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Electric Reliability Under EPA's New Air Regulations:

What We Know, and What We Can Do About What We Don't Yet Know

Sue Tierney – Analysis Group

NASEO Annual Meeting
September 13, 2011 – San Antonio

Overview – EPA Air Regulations and Electric Reliability

- What we know reasonably well
- What we don't know well enough yet
- In those situations: what we can do to ensure reliable electric supply as well as clean air

What we know reasonably well

- EPA actions – brief overview
- Market conditions – natural gas and generation mix
- Studies of reliability impacts
- Market evidence about industry responses
- Options for action in different competitive/regulated settings

What we know reasonably well – EPA actions (1)

EPA's regulations: court-ordered, more flexible than expected a year ago

- **CSAPR – Cross-State Air Pollution Rule (**SO2, NOx)
  - Some intrastate trading allowed (but tight budgets)
- **Air Toxics – mercury, arsenic, acid gases, benzene, etc.**
  - More technology, averaging on stations, "work practice standards"
- **316(b) – water cooling**
  - Case-by-case analyses of feasibility of alternatives

What we know reasonably well – EPA actions (2)

Other context:

- **States' mercury rules:**
  - Many states already have mercury rules stricter than or equal to EPA's Air Toxics proposal
- **New ozone standard:**
  - President Obama's withdrawal of EPA's proposal
- **Other court-ordered actions:**
  - Some big emitters under consent decrees to correct violations of old rules (e.g., AEP 2007 consent decree)

What we know – market conditions (1)

Natural gas prices:

- **Possible to get forward contracts at attractive prices compared to two years ago**

- **Already putting pressure on coal facilities even in the absence of EPA regulations**
  - Previously underutilized existing gas-fired capacity is already operating more

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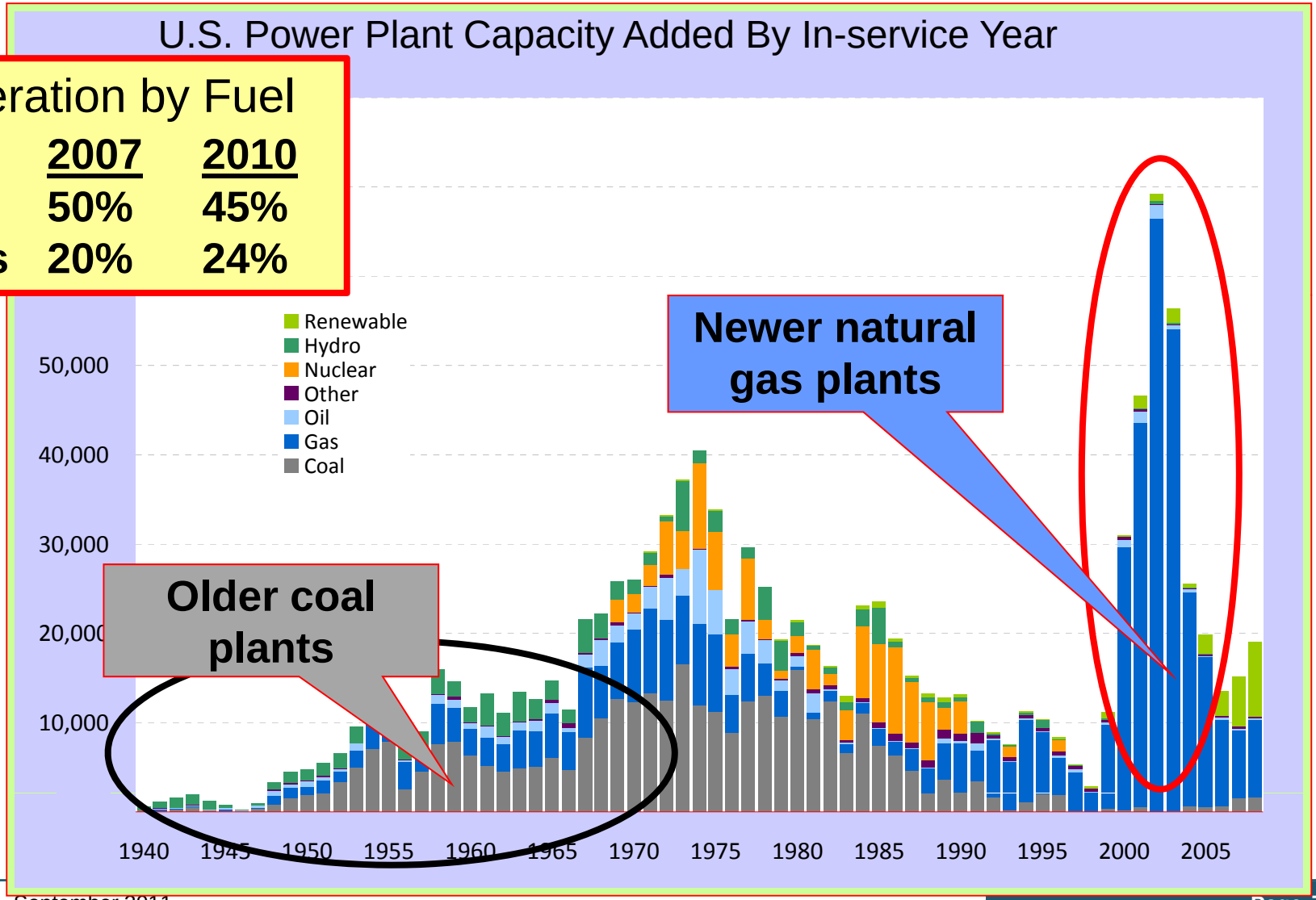
What we know – market conditions (2)

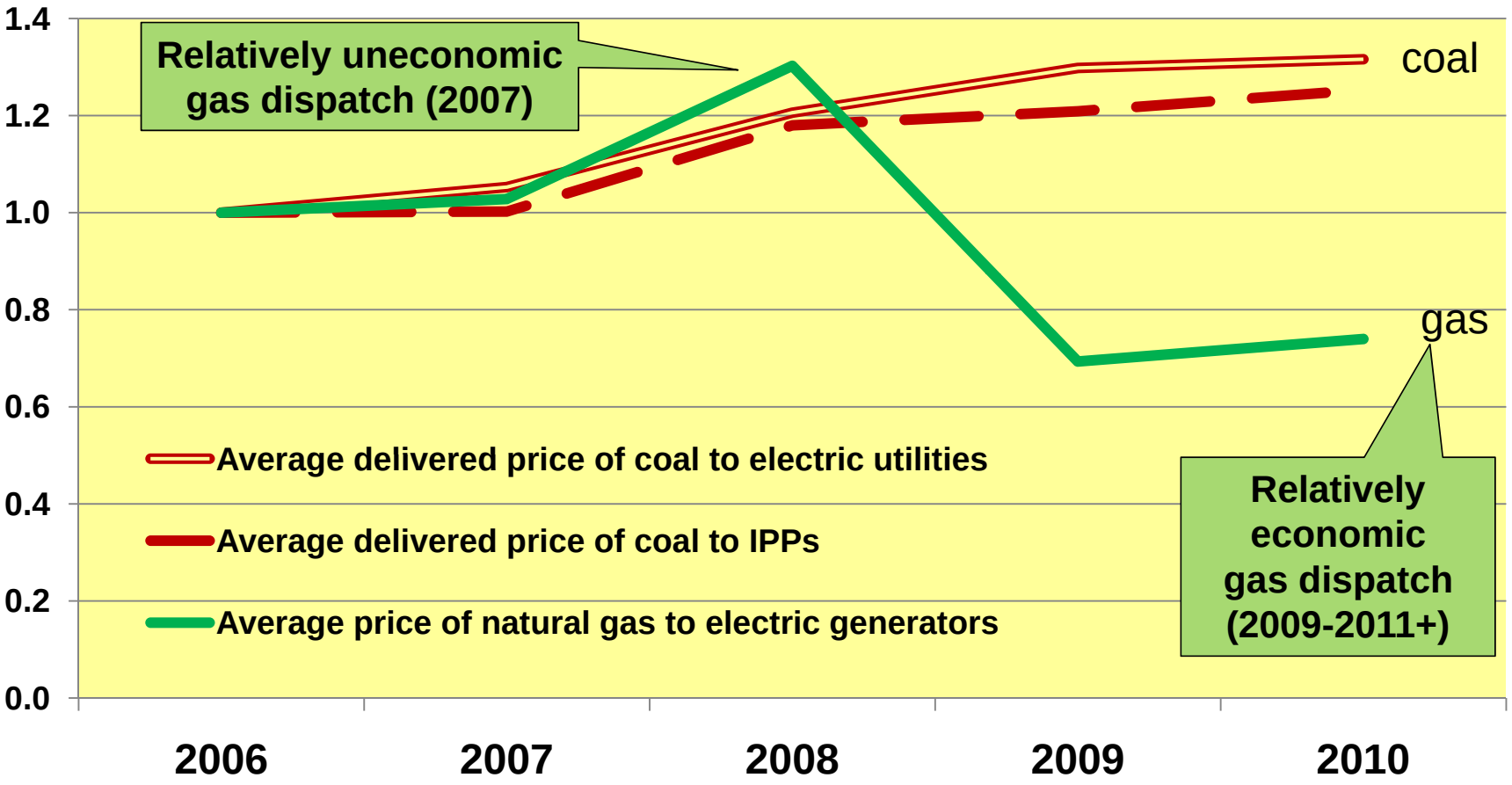
Generation by Fuel	2007	2010
Coal	50%	45%
N gas	20%	24%



Source: Ceres, et al., Benchmarking Air Emissions of the 100 Largest Electric Power Producers in the United States, June 2010.

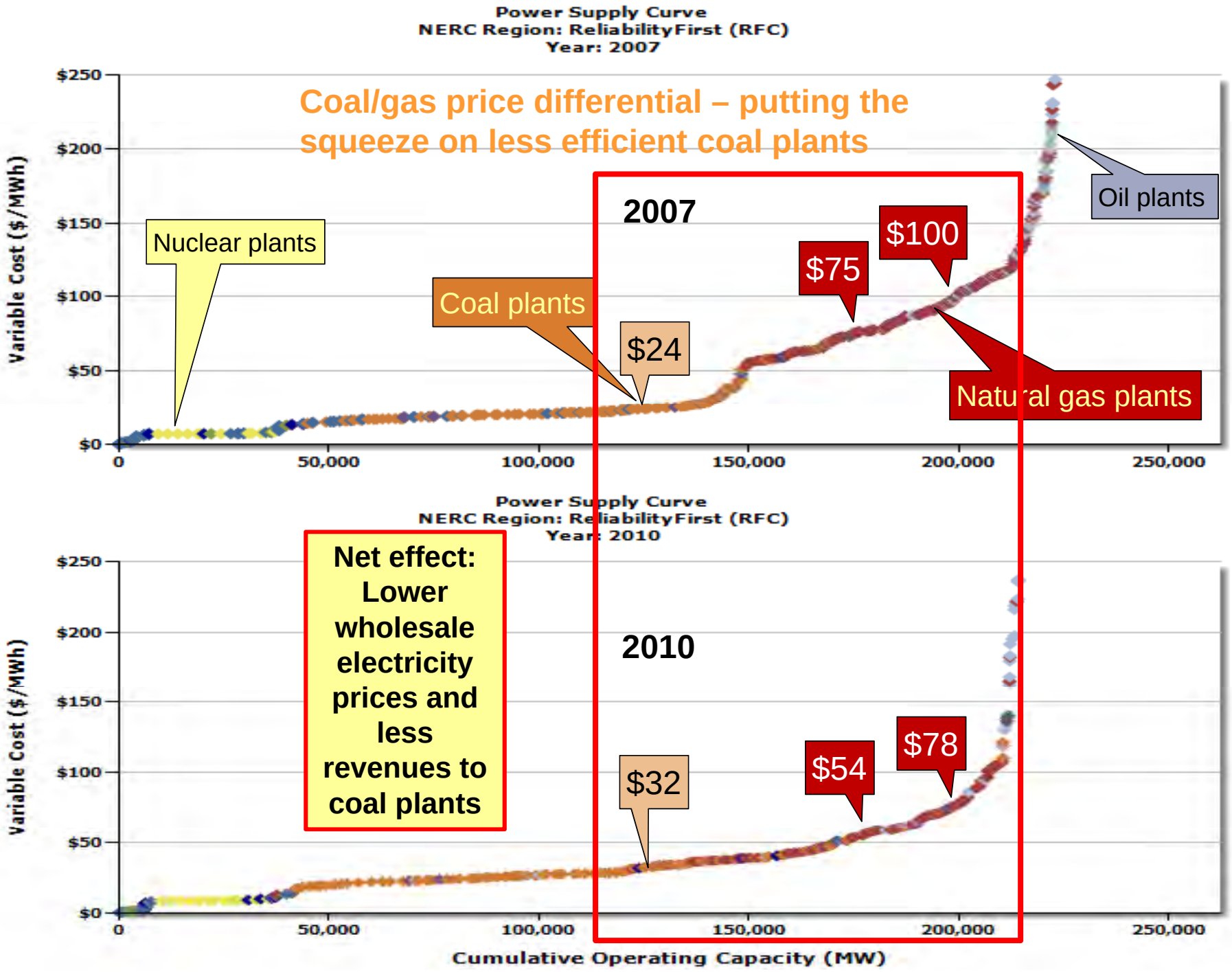
What we know – market conditions (3)

Price of Coal v. Natural Gas for Power (2006 – 2011)



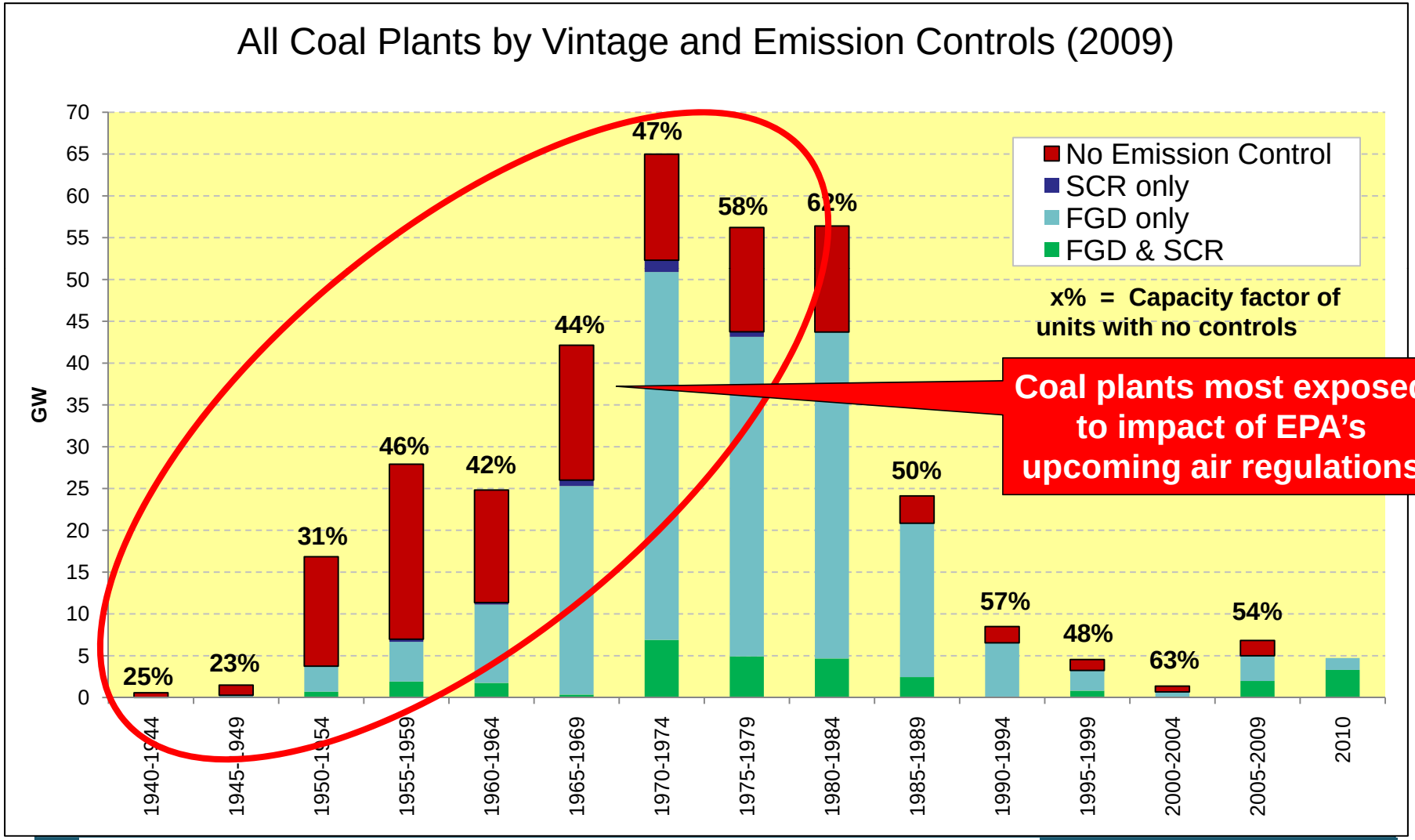
Source: Natural gas prices: EIA, http://www.eia.gov/dnav/ng/ng_pri_sum_dcu_nus_a.htm;

Coal prices: William Watson, Nicholas Paduano, Tejasvi Raghuveer and Sundar Thapa, EIA, "U.S. Coal Supply and Demand: 2010 Year in Review," June 1, 2011 (available at http://www.eia.gov/coal/review/pdf/feature10.pdf)


Power Supply Curve
NERC Region: ReliabilityFirst (RFC)
Year: 2007
Coal/gas price differential – putting the squeeze on less efficient coal plants
Variable Cost ($/MWh)
$250
$200
$150
$100
$50
$0
0
50,000
100,000
150,000
200,000
250,000
2007
Nuclear plants
Coal plants
$24
$75
$100
Oil plants
Natural gas plants
Power Supply Curve
NERC Region: ReliabilityFirst (RFC)
Year: 2010
Net effect: Lower wholesale electricity prices and less revenues to coal plants
2010
$32
$54
$78
Cumulative Operating Capacity (MW)

What we know – market conditions (4)

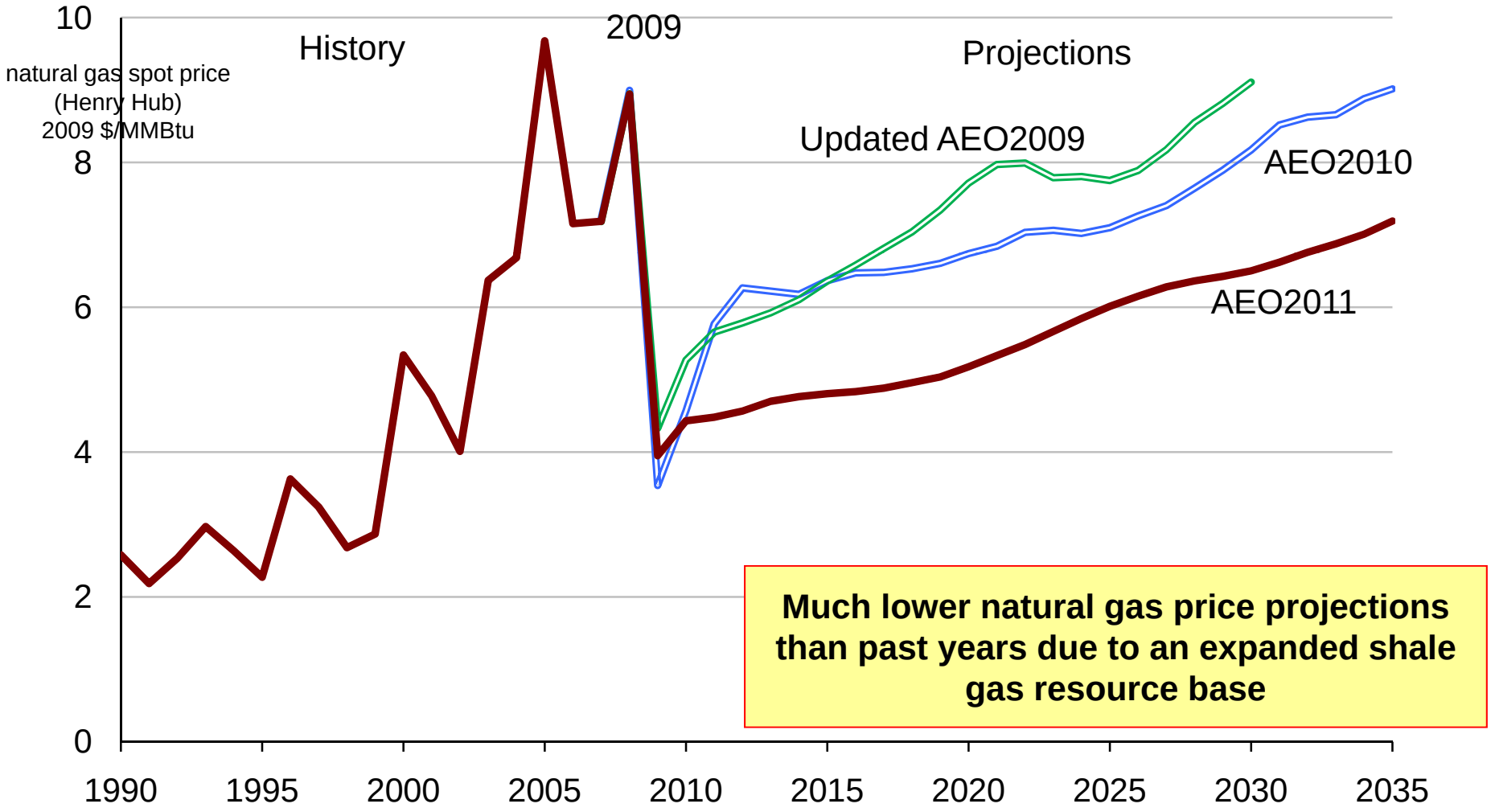
Older coal plants have fewer air-pollution controls & operate less



Notes:[1] Totals do not include Alaska or Hawaii. Source: SNL data.

What we know – market conditions (5)

Lower outlook for natural gas prices….



Much lower natural gas price projections than past years due to an expanded shale gas resource base

R. Newall, EIA, The Long-term Outlook for Natural Gas, presentation to the Saudi Arabia – United States Energy Consultation, February 2, 2011

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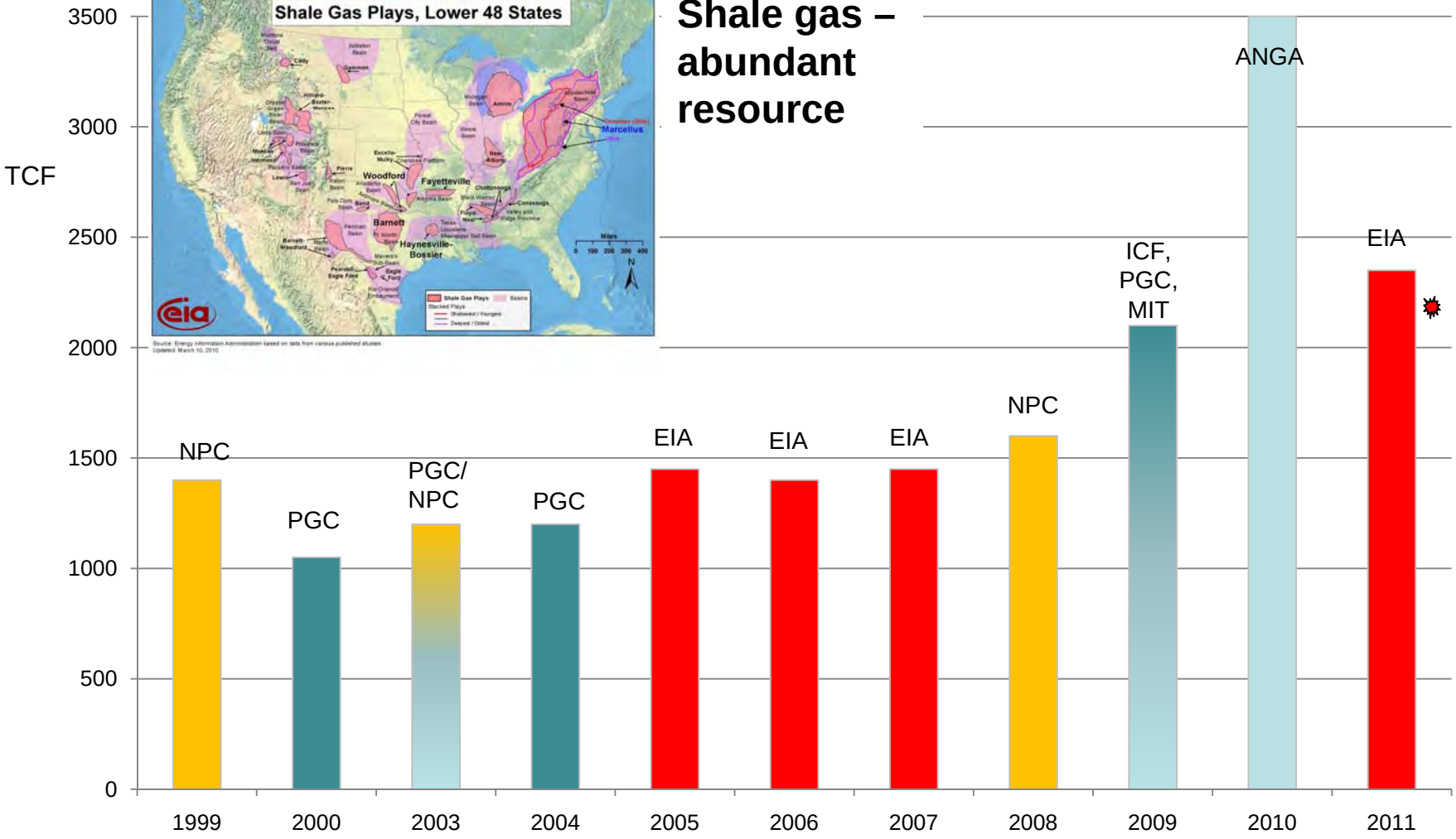
What we know – market conditions (6)

Higher estimates of shale gas resource

Changing estimates of the U.S. natural gas resources* 1999-2011

Shale gas – abundant resource



*** Technically recoverable**

The effect of a reduction in EIA's Marcellus estimate from 410 Tcf to 84 Tcf (the new USGS estimate, up from 2 in 2002)

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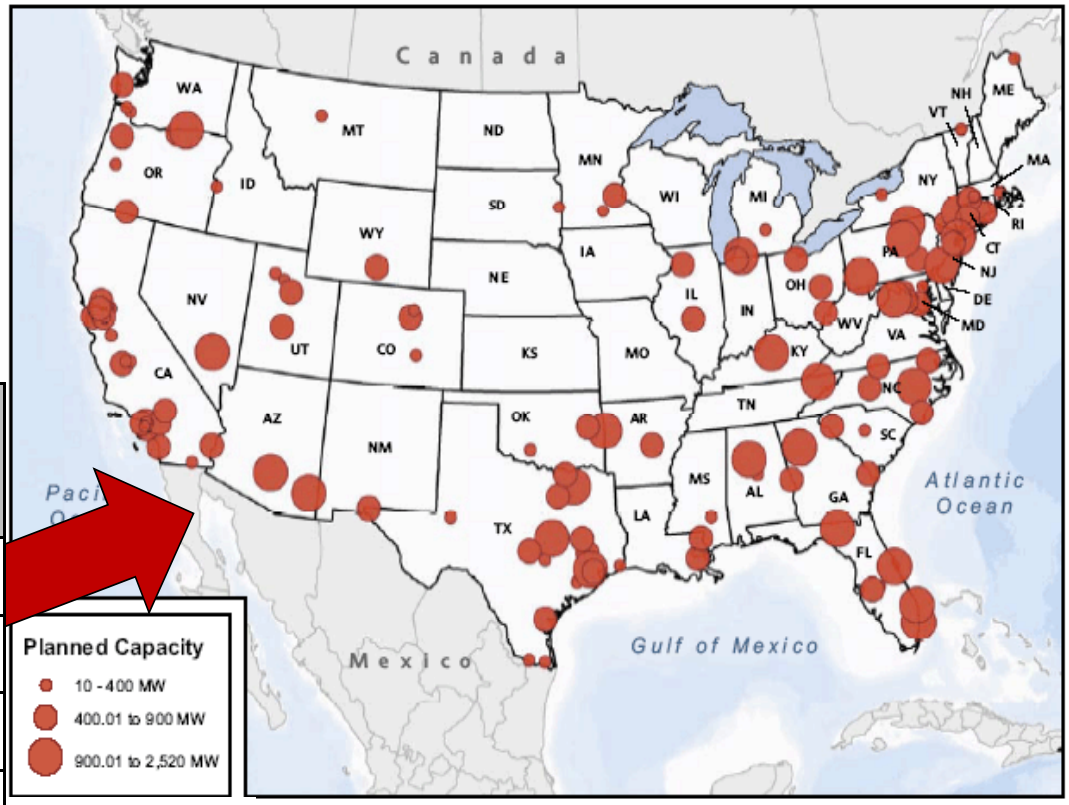
What we know – market conditions (7)

New gas plants are relatively economical investments

Gas plants (combined cycle) are the fuel/ technology of choice for *new* plants (except renewables)

	Under Const. (GW)	Adv'd Dev. (GW)	Annc'd (GW)	Total (GW)
2011	2	0	0.2	2.2
2012	5.6	0.6	5.7	11.9
2013	5.2	1.2	4.4	10.7
2014	0.6	4.7	8.6	14.0
2015	0	1.0	9.8	10.8
2016+	0	0	13.8	13.8

Planned natural gas combined-cycle projects in the US

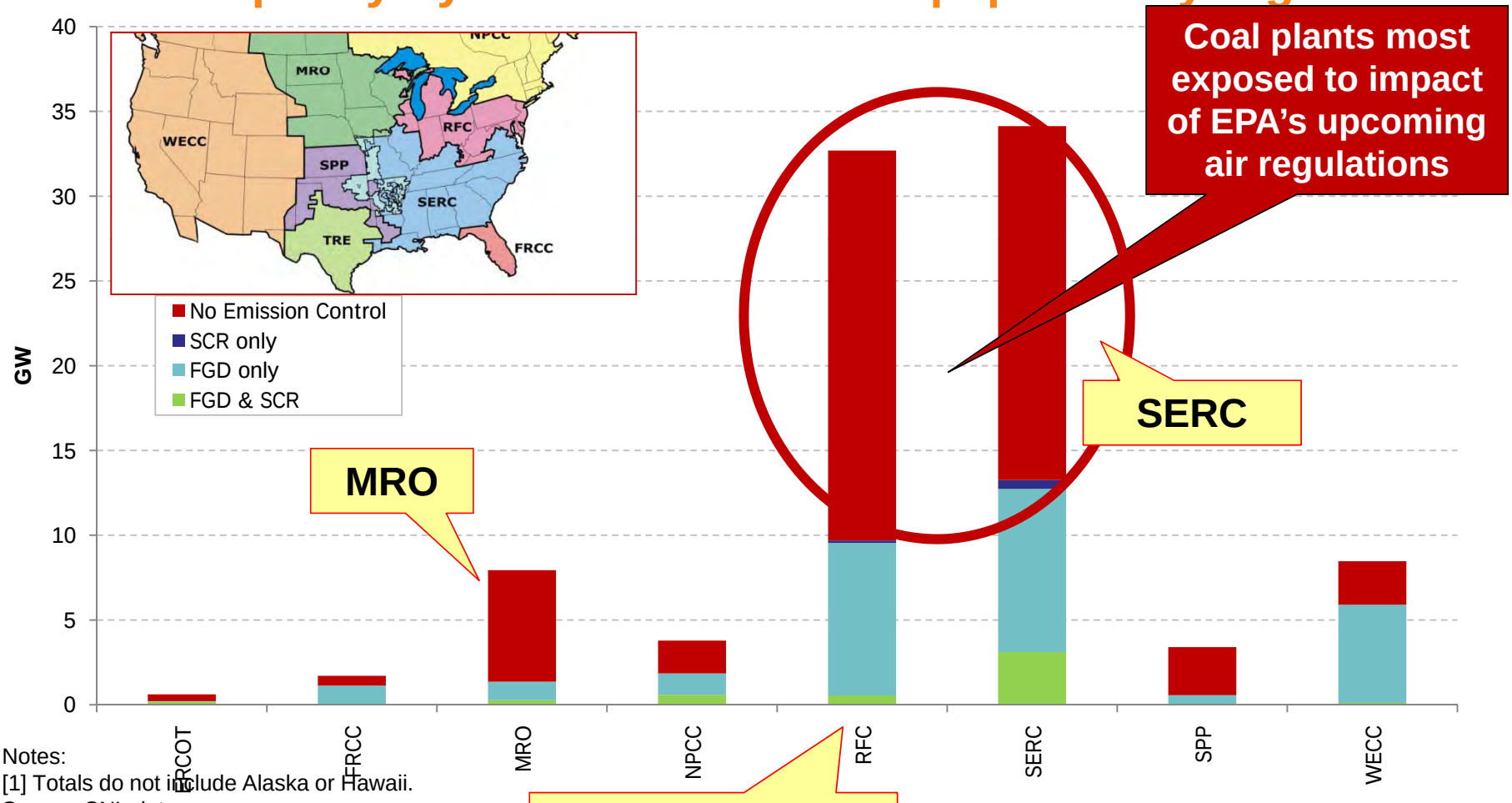


SNL Energy (data as of 8-26-2011)

Planned gas-fired combined cycle

What we know – market conditions (8)

Smaller coal plants (>300 MW) as of 2009: MW of capacity by emission-control equipment by region

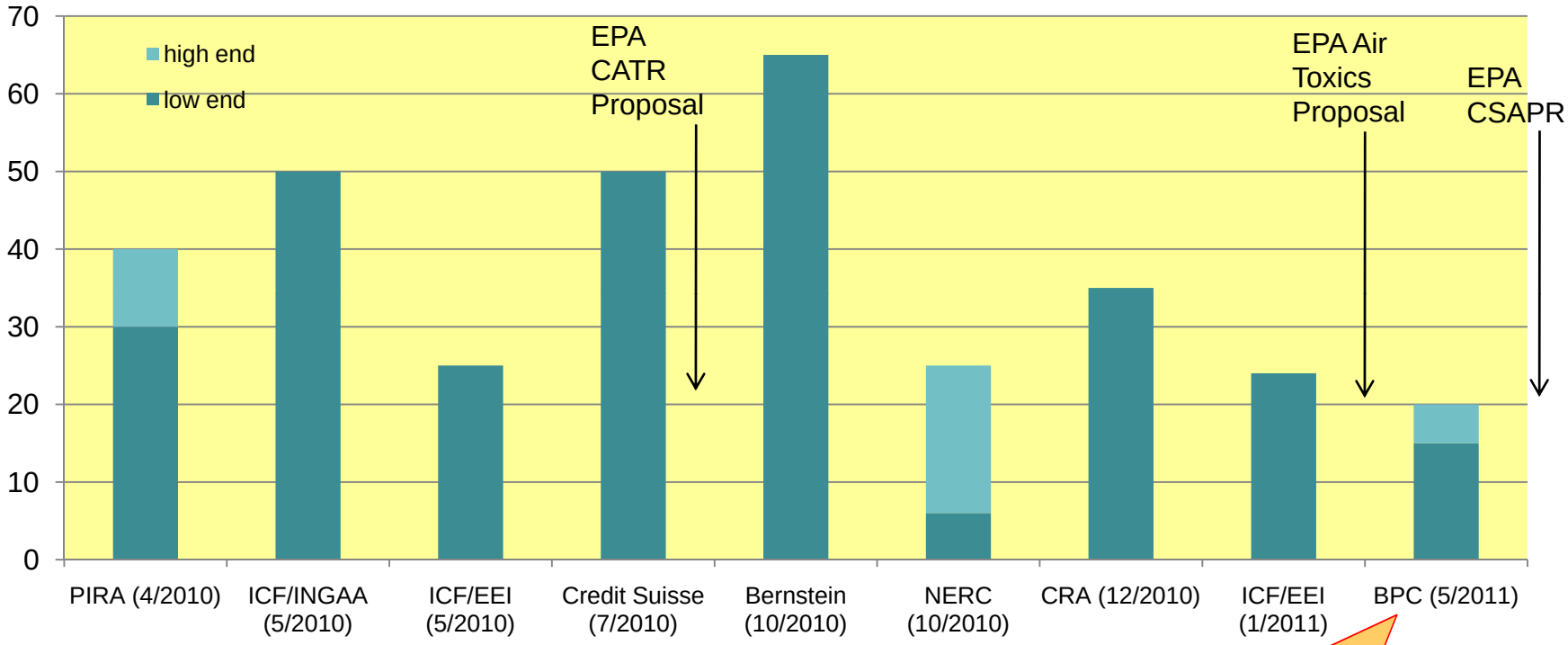


Notes:
[1] Totals do not include Alaska or Hawaii.
Source: SNL data.

Analysis Group, SNL data

What we know – reliability studies:

Estimates of Capacity Retirements Due to EPA Clean Air Rules*



Many studies that have looked at impacts:

- **Most (except BPC) were done prior to issuance of draft rules**
- **Most assumed range of scenarios (e.g., base, "moderate", "strict")**
- **No studies assumed both (a) a robust market response including DR & EE measures) and (b) more moderate cases consistent with EPA regulations**

BCP **"manageable impacts"**

* Notes: ICF / EEI (5/2010) is based on Scenario 1 (CAIR and MACT); NERC (10/2010) low end based on "moderate" CATR and MACT case, and "high end" based on "strict" CATR and MACT cases; ICF/EEI (1/2011) based on scenario with CATR and MACT (high flexibility); and BPC (5/2011) based on estimate of all four non-GHG rules

What we know: industry response (1)

Coal plants: Significant % already equipped with controls:

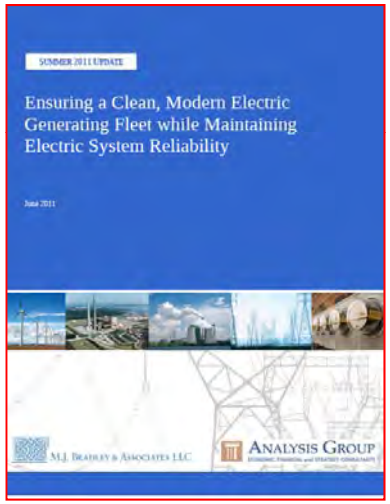
- 60% (192 GW): have scrubbers installed or under construction.
- 70% over 400+ MW in size: have scrubbers installed.
- ~35% (112 GW): have fabric filters installed (for PM and mercury)
- ~50% (158 GW): have advanced post-combustion NOx controls (SCR, SNCR)
- 70%+: have electrostatic precipitators ("ESPs") installed for PM control

http://www.mjbradley.com/news_20100809_00.html

What we know: industry response (2)

Statements of CEOs with coal plants:

- **Publicly traded companies: "in reasonably good shape"**
  - **Xcel:** *April 28, 2011 (earnings call)*
  - **Duke:** *May 3, 2011 (earnings call)*
  - **Wisconsin Energy**: *May 3, 2011 (earnings call)*
  - **Edison Int'l:** *May 2, 2011 (earnings call)*
  - **PPL Generation:** *February 4, 2011 (earnings call)*
  - **NRG:** *May 5, 2011 (earnings call)*



- **TVA:** *April 2011 announcement*
- **AEP:** *June 1, 2011 interview with Sanford Bernstein:*
  - The announced retirements "probably didn't run 5% of the time…..there will be some cost savings as well…."
  - [most of plants are subject to 2007 consent decree]

http://www.mjbradley.com/news_20100809_00.html

What we know: industry response (3)

Adequate resources in certain markets:

PJM – Most recent Base Residual Auction :

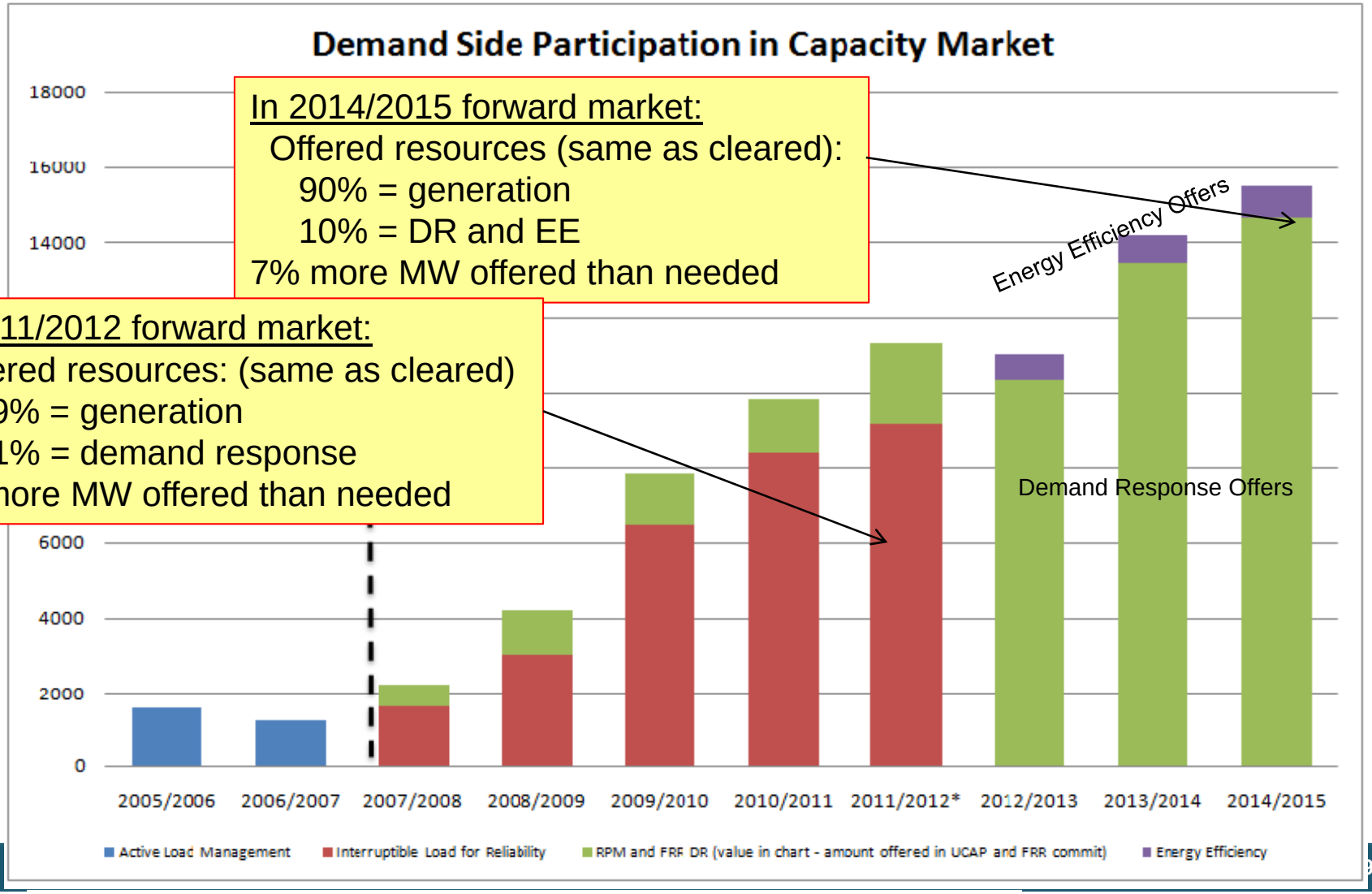
- **Capacity procured for 3 years ahead: May 2014 – June 2015**
  - Generators had received guidance to offer capacity with prices that reflected compliance with environmental regulations as proposed by EPA.
- **Market- based results announced May 31, 2011**
  - Enough resource for the region to meet its reliability requirements in 2014/2015
  - Robust response from generators and providers of energy efficiency and demand-response supply.
  - Some coal plant offers did not “clear the market” (and may retire)

What we know: industry response (3)

Demand response in PJM's Base Residual Auction

In 2014/2015 forward market:
Offered resources (same as cleared):
90% = generation
10% = DR and EE
7% more MW offered than needed

In 2011/2012 forward market:
Offered resources: (same as cleared)
99% = generation
1% = demand response
4% more MW offered than needed



PJM, "2014/2015 RPM Base Residual Auction Results"

Other collateral issues

Flip sides of the investment issue:

economic activity/jobs

potential rate impacts

- **New investment in replacement generating capacity:****
  - Cumulative construction cost of projects (under construction or in advanced development) – in most affected regions (ERCOT, MRO, RFC, SERC, SPP) – through 2013:
    - At least **$97.3 b** on projects already under construction, plus
    - At least **$17.8 b** on projects in advanced development
- **Plus other responses (energy efficiency, demand response, transmission, on-site generation)**

* Based on project owners' plans for investment, as recorded by SNL Energy

** Based on owners' cost estimates as collected by SNL Energy

Other collateral issues: jobs

PERI jobs study:

- **Assumed compliance costs for "stringent" EPA reaching almost $200 billion between 2010-2015, including**
  - almost $94 billion on pollution controls, plus
  - over $100 billion on about 68 GW of new generation capacity
- **Results: Net positive benefits (2010-2015)**
  - create an estimated 1.46 million jobs or
  - about 291,577 year-round jobs on average for each of the 5 years
- **Largest job gains: 5 states – over ½ million jobs**
  - IL (122,695), VA (123,014), TN (113,138), NC (76,966), and OH (76,240).

Source: CERES/PERI report, Executive Summary

What we probably don't know well enough yet (1)

Resource adequacy:

- **Air Toxics: Some regions will likely have adequate capacity ~2014/2015 even with retirements**
  - While the market is responding with additional capacity, the location of retirements remains uncertain
- **CSAPR: Most regions have adequate resources, but Texas raises concerns about needing more time**
  - ERCOT estimate: inclusion of Texas in final rule will introduce operational challenges starting in 2012
  - ERCOT rapidly trying to develop options (O&M coordination, demand response)

What we probably don't know well enough yet (2)

Local area reliability issues – under both air regs:

- **Granular grid studies still need to be done.**
  - to examine local issues (e.g., local area failures of operational security standards, reactive power deficiencies, loss of frequency response, black start capability)
- **Grid operators concerned that they won't get early-enough notice of retirements**
  - (e.g., letter to EPA by PJM, SPP, ERCOT, NYISO, et al)
- **There will undoubtedly be some instances where a plant cannot be retired or shut down for reliability reasons.**

What we can do to ensure reliable electric supply as well as clean air (1)

Many authorities already exist (under federal law) to ensure that local or system reliability will not be threatened:

- **Clean Air Act authority:**
  - EPA may
    - allow 1-year extension for good cause (case-by-case basis) – (112(i)(3)(B) of CAA
    - enter into consent decrees to allow continued operation (under certain circumstances) while moving toward compliance
  - President of the U.S. may exempt stationary sources from compliance for 2 years if technology is not available and if in national security interests (112(i)(4) CAA

What we can do to ensure reliable electric supply as well as clean air (2)

Many authorities already exist (under federal law) to ensure that local or system reliability will not be threatened:

- **Federal power act:**
  - DOE may override CAA control requirements in limited emergency circumstances where an electric emergency exists. 202(c) of FPA
    - Broad definitions of emergency
  - FERC may act to require steps to be taken by regulated entities to assure reliability

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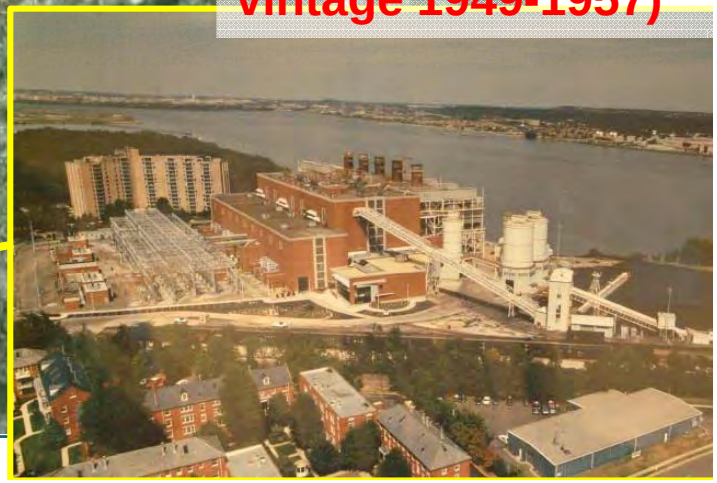
Ensuring reliable electric supply as well as clean air (3)

Example: Potomac River Gen Station – Alexandria, VA



PRGS (482 MW, 5 coal-fired units, vintage 1949-1957)

Ensuring reliable electric supply as well as clean air (3)
Potomac River Gen Station: events

Aug. 2005:	**VA DEQ says PRGS violates local air issues: "fix or retire";**
	DC PSC petitions to FERC to keep plant open to assure reliability
Nov. 2005:	**DOE declares reliability 'emergency' & orders PRGS to operate**
Dec. 2005:	**ORNL study to DOE on local reliability issues if PRGS retired**
Jan. 2006:	**After FERC order, PJM and PEPCO file reliability plan, which includes two new 230 kv transmission lines to be built**
June 2007:	**Construction of two lines (and other facilities) is underway**
July 2007:	**FERC finds PRGS shutdown poses no reliability issue**
July 2011:	**Update on status of new transmission: no reliability issues likely**
Aug 2011:	**Proposed alternative development plan for the site**
Sept 2011:	**PRGS owner agrees to shut down plant**

Ensuring reliable electric supply as well as clean air (4)

Other actions and tools:

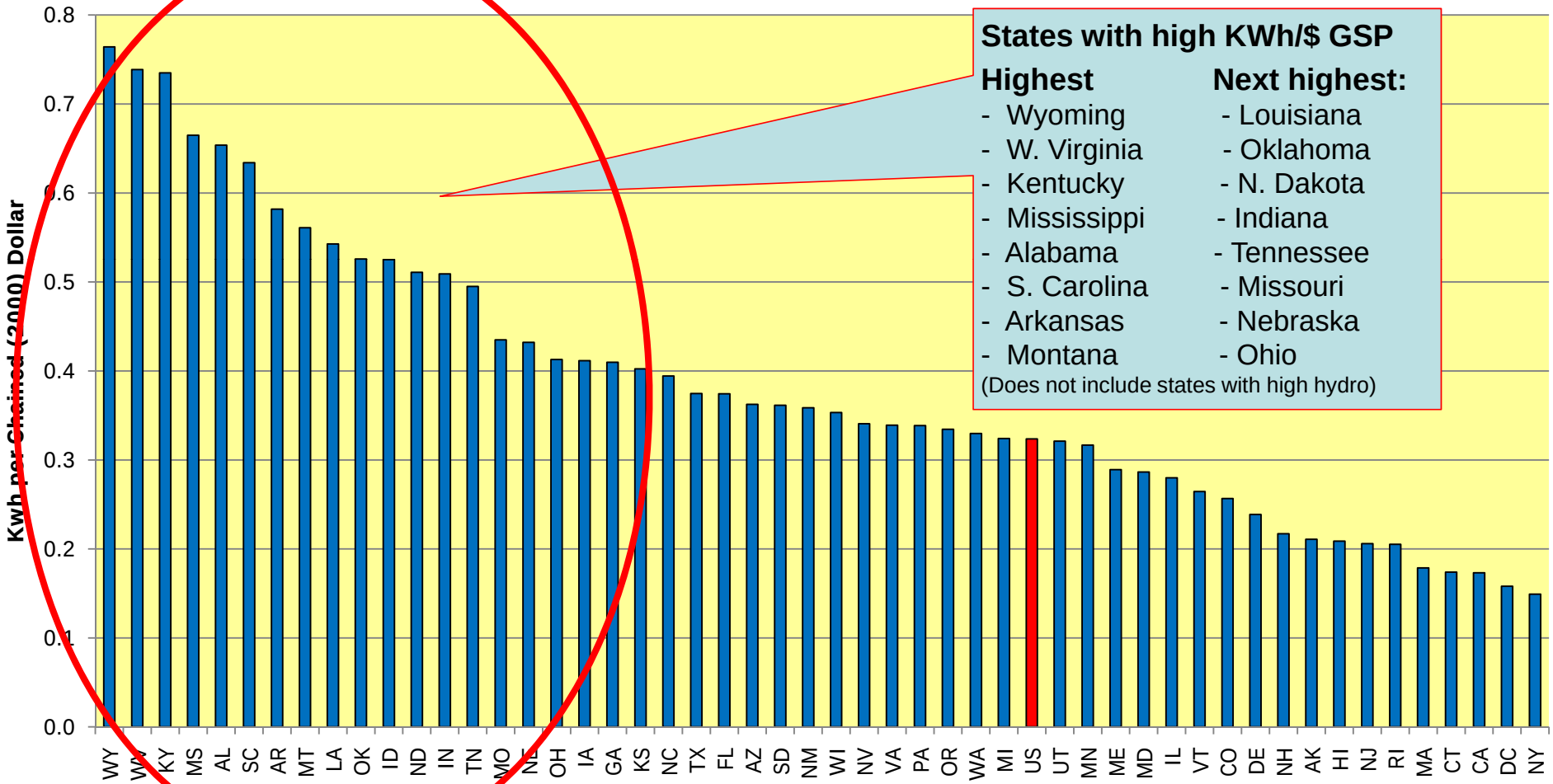
- **FERC:**
  - **Focus on requiring planning entities to file emergency rules requiring advance notice of planned retirements**
- **Related request by RTOs to EPA:**
  - **For the Air Toxics rule to include "narrowly-drawn reliability safety valve"**
    - A "pro forma" Consent Decree (time extension) – case-by-case basis:
      - Tied to accelerated notice of retirement (12 months)
      - Identification of the unit as a "Reliability Critical Unit"
      - Alternatives (e.g., transmission, generation, DR, EE) undertaken to mitigate the reliability impacts are expected to take more than 3 years

Ensuring reliable electric supply as well as clean air (4)

Other actions and tools:

- **States:**
  - **Aggressive focus on efficiency and demand-response opportunities in states with historical low electricity costs and high usage levels**
    - **Opportunity exists to mine efficiency opportunities through well-established best practices in other states**

Retail Sales of Electricity per Dollar of GSP



Source: EIA, State Energy Data System (SEDS), Table R3, available at http://www.eia.gov/emeu/states/_seds.html.

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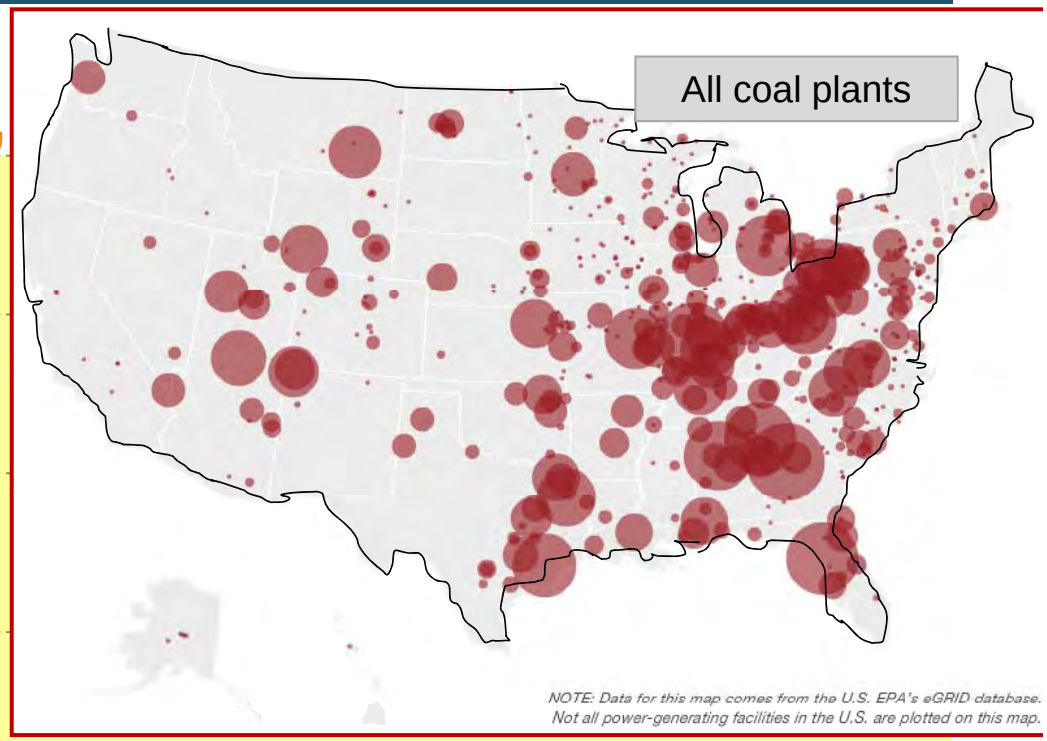
Coal plant capacity – Without emission controls,



States with still-good potential lower customers' bills through demand-side measures (and ratemaking policy)

Coal Units Without Emissions Controls
(Total GW – 2009)

GW

0 2 4 6 8 10 12

IL MI OH MO TX IN IA OK TN AL KY PA NC NE WV SC GA VA WI AR FL LA MS MD NY MN KS DE CO MA UT MT CT ND NJ CA WY NV AZ ME NH SD ID NM

Notes:
[1] Totals do not include Alaska or Hawaii.
[2] Units without emissions are those units without SCR or FGD systems.

Source: SNL data.

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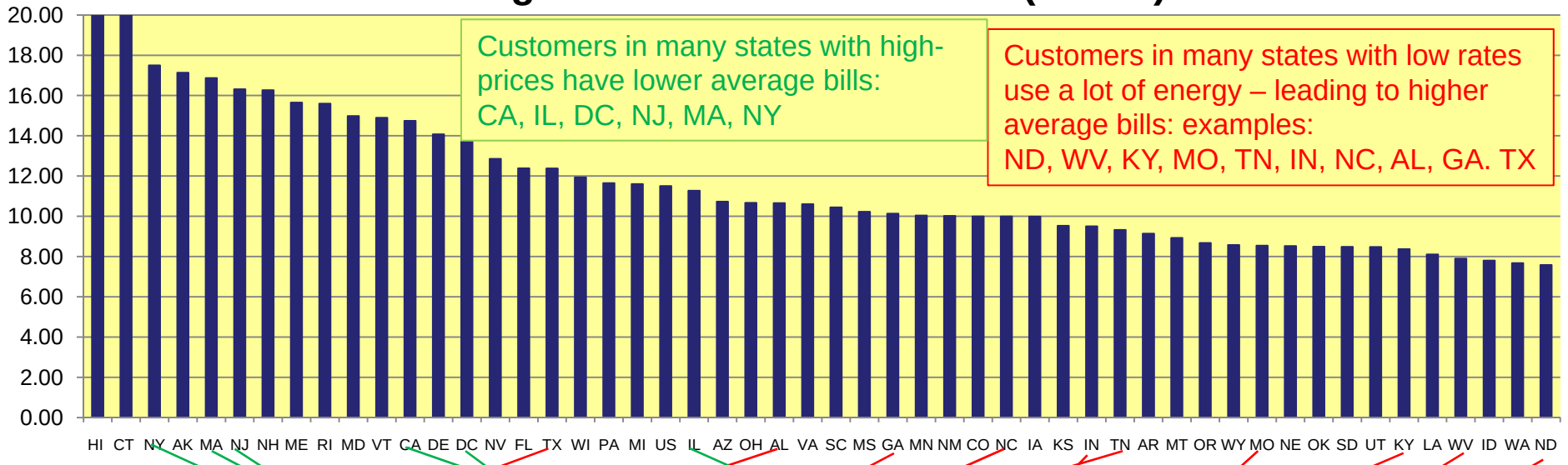
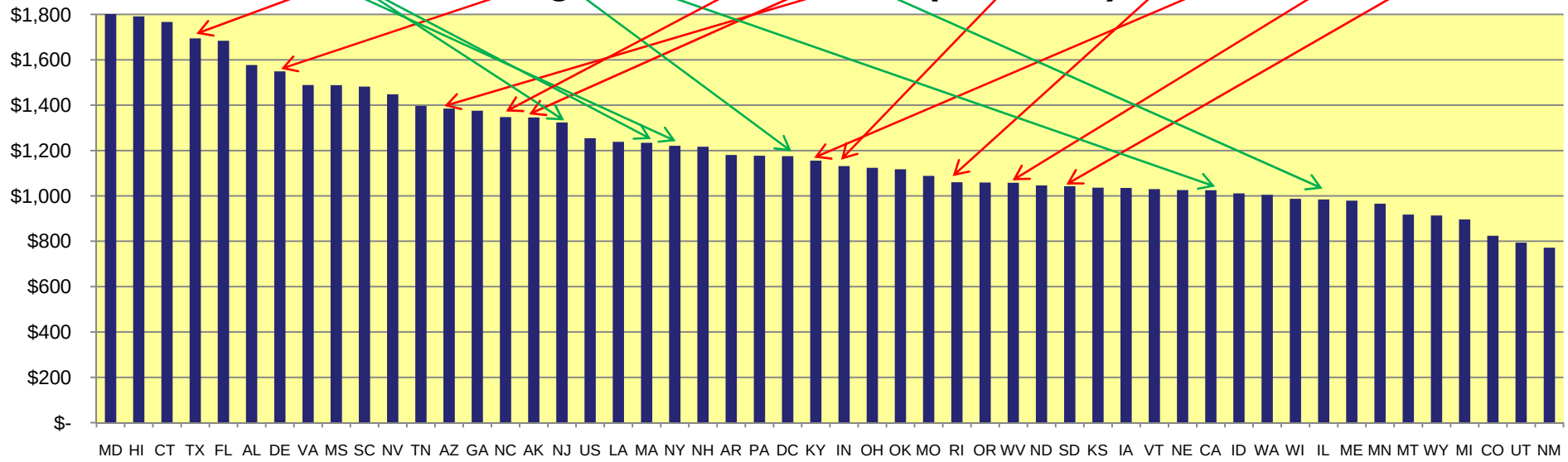
Average Retail Price Residential (c/kWh)



Customers in many states with high-prices have lower average bills:
CA, IL, DC, NJ, MA, NY

Customers in many states with low rates use a lot of energy – leading to higher average bills: examples:
ND, WV, KY, MO, TN, IN, NC, AL, GA. TX

Average Bill - Residential (Annual $)



Summing up:

The industry is well-positioned to provide reliable electric service while responding to the new EPA regulations.

- The industry and its regulators have a proven track record of doing what it takes to provide reliable power supplies.
- The EPA regulations are having been coming for many years and the proposal offer flexibility and proven technologies.
- Recent reliability studies and investment statements: companies are already prepared and the retirements are manageable.
- Markets are responding to combination of conditions that favor natural gas, energy efficiency, demand response, and renewables over investment in pollution controls on the less efficient coal plants.
- Various tools exist to assure that reliability will not be adversely affected.

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