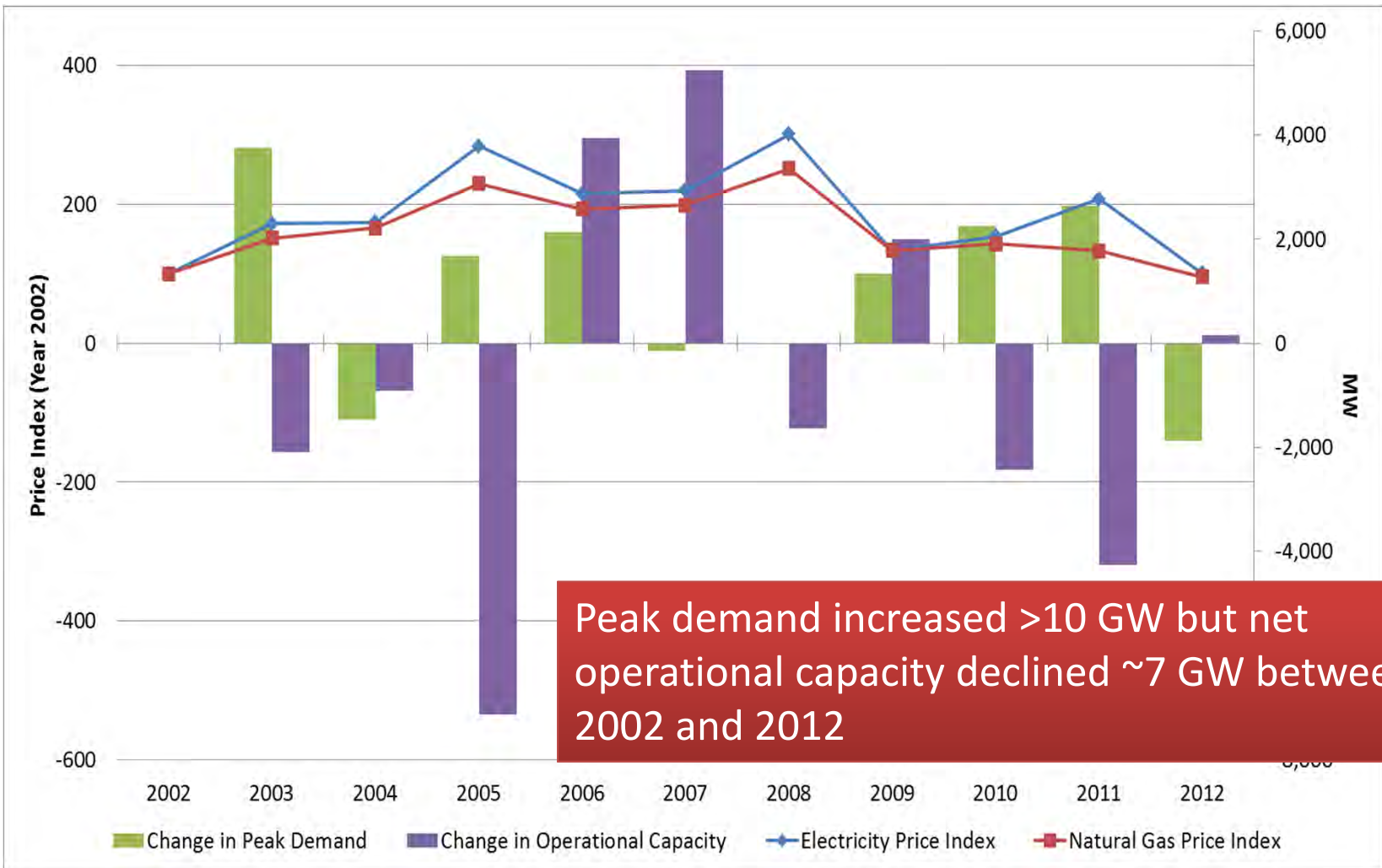
*U.S. Gas-Power Linkages: Building Future Views* for details:

<http://www.beg.utexas.edu/energyecon/thinkcorner/Think%20Corner%20Gas-Power%20Linkages.pdf>

# The ERCOT Market - Basics

- ERCOT is an energy-only market
- Reserve margin **target** of 13.75% (was 12.5%; might be increased to  $\geq 16\%$ )
- Rapid demand growth over the last decade
- Generation capacity expansion falling behind
- Extreme weather in summer of 2011
- System-wide offer cap (price cap) was raised to \$4,500 (from \$3,000) on August 1, 2012; and will increase to \$9,000 by 2015.

# Demand & Generation Growth Mismatch



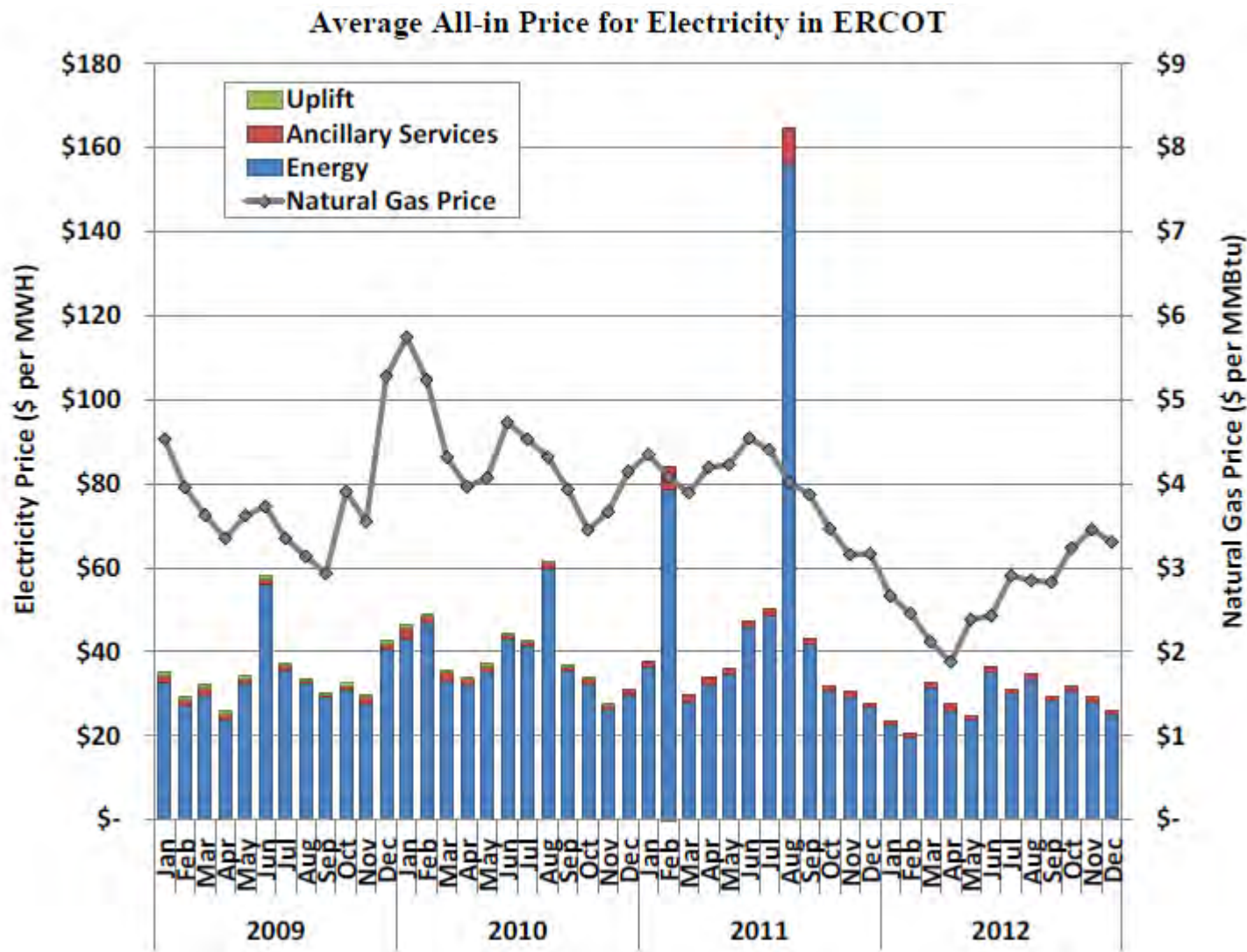
# Why is Generation Falling Behind?

## Possible Contributing Factors

- Competition works
- Low natural gas prices since 2008 → low electricity prices → tighter margins
- Low price caps & infrequency of price cap hits
  - Even in August 2011, only 17 hits
- Negative prices due to wind dispatch
- Aftershocks of the 2008 crisis: more cautious investment & lending practices

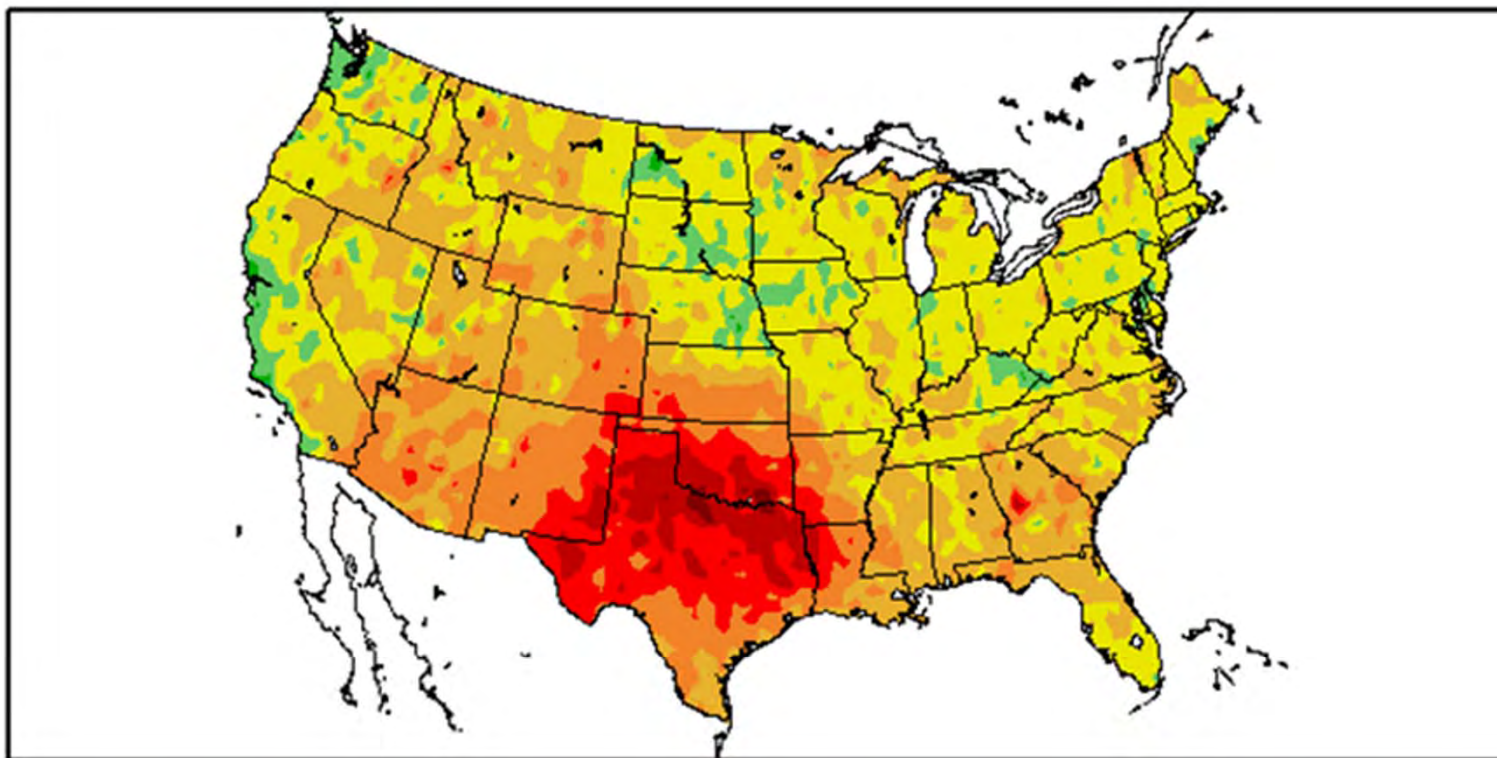


# Wholesale Price in ERCOT



# Departure from normal temperature

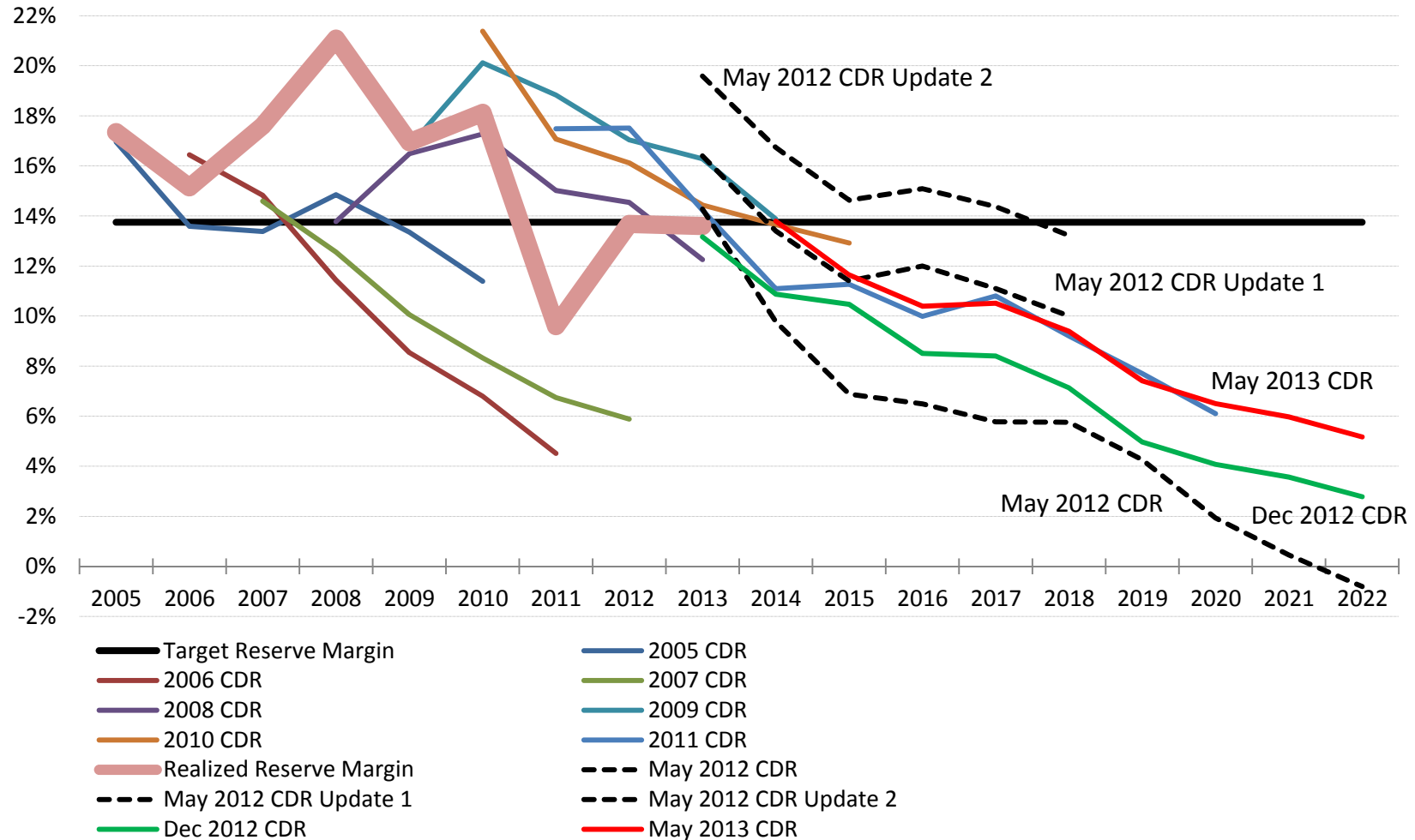
*(F) 8/2/2011 – 8/31/2011*



Generated 9/1/2011 at HPRCC using provisional data.

Regional Climate Centers

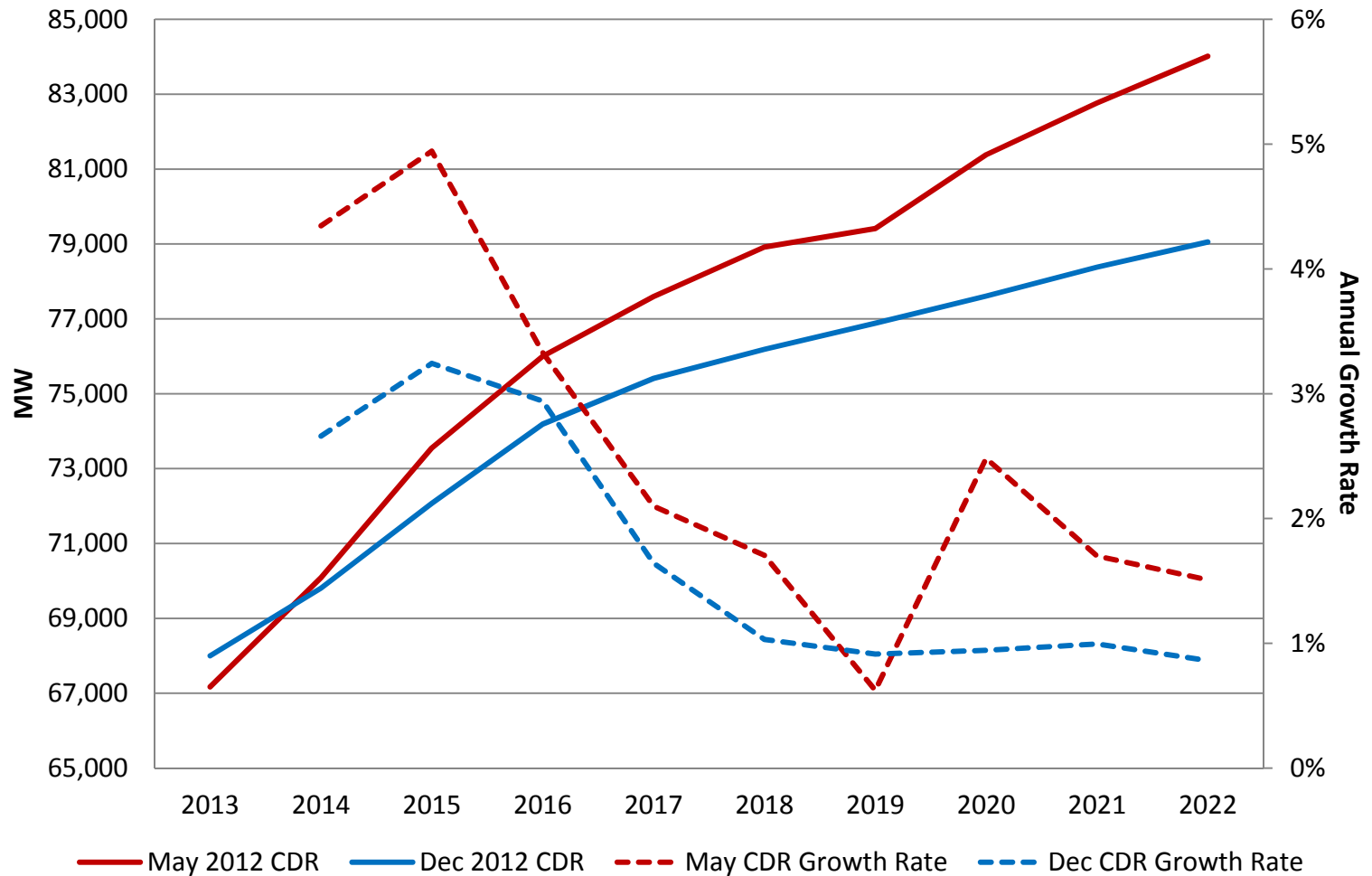
# Reserve Margin – Forecasts v Actual



2012 Update 1: de-mothballed units

2012 Update 2: de-mothballed units, lower demand growth, new resources

# Change in Demand Growth Assumption

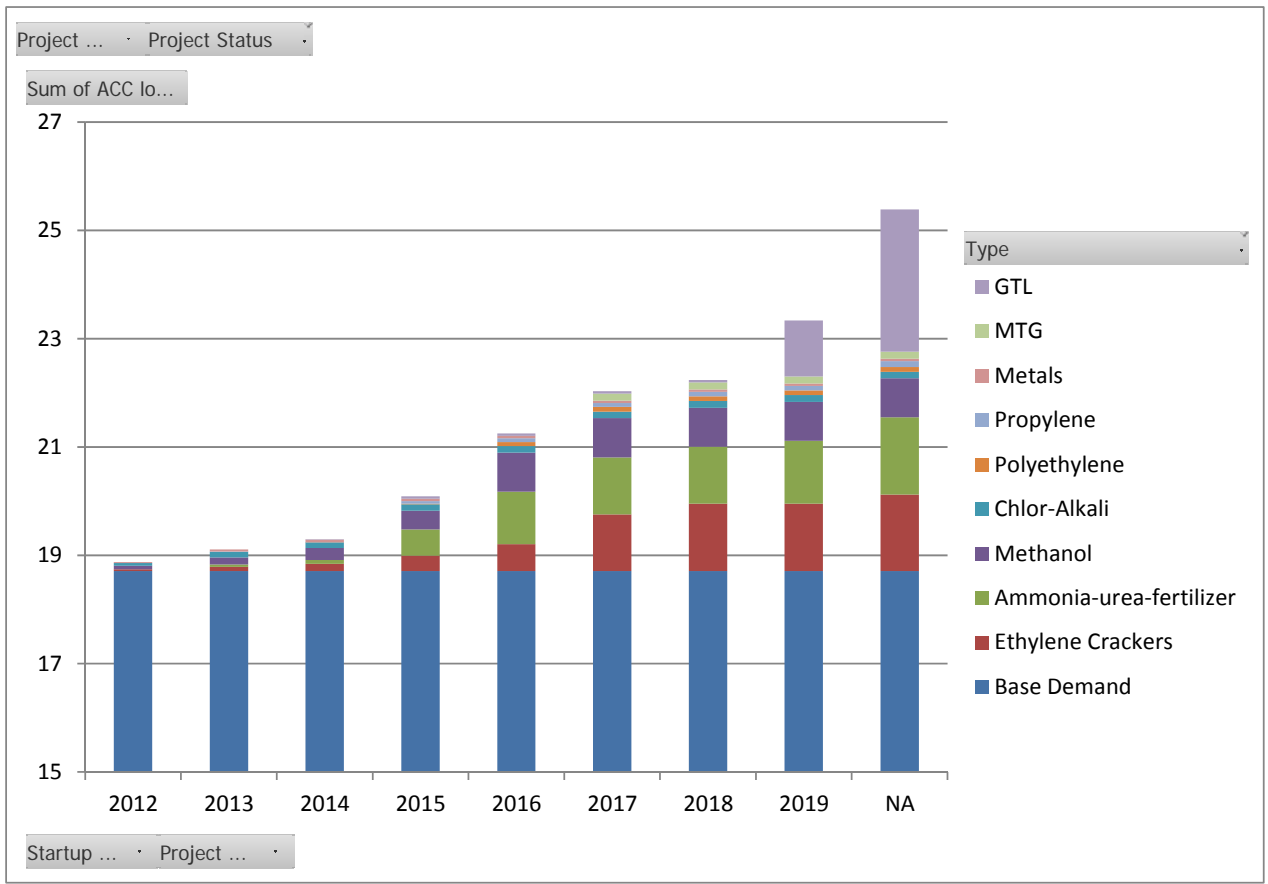


# CDR Revisions

- Lower demand growth scenario from Moody's since December 2012 CDR
- Going forward, a different approach to estimating demand growth
  - Weather modeling
  - Energy efficiency & demand response
- Possible change to target reserve margin ( $\geq 16\%$ )
- Wind ELCC to rise from 8.7% to  $\sim 14\%$  for West Texas &  $\sim 33\%$  for coastal areas

# Demand Complexities

- Increased oil & gas activity
  - Upstream: drilling in Barnett, EF, Permian, and more
  - Midstream: pipelines, processing facilities
  - Downstream: petrochemicals
  - Exports: LNG & pipes



# Generation Interconnection Requests

## GENERATION INTERCONNECTION REQUESTS CURRENTLY UNDER REVIEW

Currently tracking 161 generation interconnection or change requests

As of August 31, 2013

Total

Security Screening Study	13
SSS Completed	14
Full Interconnect Study	93
FIS Completed	8
Suspended Studies	0
Capacity of Suspended Study Projects	0
Interconnect Agreement Completed	40
Capacity under Interconnection Agreements	12,605
Capacity for Grid, MW	42,348
Wind Capacity, MW	21,190
Cancelled Projects	0

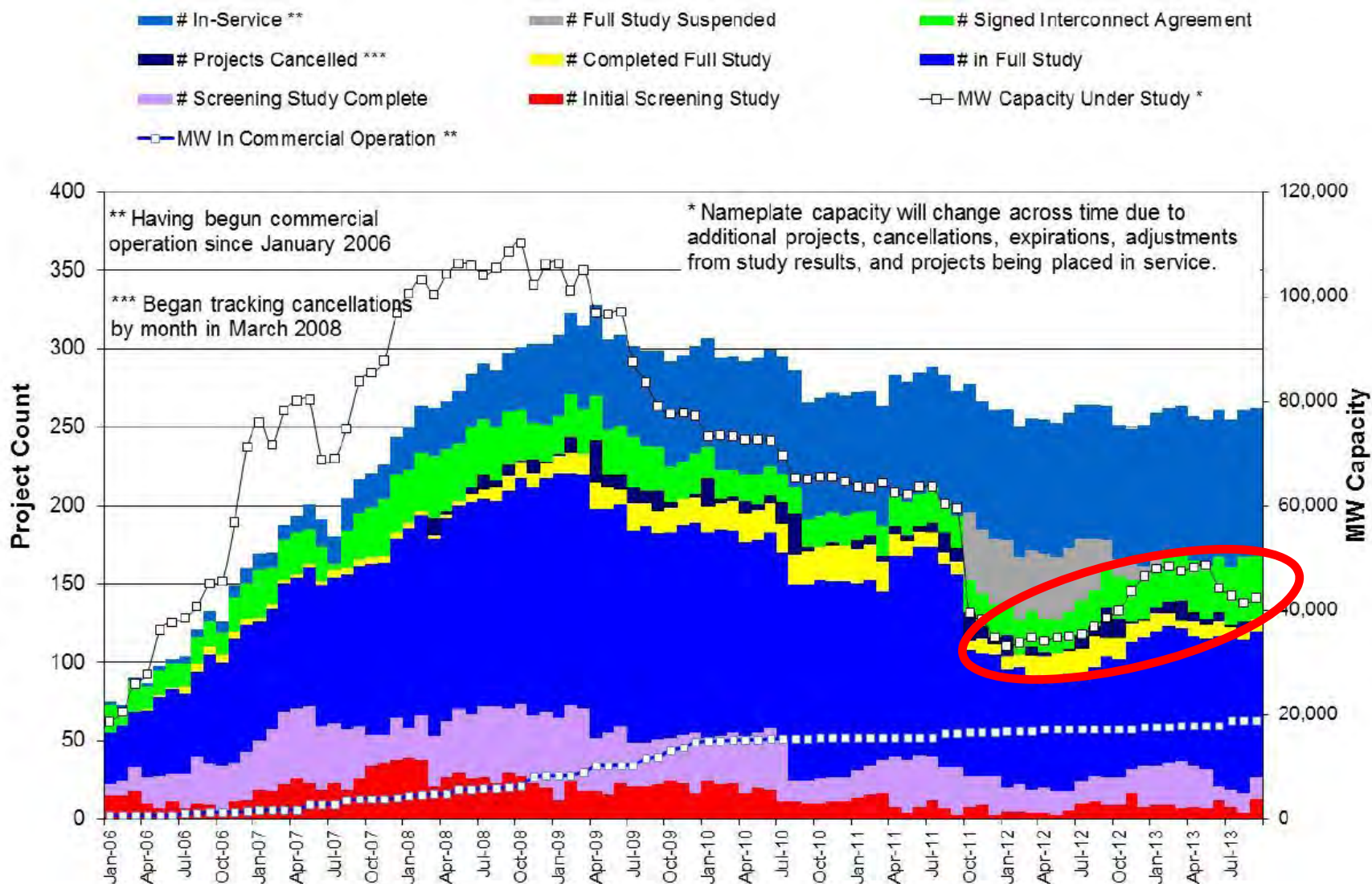


# Natural Gas & Wind Dominate

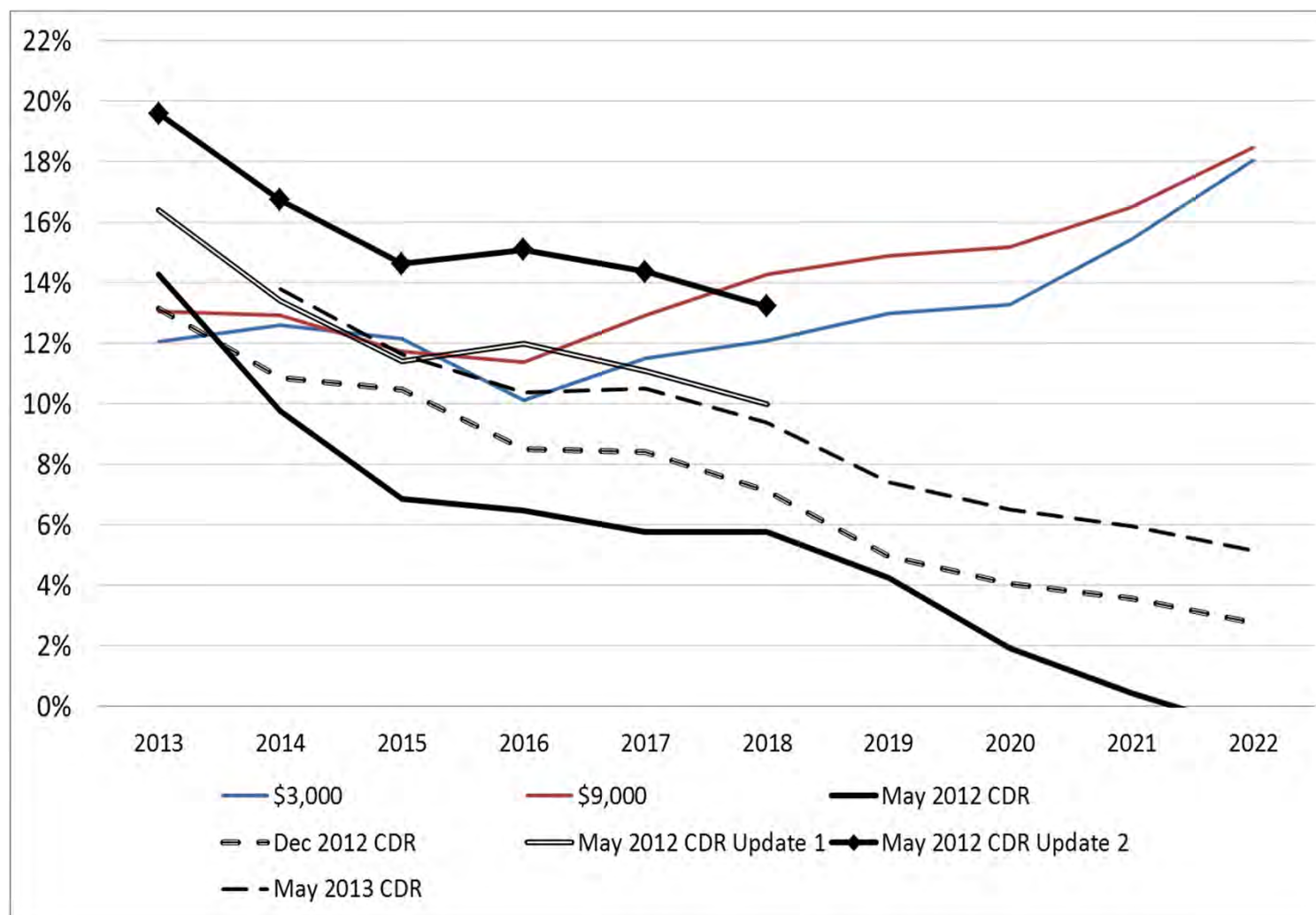
Fuel Type	Confidential Projects (MW)	Projects Under Full Study (MW)	Public Projects (MW)	Suspended Studies (MW)	Grand Total (MW)
Gas-AllOther			374	-	4,780
Gas-CombinedCycle			6,515	-	13,561
Total Gas	320	11,132	6,889	-	18,341
Nuclear	-	-	-	-	-
Coal	-	30	240	-	270
Wind	2,413	13,317	5,460	-	21,190
Solar	331	1,152	150	-	1,633
Biomass	-	-	-	-	-
Storage	-	874	40	-	914
Petroleum Coke	-	-	-	-	-
Grand Total	3,064	26,505	12,779	-	42,348



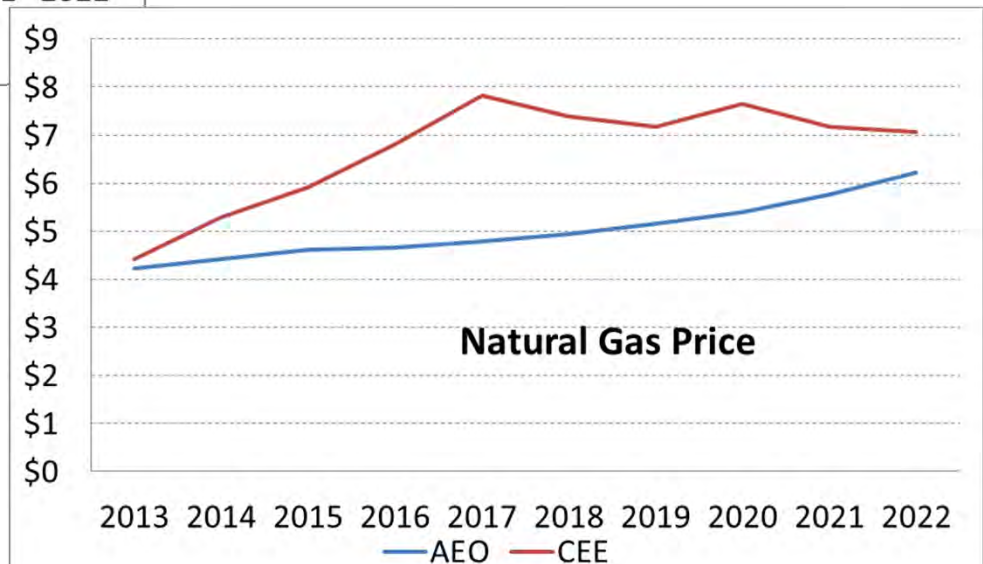
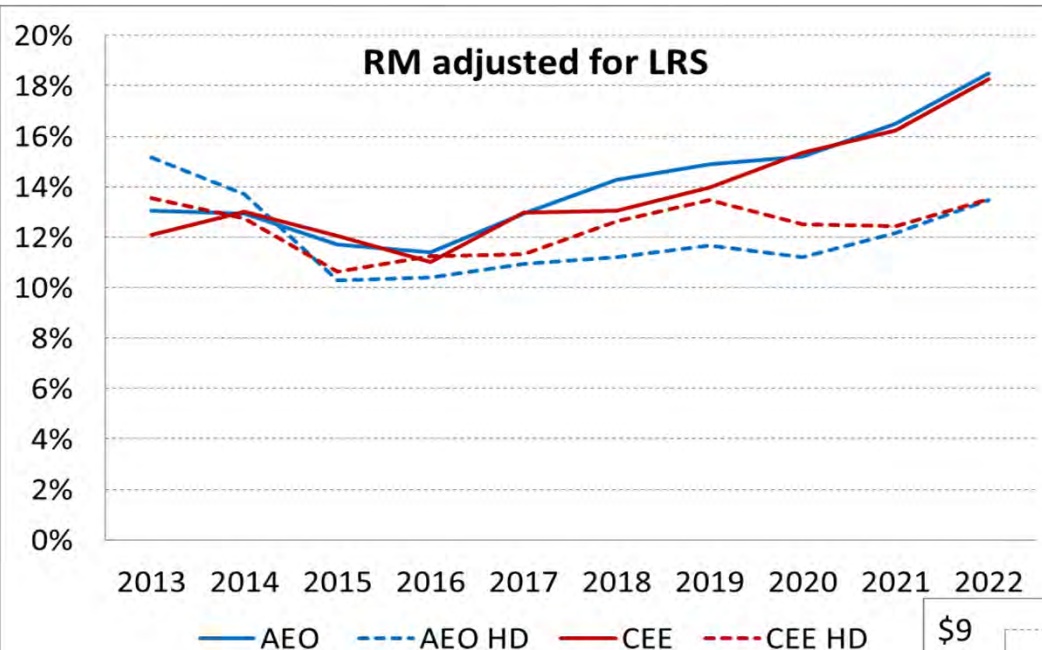
# Increasing IAs



# CEE Analysis: Impact of Higher SWOC



# Impact of Higher Demand Growth & Natural Gas Price Scenarios

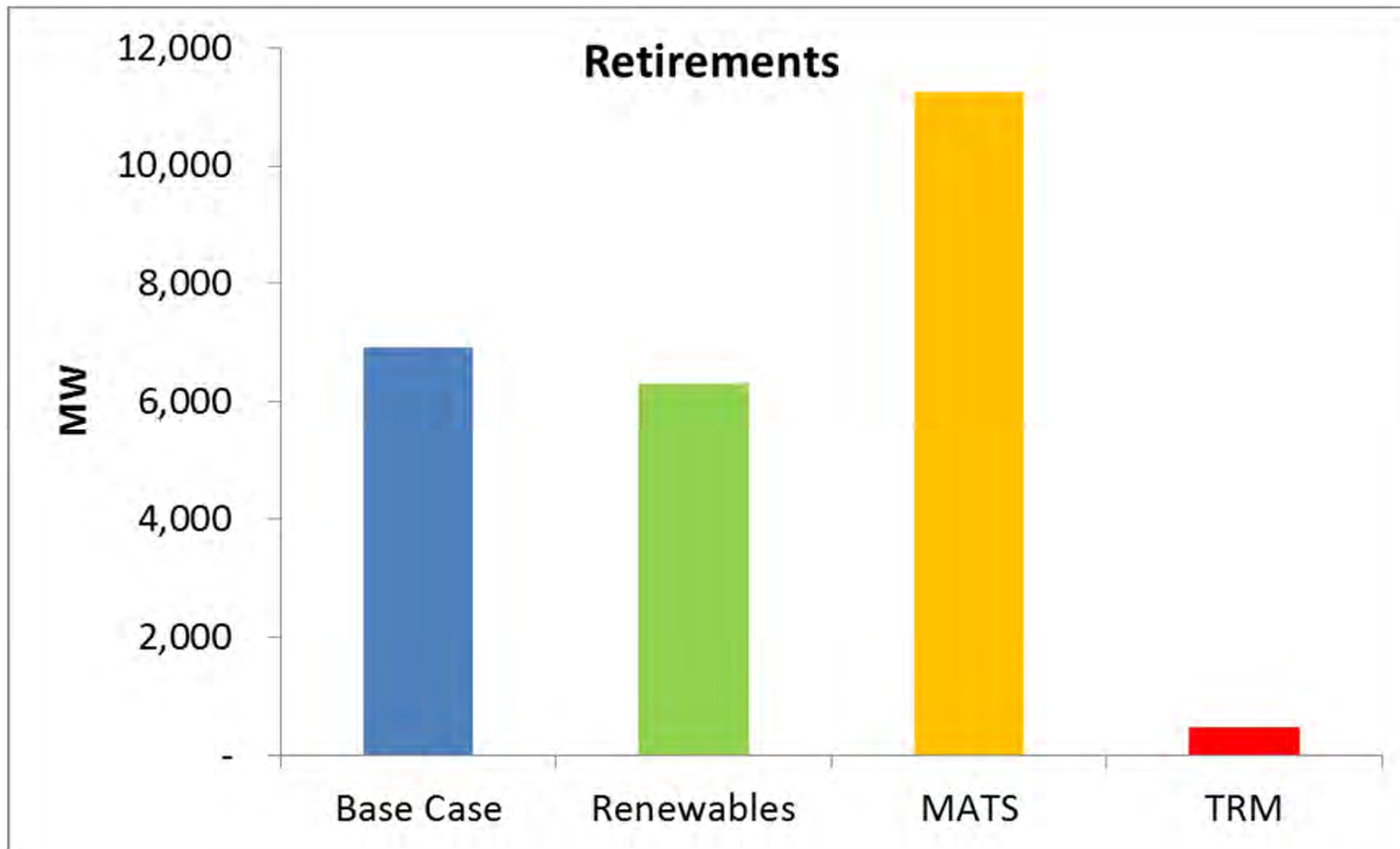


*Gülen & Soni, The Impacts of Raising the Energy Price Cap in ERCOT, The Electricity Journal, 26(7), 43-54.*

# Recent CEE Research

- **Base Case**—2013 AEO natural gas price forecast and ERCOT low demand growth scenario
- **Target Reserve Margin (TRM)**—Set target reserve margin equal to 13.75%
- **MATS**—Added cost compliance with MATS, CSAPR/CAIR, 316 (b) and coal combustion residuals as estimated by ERCOT
- **Renewables**—Inserted planned renewable builds in ERCOT through 2017 according to SNL/ERCOT data + employed higher ELCC figures

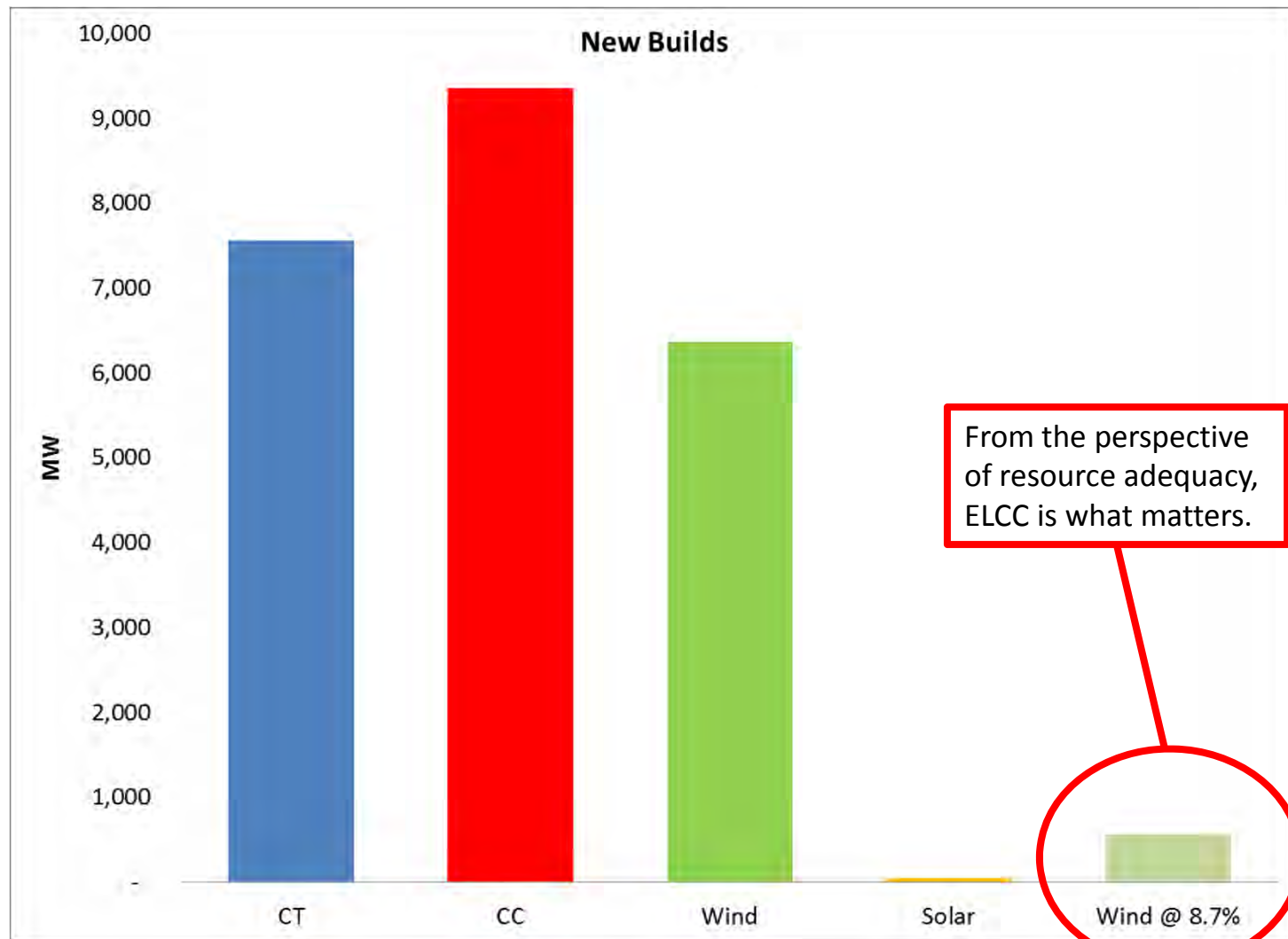
# Retirements (2013-2023)



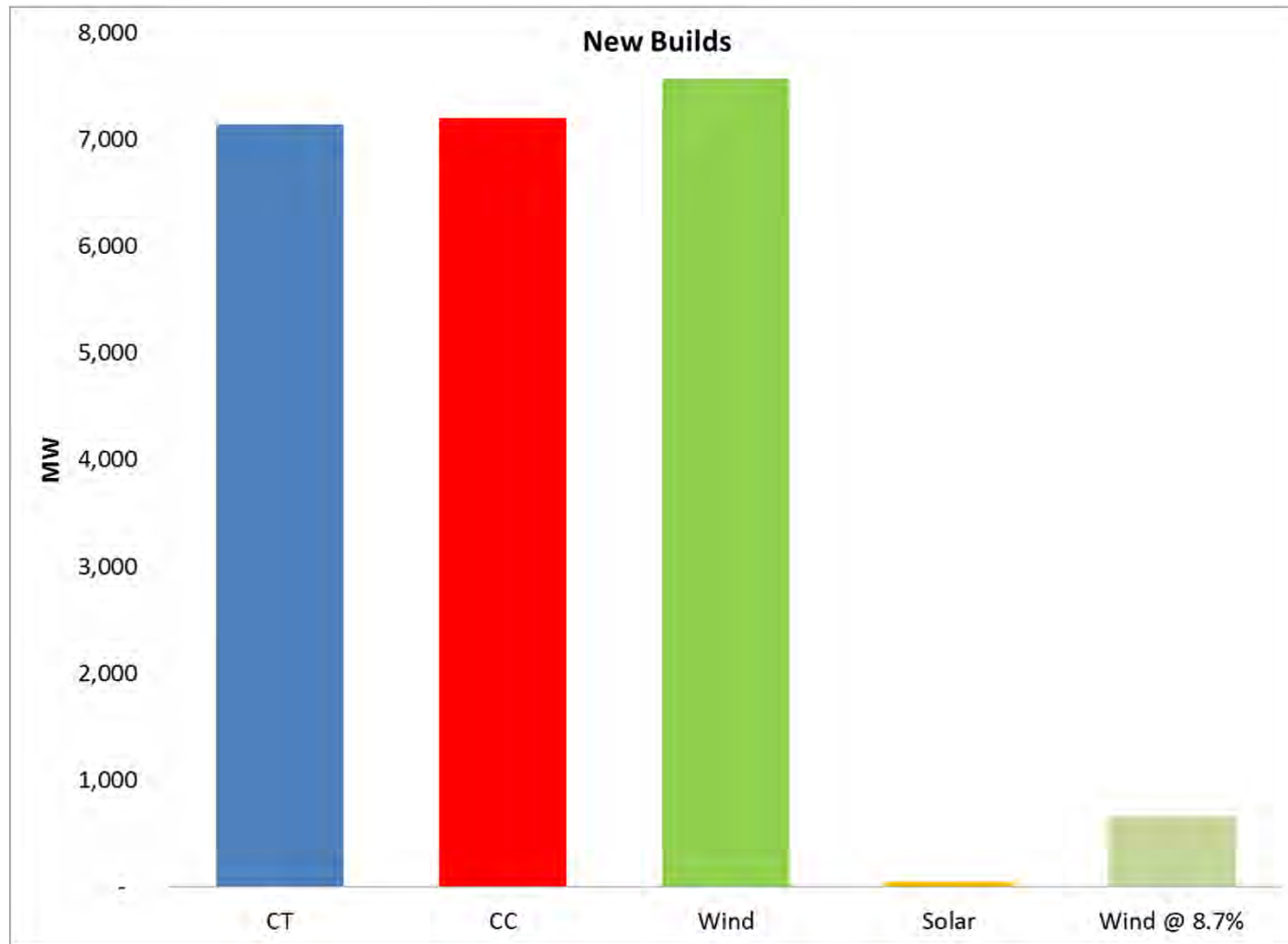
- All retirements in the Base Case are natural gas
- Under the MATS Case, there are 3.1 GW of coal retirements
- Very few retirements in the TRM case due to “capacity payments”



# Base Case New Builds (2013-2023)

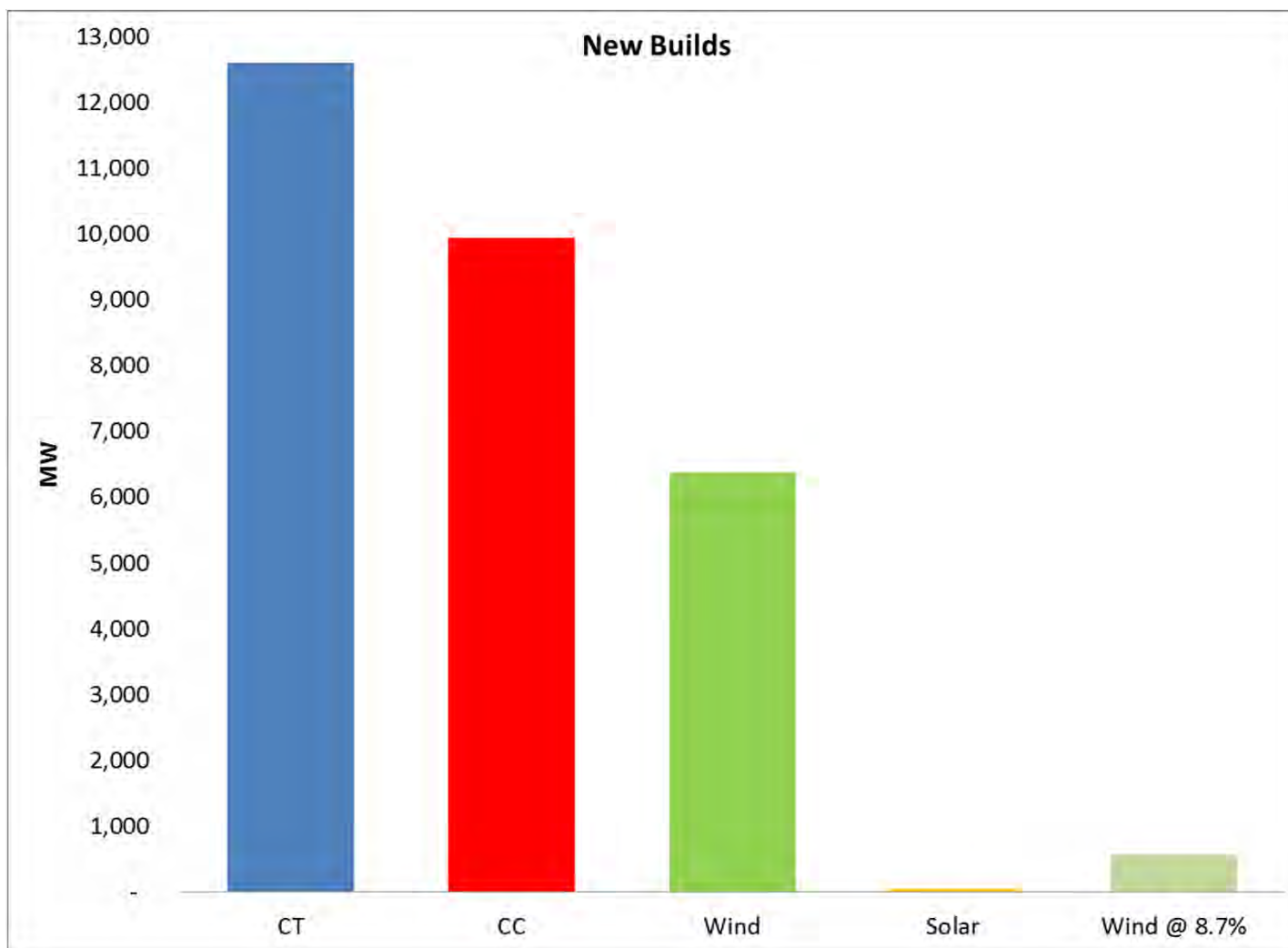


# TRM Case New Builds (2013-2023)



- Fewer new builds than the Base Case, especially in CC, due to fewer retirements → probably less gas use

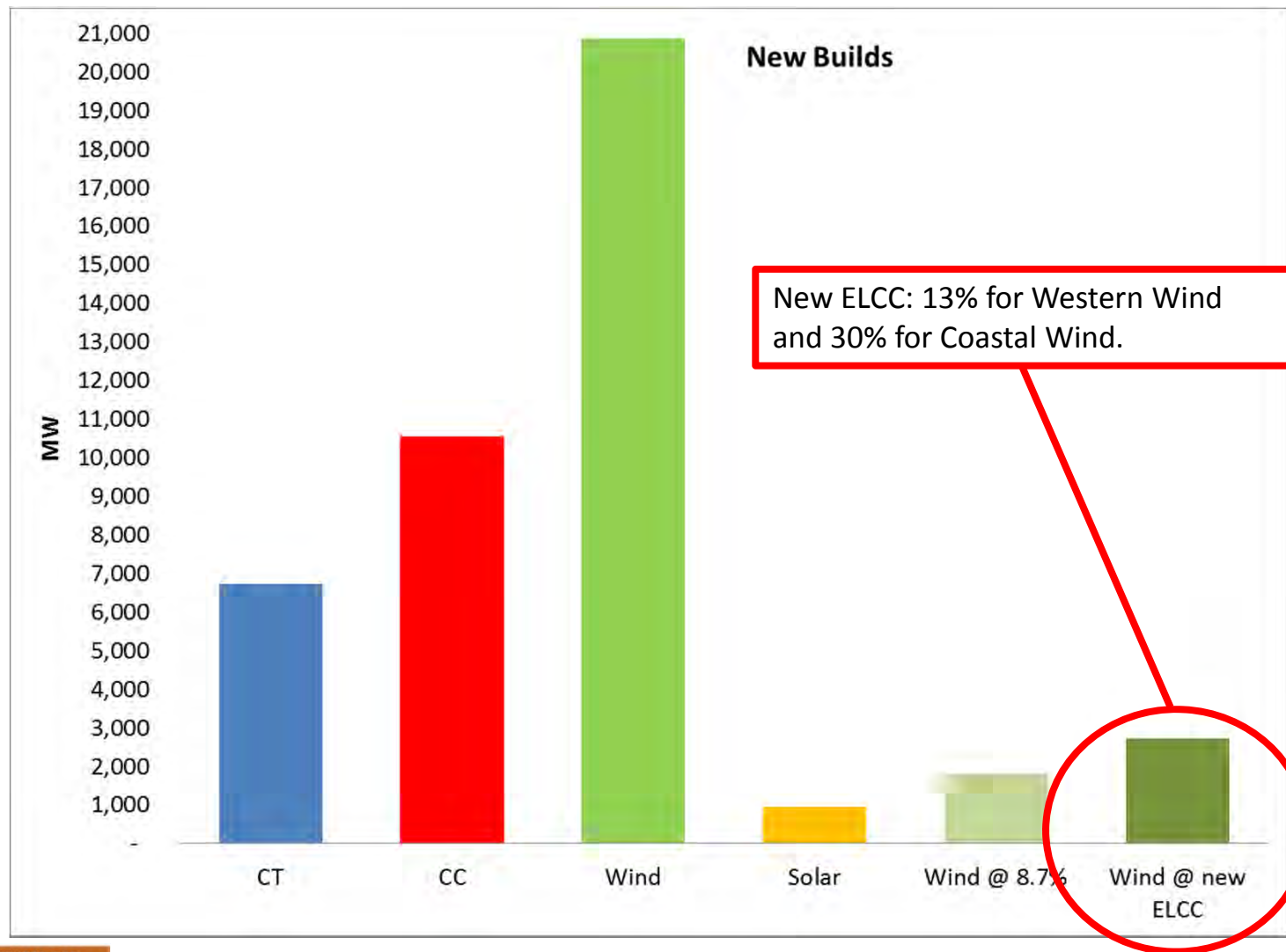
# MATS Case New Builds (2013-2023)



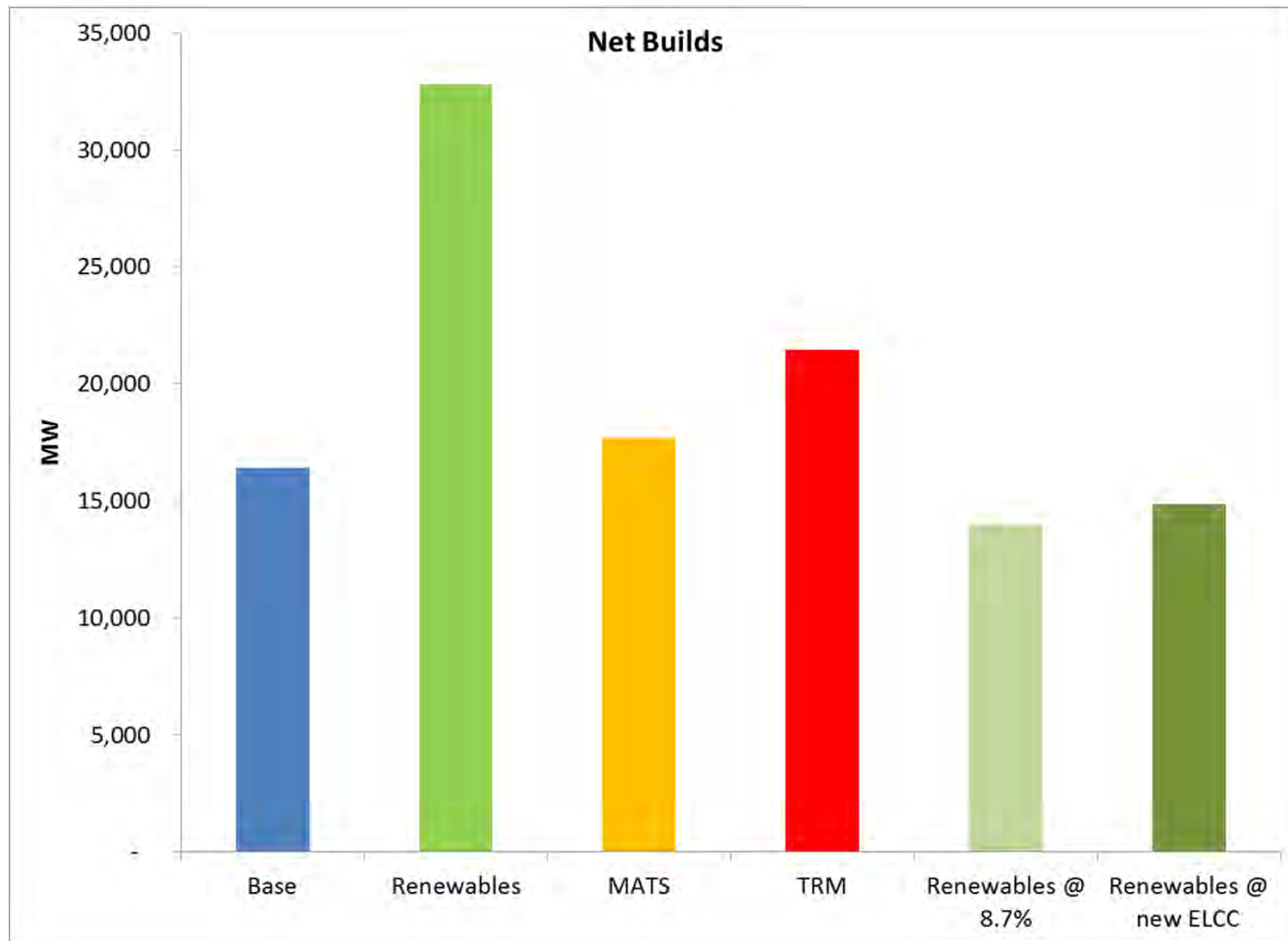
- MATS case brings more CT/CC online to replace lost coal units → probably more gas use



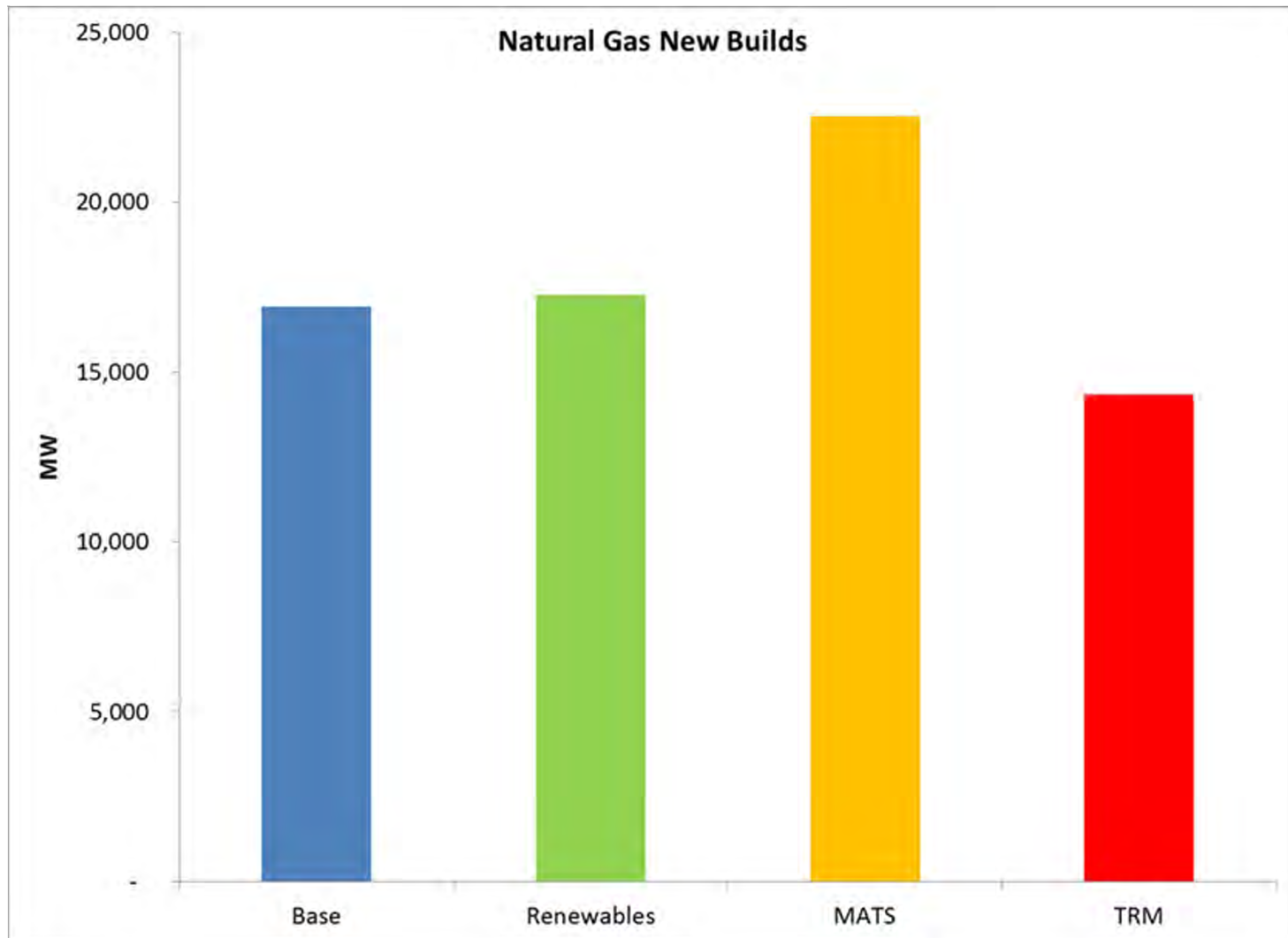
# Renewables Case New Builds (2013-23)



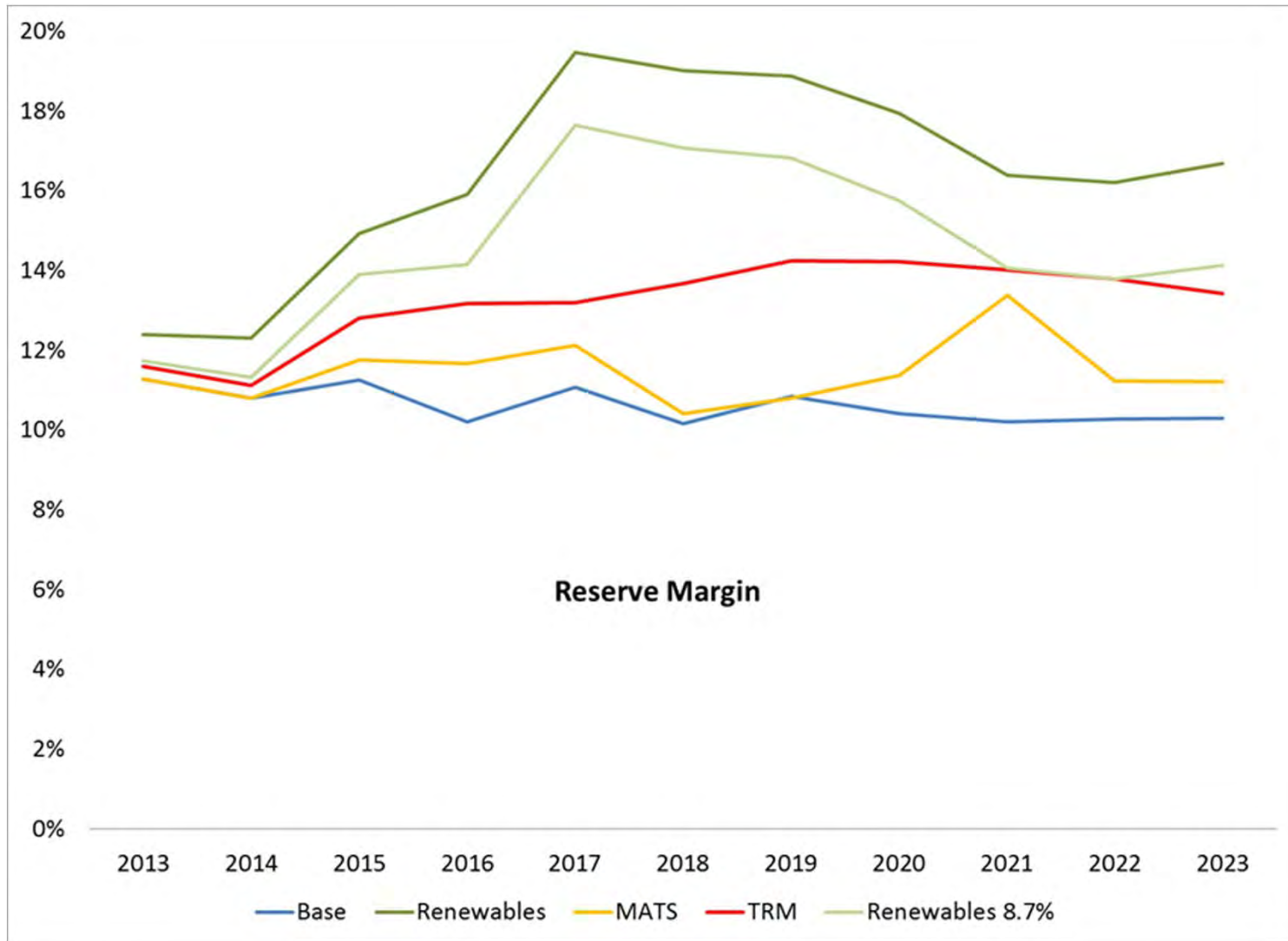
# Net Builds(2013-2023)



# Net Natural Gas New Builds



# Reserve Margin (2013-2023)



# Going Forward

- Due diligence on recent results
- Combined effects (e.g., MATS + renewables)
  - Add DR & EE (?)
- Expand to the rest of the US (i.e., update the analysis from early 2012)
  - Coal & nuclear retirements
  - Renewables