Cost and Economic Impacts of Pending EPA Regulations

Bruce Braine
Vice President,
Strategic Policy
Analysis

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AEP - Background

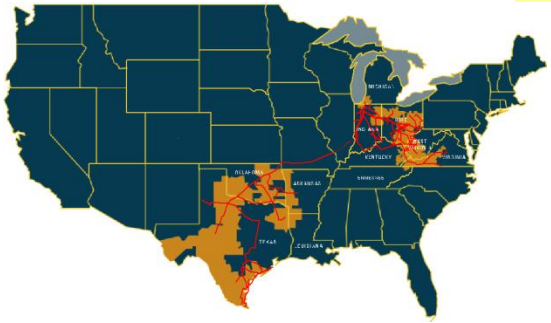
Coal/Lignite
66%

Gas/Oil
22%

Nuclear
6%

Pumped Storage/
Hydro/Wind
6%

AEP's Generation Fleet
~39,000 MW Capacity
~80% of coal is in AEP-East



5.2 million customers in 11 states
Industry-leading size and scale of assets:

Asset	Size	Industry Rank
Domestic Generation	~39,000 MW	# 2
Transmission	~39,000 miles	# 1
Distribution	~214,000 miles	# 1

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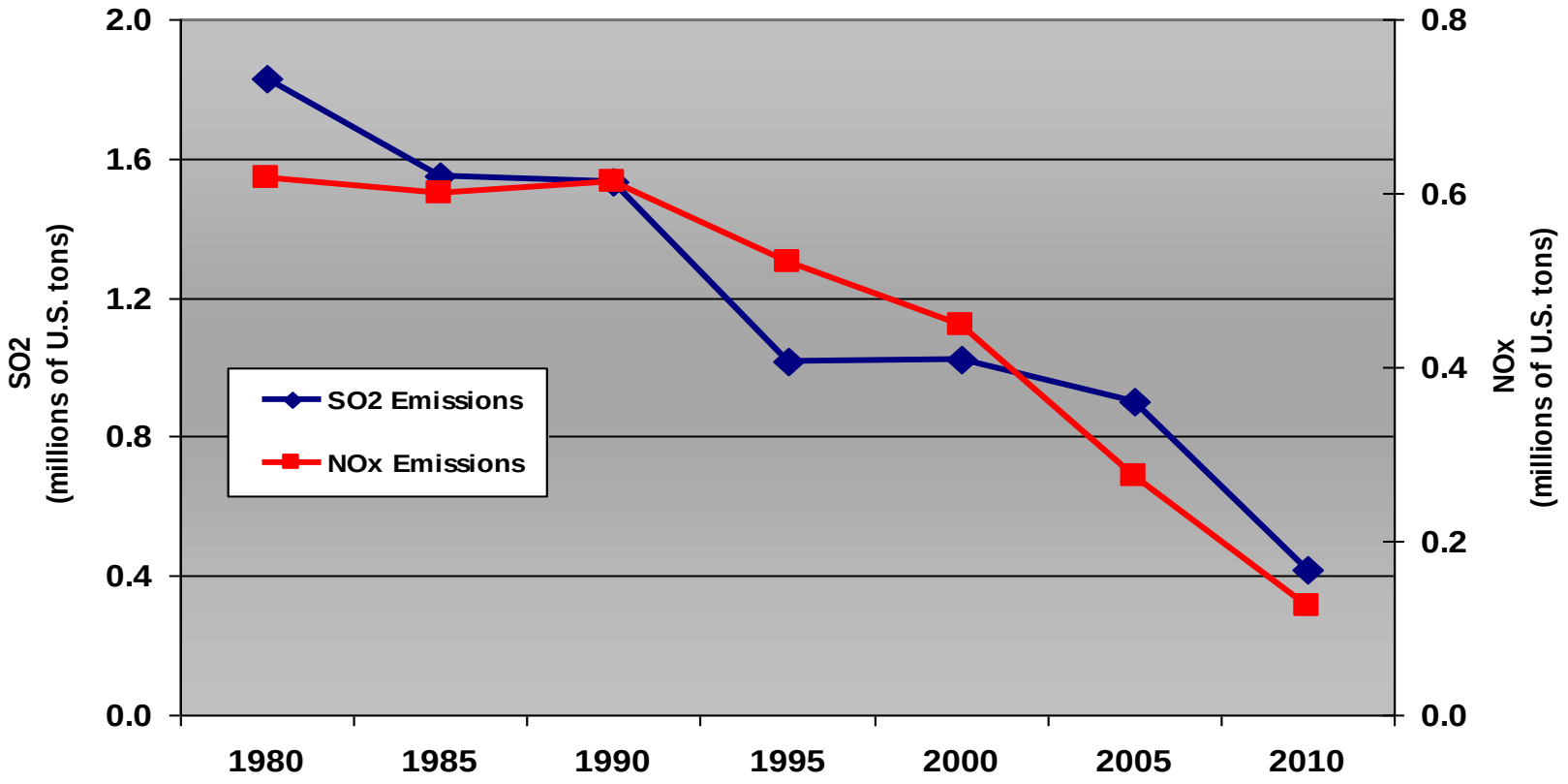
AEP Already Has Substantially Reduced SO_2 & NOx Emissions



- *Since 1980 AEP's TOTAL generating fleet has reduced:*
  - *SO_2 emissions by over 77%*
  - *NOx emissions by ~80%*

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EPA New Regulatory Challenges

- *Climate Regulations (NSPS & NSR)*
- *Transport Rule (SO_2 & NOx)*
- *Mercury/Hazardous Air Pollutants (HAPs)*
- *Coal Combustion Residuals (CCR)*
- *Water Quality / Aquatic Impacts (316(b))*

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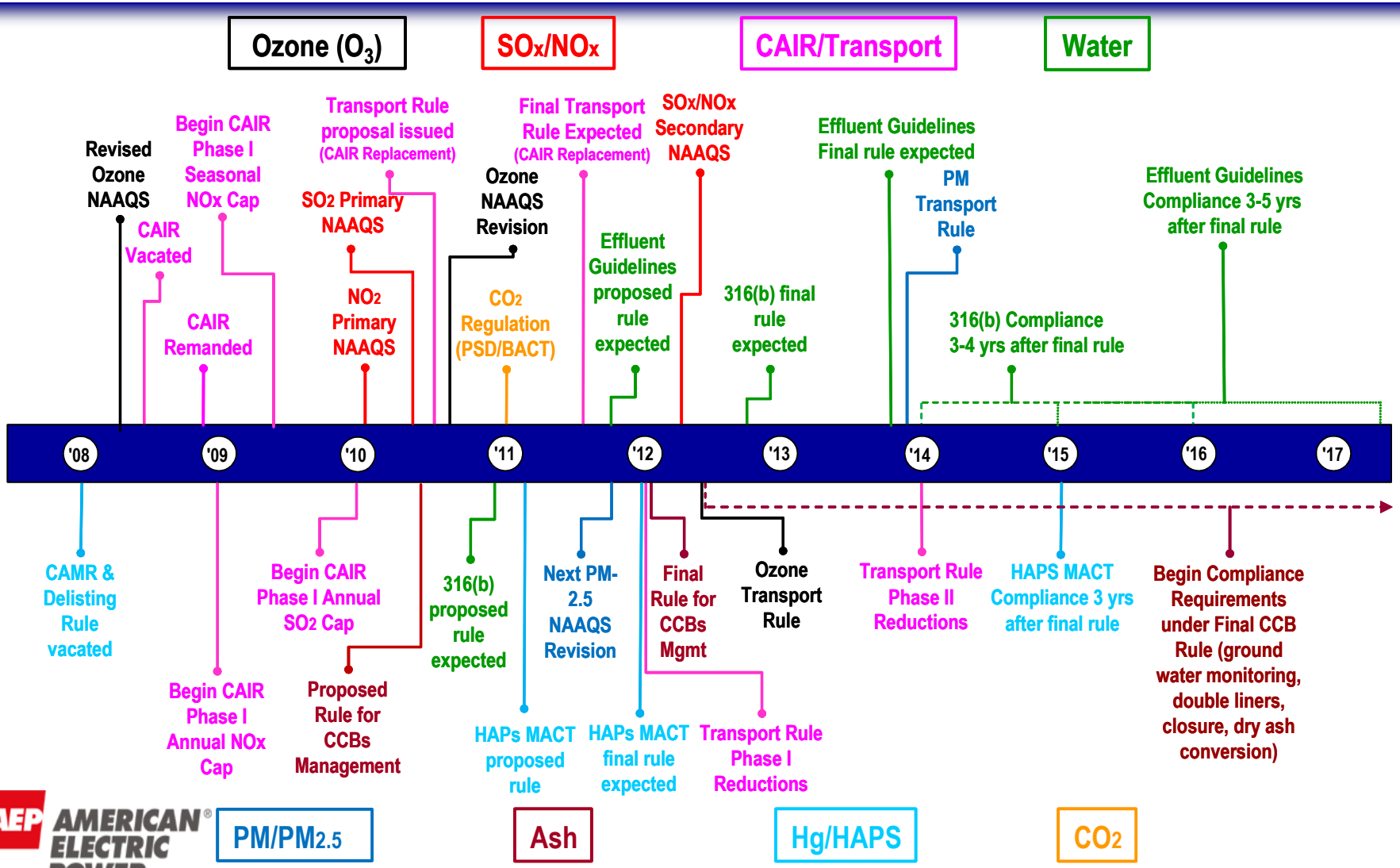
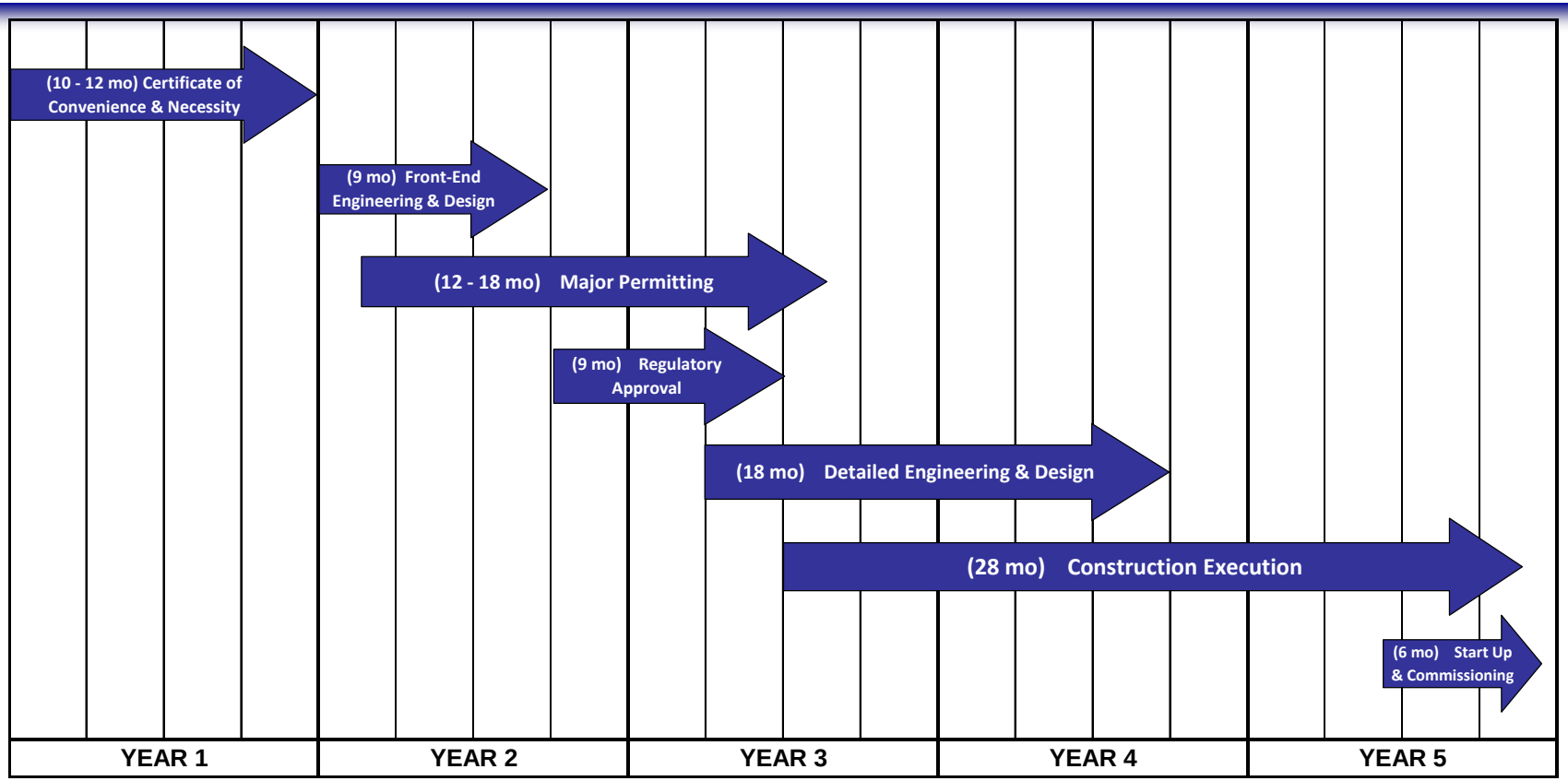
Possible Timeline for Environmental Regs for Electric Utilities



-- Adapted from Wegman (EPA 2003) Updated 09.02.10

Typical AEP FGD Retrofit Timeline



- *Timeline milestone lengths based on actual AEP construction experience*
- *Phases could be longer if the support system becomes strained from multiple companies facing similar compliance deadlines*
- *From 2003-10 AEP retrofitted 7,800 MWs (9 units), using over 35 million work hours at a cost of over $3.6 billion*

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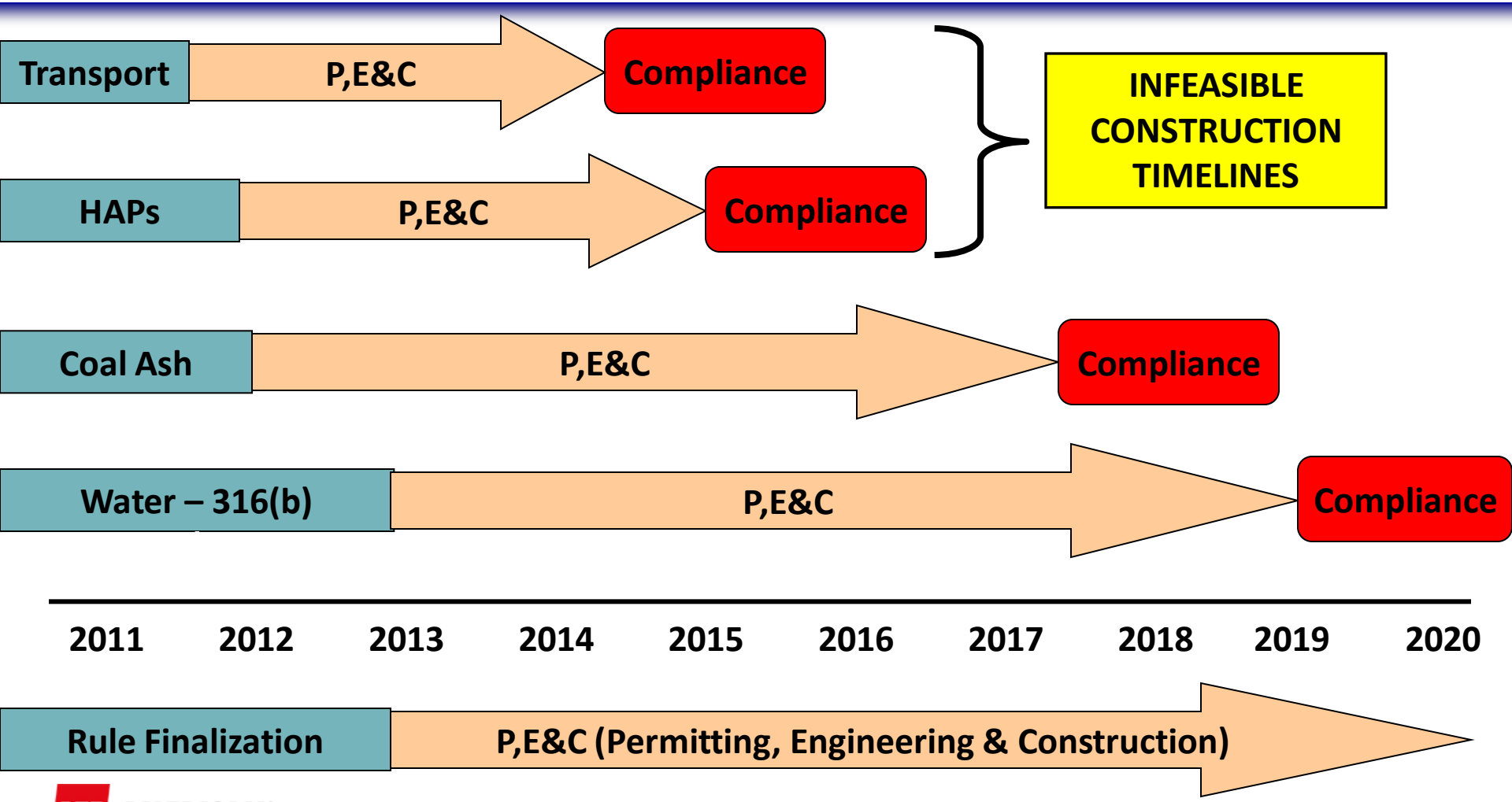
Anticipated EPA Timeline for Retrofits or Replacement



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"The Nightmare on Utility Street?"

- **Transport Rule**
  - SO_2 and NOx caps in 2012, tighter SO_2 caps in 2014
  - FGD effectively "required" for most all AEP East units in 2014
- **Mercury and Other HAPs MACT Rules**
  - Compliance in 3 years = 1/2015 (or 1/2016 "case by case")
  - FGD for acid gases likely required on most AEP-East units
  - Baghouses (BH) w/ activated carbon injection (ACI) COULD ALSO be required to meet Hg and heavy metal limits
  - Some AEP-West coal units may be able to comply with only BH and ACI; however other EPA requirements (CAVR) likely to force scrubbers at most units
- **CCR Rule (e.g. ash disposal)**
  - Compliance estimated by 2017
  - AEP capital + pond closure cost: $1.4-2.4 billion if "non-hazardous"
  - Costs DOUBLE with "hazardous" designation by EPA

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Major AEP Impacts of Pending and New EPA Regulations

- Large Amount of AEP Coal Unit Retirements
  - 5 to 7 GW retired (~20-30% of AEP total capacity) by 2014-2015
  - Coal units potentially mothballed 2014-2016
- Capital Cost: $6 to 11 billion by 2020
  - As much as DOUBLE AEP Environmental Capital spend during last 20 years
- Ongoing additional O&M, fuel and purchased power expenses of $300 to 600 million per year
  - NPV cost of about $2 to $4 billion
- Large Electricity Rate Increases
  - Average of 20 to 30% across AEP system

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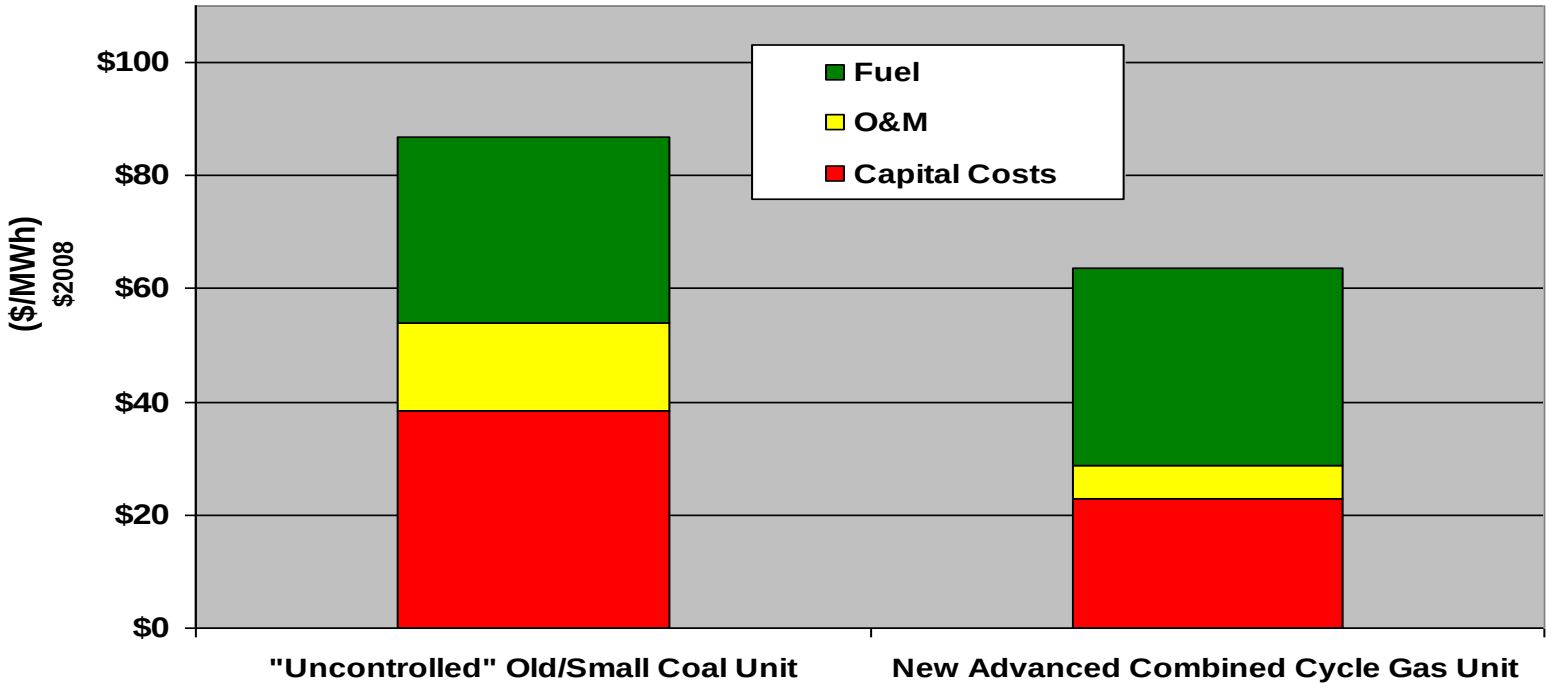
Old/Small Units Very Likely to Retire by 2015 Under EPA Regulations



Assumptions

- *Retrofit and New Build capital cost & O&M assumptions are from EPA estimates*
- *Coal Combustion Residuals (CCR) capital cost is from industry estimates*
- *Uncontrolled Coal Unit (300 MW) Requires FGD+SCR+CCR: Capital Cost ~$1,200//kW; Retrofit Life - 15 years; 11,000 Btu/kWh Heat Rate, $2.50/MMBtu Coal Price*
- *Gas Combined Cycle: Capital Cost - $1000/kW; Life - 30 years; 7,000 Btu/kWh Heat Rate, $5/MMBtu Gas Price*

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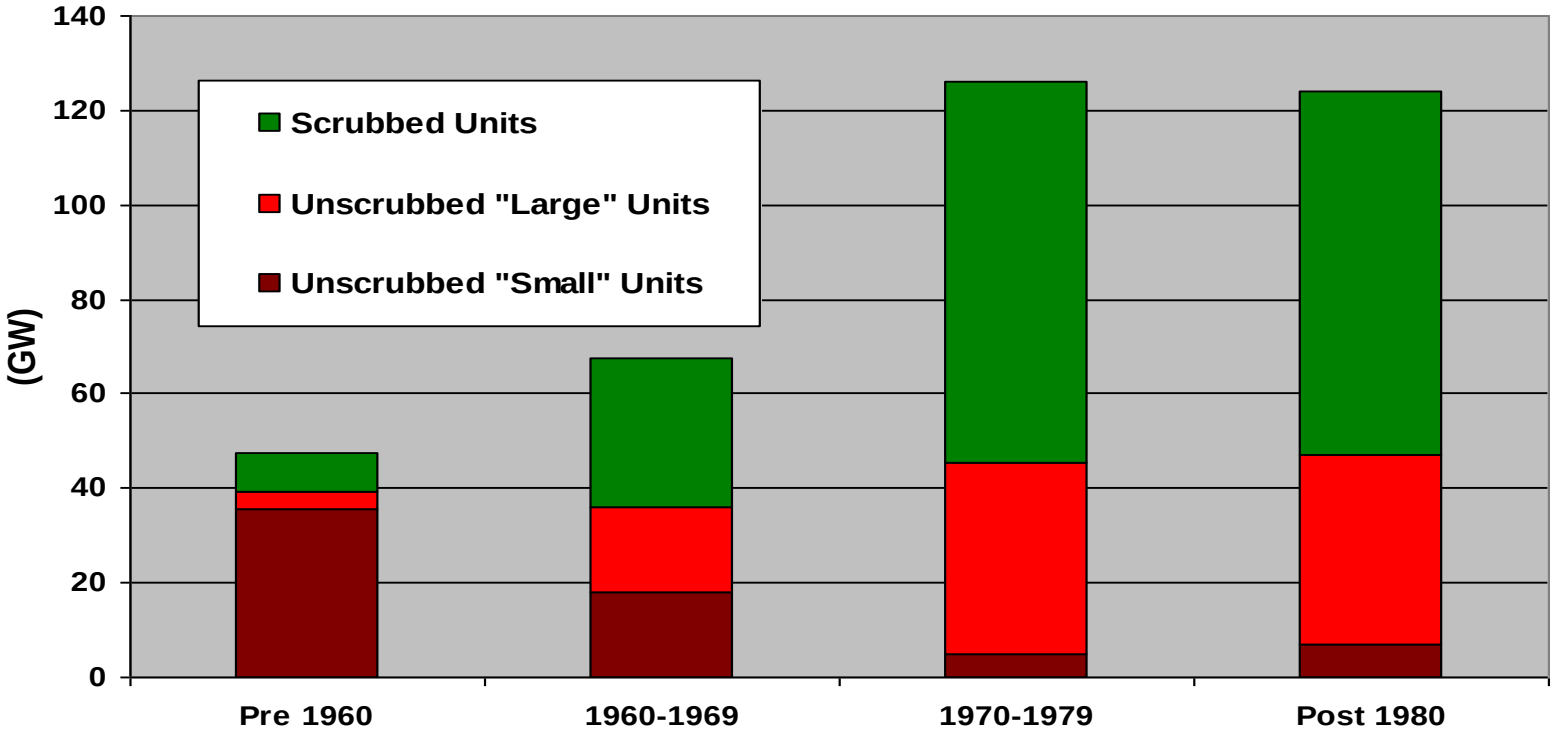
U.S. Coal Fired Generating Capacity



Source: Energy Velocity Suite Data

- ***~75 GW BOTH unscrubbed AND >45 years old by 2015***
- ***~54 GW also "SMALL" - Almost ALL will retire by 2015 w/ EPA regs.***

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ICF-EEI Study Results: Large US & Regional Cost Impacts

	2010 Coal Capacity	"Optimistic" Case Retirements	"Pessimistic" Case Retirements
Total U.S. Coal (GW)	324	-46	-101
SERC Coal (GW)	100	-17	-41
RFC Coal (GW)	105	-16	-29
U.S. Incremental Capital (2012-2020) ($Billions)		141	247

"2010 Coal Capacity" Source: Ventyx Velocity Suite

- *ICF-EEI study first to assess impact of ALL new EPA rules*
- *Range of impacts from Run #3 (optimistic) to # 8 (pessimistic)*
- *ICF-EEI study "conservative" on retirements: (1) high gas prices (2) long 20 year life for retrofits (3) assumes retrofits can be done by 2015 (4) low end of range assume NO CO2 requirements*
- *Capital (most before 2015) more than DOUBLE U.S. electric industry environmental capital spend during 1991-2010*

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Reliability Impacts of EPA Regulations on RFC / PJM

- *RFC estimated to have between 16 and 29 GW of coal retirements, or about 15 to 25 percent of RFC coal, most occurring by 2015*
- *Also, substantial % of capacity will be retrofit in RFC over the exact same time period*
- *Retrofits often requires a plant to be taken offline at end of construction for 2-3 months*
- *AEP is likely to mothball some additional capacity during the 2014-16 in order to complete retrofits and continue to comply with MACT and Transport Rules*
- *PJM analysis will be required to determine if this poses any regional reliability problems*

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Local Reliability Impacts

- *Almost all of AEP retirements will be subcritical coal units, which are located in the middle of the supply stack, and thus are "load following"*
- *These units often provide key ancillary services:*
  - *Voltage Support*
  - *Frequency Regulation*
  - *System Restoration*
- *Local transmission mitigation and local system restoration capability/capacity will need to be installed prior to unit retirements to ensure grid integrity*
- *Timing of EPA regulations NEEDS to be coordinated with time required to address these local issues*
- *Further PJM, SERC and other regional study is needed on this issue and potentially affected facilities*

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Other Economic Impacts of EPA Regulations

- *Higher natural gas use and related price increases affects ALL consumers*
- *$0.50/MMBtu gas price change increases other consumer costs about $8-9 billion/year*
- *Net Job Impacts are Negative:*
  - *Near term increases in temporary (2-5 years) construction jobs*
  - *BUT, "NET" NEGATIVE for Total Jobs mostly due to large electricity price increases*
    - *CRA Testimony --- NET LOSS of 1 MM Jobs*
    - *ERRC Testimony --- NET LOSS of 2.5 MM Jobs*
  - *'Green jobs' studies such as PERI study don't consider big negatives of higher electricity & energy prices*

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There is a Better Way…

- *More flexibility in regulations (e.g., HAPs emissions averaging, low capacity factor allowed during retrofit construction)*
- *Phase-in requirements over 2015-2020*
- *Allow off-ramp for units that commit to retire or repower through 2020*
- *Continues emission reduction progress starting today, but reduces capital cost, rate shock and other economic impacts*
- *All coal units "well controlled" by 2020*

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