AEP and Climate Legislation

Mountaineer Plant - New Haven, WV

AEP AMERICAN® ELECTRIC POWER

Northeastern Plant - Oologah, OK

Bruce Braine

Vice President - Strategic Policy Analysis

October 16, 2007

ELCON Fall Workshop

Presentation Topics

- **AEP Climate Strategy:**
  - How is AEP preparing for ultimate climate legislation?
  - What specific voluntary actions and proactive investments is the company undertaking?

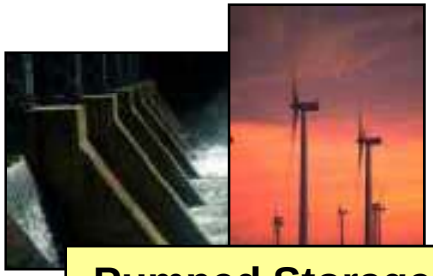
- **Federal Legislation:**
  - What type of climate legislation is likely?
  - When will it become effective?
  - What constitutes “reasonable” climate legislation?

Company Overview

Coal/Lignite
67%

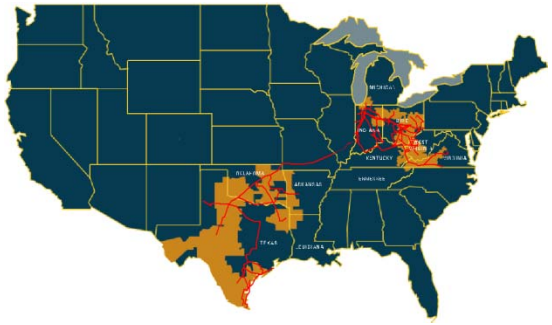
Nat.
Gas/Oil
24%

Nuclear
6%



Pumped Storage/
Hydro/Wind
3%

AEP's Generation Fleet
38,388 MW Capacity



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

Asset	Size	Industry Rank
Domestic Generation	~38,300 MW	# 2
Transmission	~39,000 miles	# 1
Distribution	~208,000 miles	# 1

AEP Climate Strategy

AEP's Climate Strategy

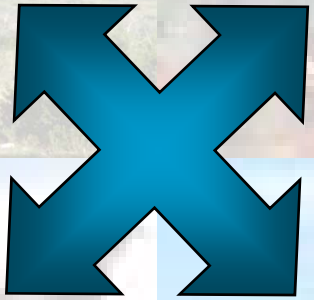
- **Being proactive and engaged in the development of climate policy**
  - International Emissions Trading Association (IETA)
  - Electric Power Research Institute (EPRI)
  - Pew Center on Global Climate Change
  - e8
  - Global Roundtable on Climate Change
- **Investing in science / technology R&D**
  - FutureGen Alliance
  - US DOE research on carbon capture and sequestration at our Mountaineer Plant
  - EPRI – combustion technologies
  - MIT Energy Laboratory
  - B&W – Oxy-Coal
- **Taking voluntary, proactive action now, making real reductions and setting policy precedents thru CCX**
  - Chicago Climate Exchange (CCX)
  - EPA Climate Leaders and SF-6 Program
  - Asia-Pacific Partnership
  - DOE 1605B- voluntary reporting of GHGs Program
  - Business Roundtable Climate Resolve
  - Numerous forestry activities
- **Investing in longer term technology solutions--new generation and carbon capture and storage (e.g., IGCC, Ultra-supercritical PC)**

AEP must be a leader in addressing climate change

AEP's Long-Term GHG Reduction Portfolio

Renewables (Biomass Co-firing, Wind)

Supply and Demand Side Efficiency



Off-System Reductions and Market Credits (forestry, methane, etc.)

Commercial Solutions of New Generation and Carbon Capture & Storage Technology

AEP is investing in a portfolio of GHG reduction alternatives

A Portfolio Approach: AEP Long-Term CO_2 Reduction Commitment

Existing Programs

- **Existing plant efficiency improvements**
- **Renewable Energy**
  - 800 MWs of Wind
  - 300 MWs of Hydro
- **Domestic Offsets**
  - Forestry – 0.35MM tons/yr @ $500K/year
  - Over 63MM trees planted through 2006
  - **1.2MM tons of carbon sequestered**
- **International Offsets**
  - Forestry projects have resulted in 1MM tons of carbon sequestered through 2006
- **Chicago Climate Exchange**

AEP's reductions/offsets of CO_2:
- **2003-2005: 31 MMT**
- **2006-2010 (proj.): Additional 15 MMT**

New Program Additions (by 2011)

- **1000 MWs of Wind PPAs: 2MM tons/yr**
- **Domestic Offsets (methane): 2MM tons/yr**
- **Forestry: Tripling annual investment to increase to 0.5MM tons/yr by 2015**
- **Fleet Vehicle/Aviation Offsets: 0.2MM tons/yr**
- **Additional actions--end use and supply efficiency and biomass: 0.2MM tons/yr**

New Technology Additions

- **New Technology Generation – IGCC and USC**
- **Commercial solutions for existing fleet**
  - Chilled Ammonia
  - Oxy-Coal

AEP's reductions/offsets of CO_2:
2011+: 5 MMT/YEAR
Longer Term—New Technology

AEP Wind Operations / Purchases

Trent Mesa (2001)

- **150 MW** (100 - 1.5 MW turbines)
- Abilene/Sweetwater, TX

Southwest Mesa (1999)

- **75 MW** (107 – 700kW turbines)
- McCarney, TX
- Power Purchaser

Desert Sky (2002)

- **160 MW** (107 - 1.5 MW turbines)
- Bakersfield, TX

Summary

- Owned/Operated 385 MW
- Wind Purchases 392 MW
- Total Existing Wind at end of 2006: 777 MW
- **New Wind Purchases in 2007: 275 MW**

Will acquire an additional 725 MW of new wind to attain goal of 1,000 MW by 2011

AEP Has 10 Years of Wind Experience

- 5 MW Ft. Davis Wind Farm: Early AEP R&D Project (1996 - 2004) Decommissioned
- 75 MW Southwest Mesa PPA: Project built on AEP owned land (1998) SWEPCo
- 150 MW Trent Wind Farm: AEP owned / developed IPP wind farm (2001) AEPEP
- 160 MW Desert Sky Wind Farm: AEP owned IPP wind farm (2001) AEPEP
- 147 MW Weatherford PPA: (2005) PSO
- 151 MW Blue Canyon II PPA: (2005) PSO
- 94.5 MW Sleeping Bear PPA: Completion in Summer 2007 PSO
- **200 MW Fowler Ridge PPA: Completion in late Q4 – 2008** **I&M / APCo**
- **75 MW Camp Grove PPA: Completion in early – 2008** **APCo**

Off-System Reductions

Existing AEP Programs:

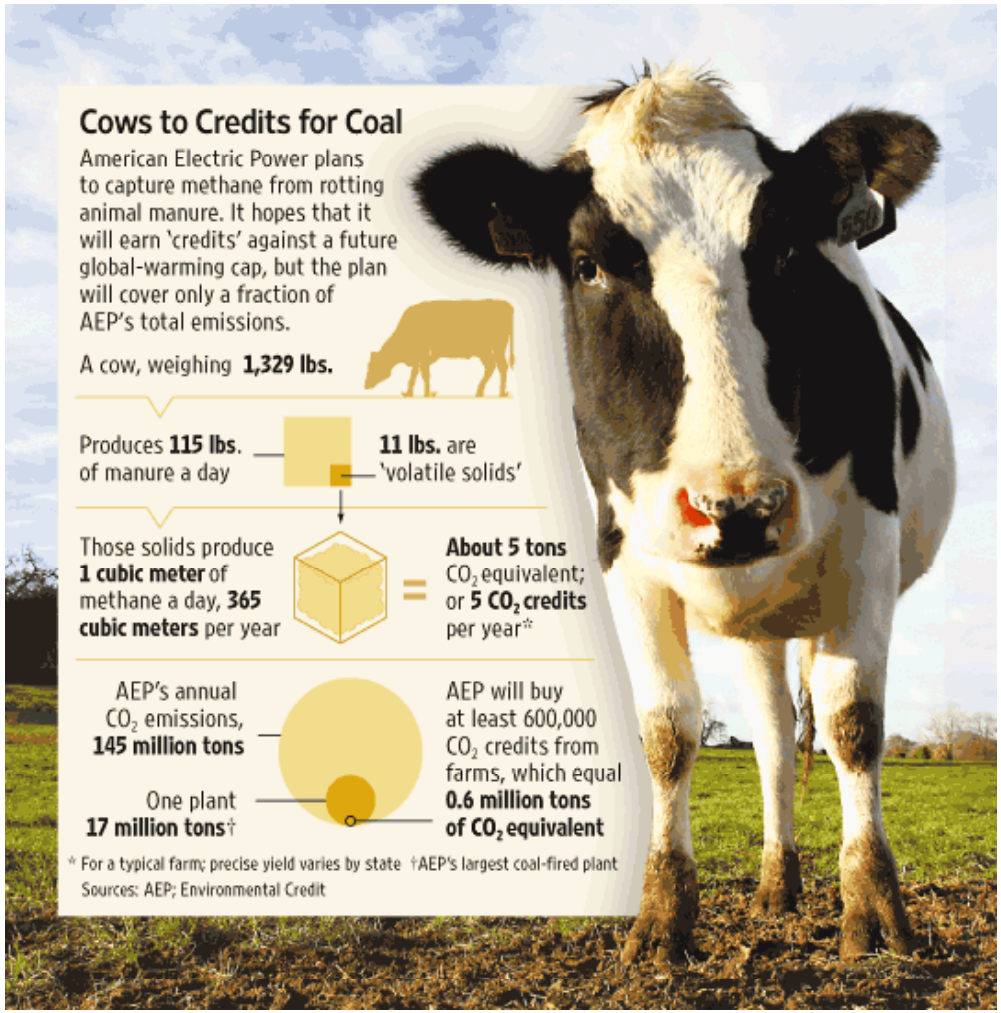
- Forestry - Domestic
  - 350,000 tons / yr
  - 63 MM trees planted
- Forestry – International
- Chicago Climate Exchange

New AEP Commitment by 2011:

- 2 M tons per year of additional CO_2 offsets

Latest Announcement:

- Methane Capture Deal with Environmental Credit Corp.
  - 600,000 CCX carbon credits per year
  - Begins 2010
  - Runs through 2017
  - 51% of credits sourced from "AEP States"



Source: Wall Street Journal June 14, 2007

AEP Leadership in Technology: IGCC/USC and Future Gen

NEW ADVANCED GENERATION

- **IGCC---AEP plans to build first two 600+ MW IGCC commercial-scale facilities in the US in OH and WV by the end of the next decade**

- **USC--AEP plans to build a new generation ultra-supercritical (steam temperatures greater than 1100^{o}F) coal plant in Arkansas**

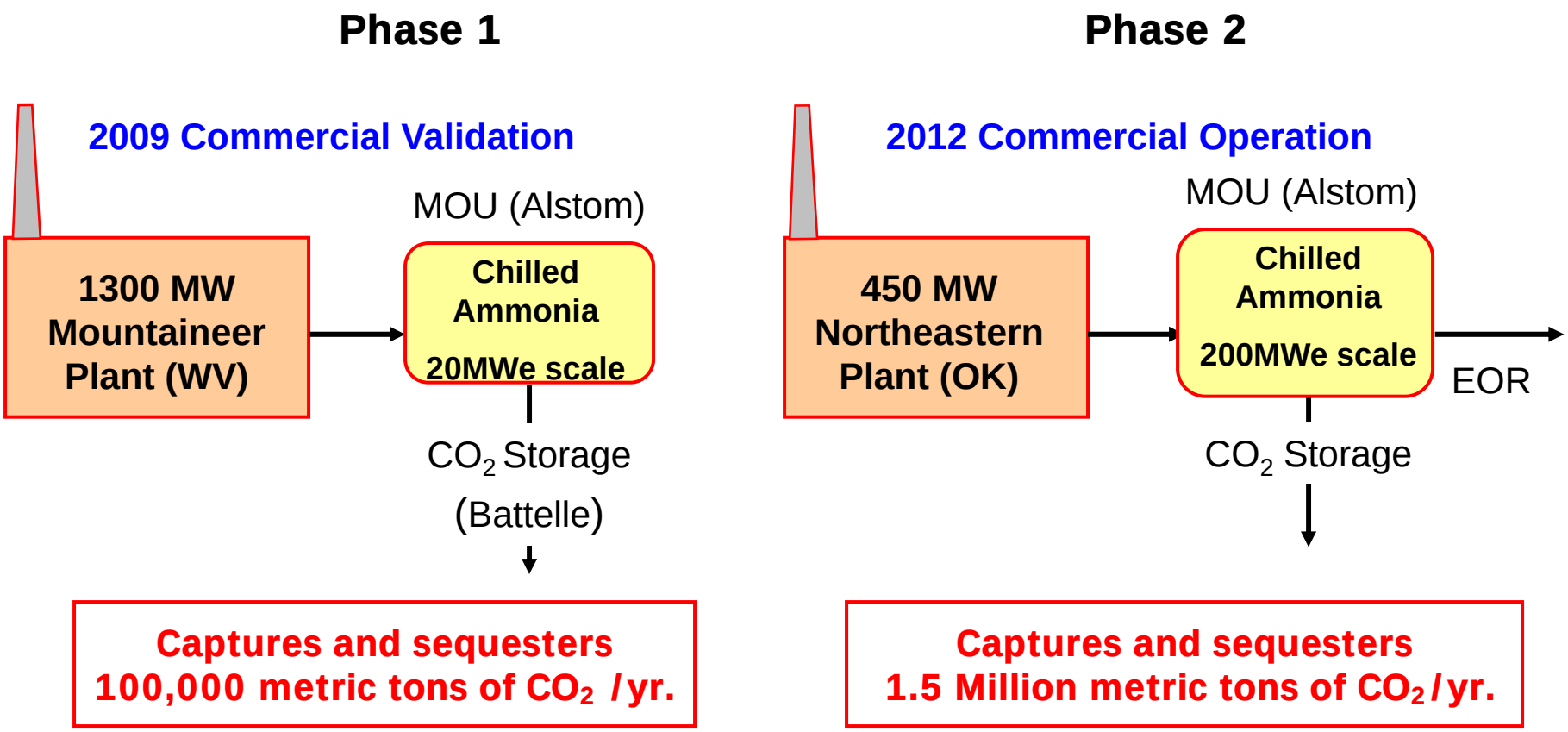
FUTUREGEN- ***First Near Zero Emissions Hydrogen/ Electric (coal-fueled IGCC with CCS)- AEP and Alliance members***

AEP's Carbon Capture & Storage Initiative

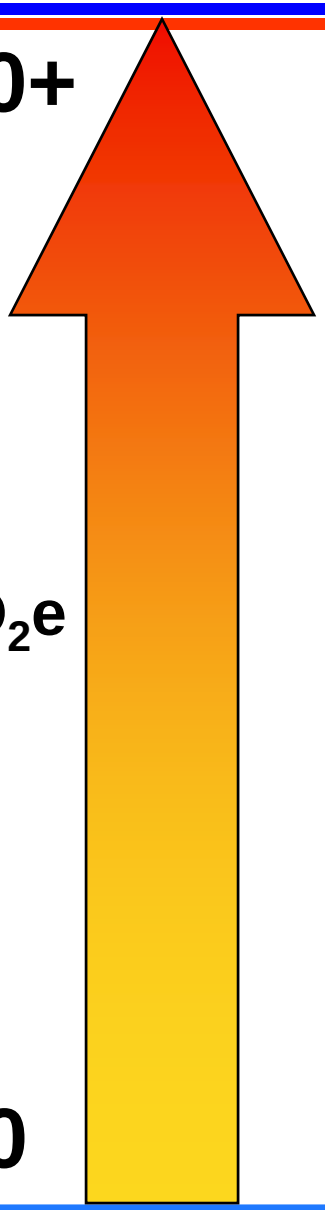
In March 2007, AEP announced a major new carbon capture and storage initiative:

- **Chilled Ammonia CCS--We will install carbon capture on two coal-fired power plants, the first commercial use of technologies to significantly reduce carbon dioxide emissions from existing plants.**
  - **The first carbon capture project, at the Mountaineer plant in West Virginia, is expected to complete its product validation phase in 2009**
  - **The second, at the Northeastern plant in Oklahoma, will begin commercial operation in 2012.**
- **Oxy-Coal--AEP will also demonstrate (10MWe) and then install oxy-coal CO_2 capture & storage at a commercial sized coal unit (about 200 MWe)—feasibility study to be completed in 2008.**

AEP Leadership in New Technology: Chilled Ammonia CCS



Examples of Relative GHG Mitigation Costs for Power Sector



$40+

$/ton CO_2e

$0

- Carbon Capture w/ Geologic Sequestration
- Other renewable, advanced geothermal and/or solar
- Carbon Capture for Enhanced Oil Recovery
- New Biomass Generation
- Dispatch of additional gas vs. inefficient coal
- Biomass Co-firing
- Biological Sequestration (e.g. Forestry)
- New Wind
- Energy Efficiency
- Methane Offsets

Nuclear?

Key Issues for CCS Development in U.S.

- Overcoming the “Economic” Hurdle
- High Up-Front Capital Investment—Getting Adequate Financing and Recovery in Rates
- Commercial Demonstrations of CCS at Large Coal-Fired Power Plants
- National Standards for Permitting of Storage Reservoirs
- Potential Institutional, Legal and Regulatory Barriers to Carbon Storage

Federal Legislation and AEP Position

Prospects for US Federal Legislation—The Crystal Ball

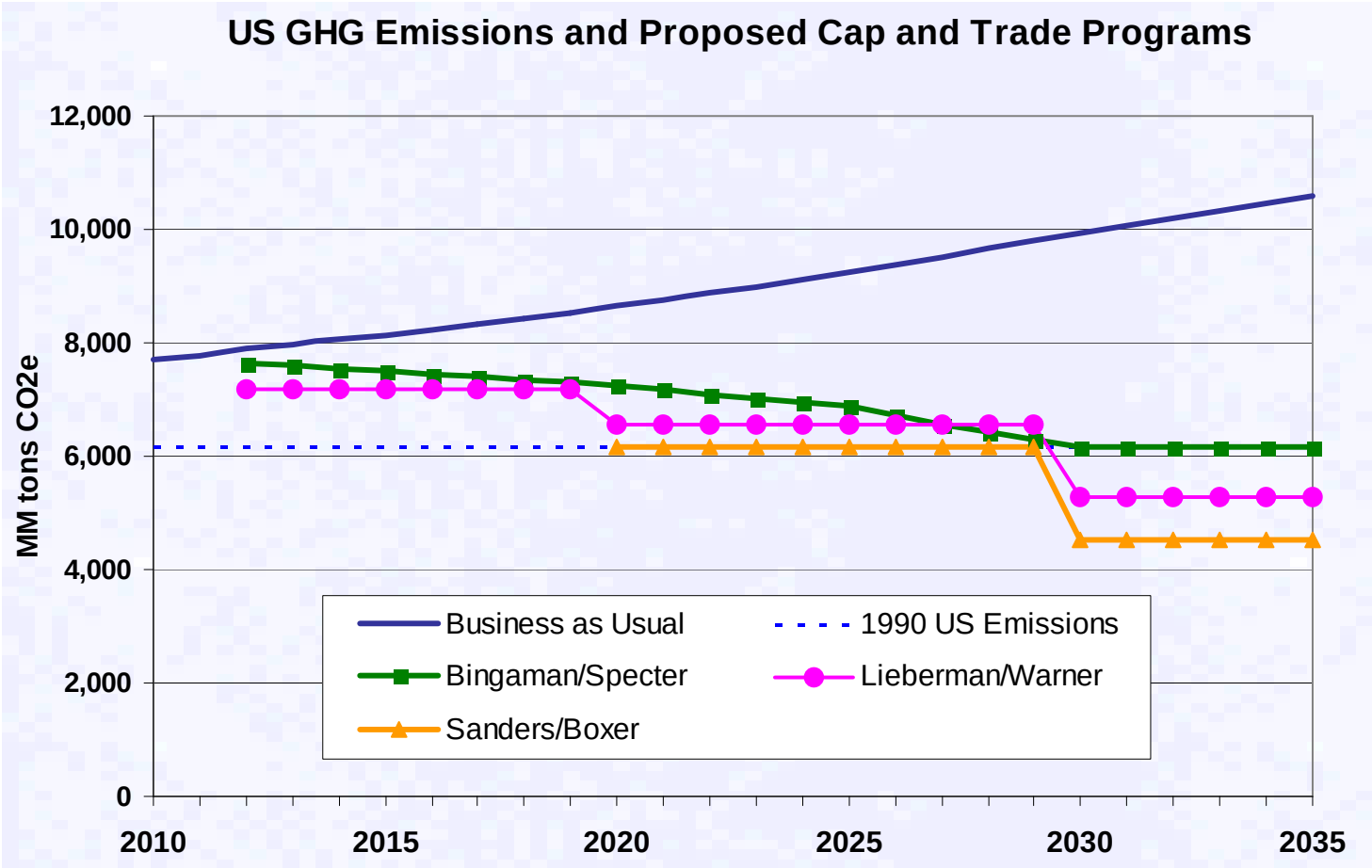
- With Democratic majorities in the House and Senate, prospects during the 110th Congress for mandatory climate legislation have increased.
- Nonetheless, the Senate and House have just begun introducing/developing legislation and there are many contentious issues, particularly allocation.
- In the 2009 and after period, passage of legislation is more likely, with a new President in office.
- A general timeline for passage of Clean Air Legislation has typically been 5-8 years after the initial "serious" proposals.

We are at the "end of the beginning" NOT the "beginning of the end."

Potential for Federal Climate Legislation

- Legislation could pass as early as 2009-10 with limits taking effect as early as 2015. Any earlier reduction requirements are unlikely.
- Moderate approach probably has best chance of passage, which means offsetting emissions growth initially (during next decade) with significant reductions thereafter.
- Cost impacts won't be until the 2015-20 period, with more substantial impacts probably not beginning until 2020 and after.

Emission Reductions Under Selected Bills



AEP's Climate Position

- A certain and consistent national policy for reasonable carbon controls should include the following principles:
  - Comprehensiveness
  - Cost-effectiveness
  - Realistic emission control objectives
  - Monitoring, verification and adjustment mechanisms
  - Technology development & deployment

- Inclusion of adjustment provision if largest emitters in developing world do not take action

A reliable & reasonably-priced electric supply is necessary to support the economic well-being of the areas we serve.

AEP Position: A "Reasonable" Approach to Climate Legislation

- Reductions and Timing--Moderate with Adequate Lead Times
- Scope of Program-- Economy Wide
- Point of Regulation (e.g. Upstream or Downstream)--Hybrid Approach
- Flexibility of the Program—Trading, Banking, Unrestricted Offsets, Early Action Credits
- Allowance Allocation And Other Cost Issues—Low auctions and safety valve
- International Linkage—AEP-IBEW Proposal: emission requirements to foreign imports from non-participating countries

AEP Supports Bingaman-Specter Bill

"Low Carbon Economy Act of 2007"

- Economy wide cap-and-trade program to limit Greenhouse Gas Emissions
  - Caps and Dates
    - 2006 Levels by 2020
    - 1990 levels by 2030
  - Industry Sectors "Regulated" under bill
    - Natural Gas and Petroleum regulated "upstream"
    - Coal regulated "downstream" at the power plant level
  - Allocations to Electricity Generators
    - Only fossil-fired electric generators receive allowances
  - Safety Valve (TAP)
  - Bonus Allowances for Carbon Capture and Sequestration
  - Early Reduction Credits and Offsets Included
  - Congressional Review of International Action (e.g. AEP-IBEW Proposal)

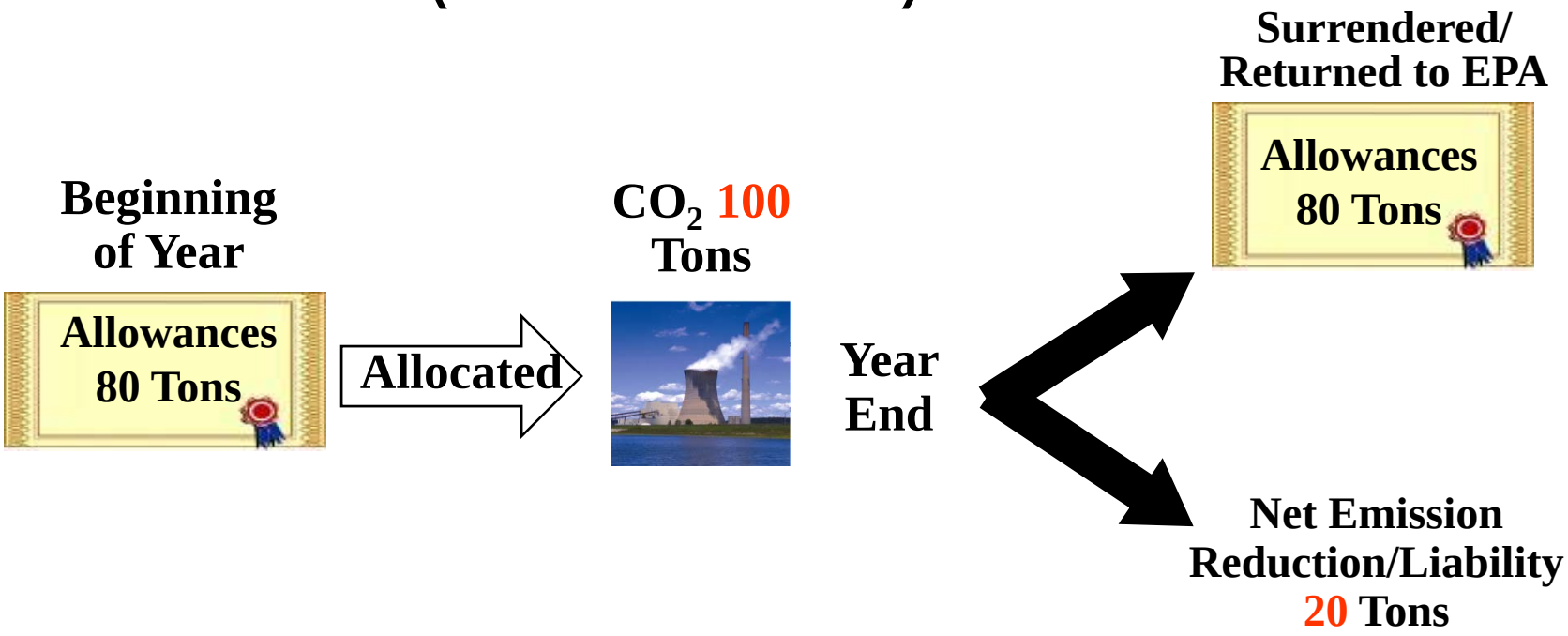
AEP Supports Reasonable Legislation on GHG

Background on Allowance Allocations and Auctions

- **"Allowance" = Right to emit a ton of emissions.** Each year allowances are surrendered to cover annual emissions.
- **Most programs (e.g. EPA's SO_2 and NOx, CAIR and CAMR) allocate allowances (at "no cost") to generators (primarily based on historic emissions) with little or no auction.** The EPA SO_2 program has been hailed as a success because of its AFFORDABILITY due in part to a small (2.8%) auction.
- **Allowance allocation to emitters does NOT result in a "windfall." CO_2 cap means ALLOWANCES <EMISSIONS. So reductions must be made at a NET COST.**
- **Importantly, whether allowances are allocated at "no cost" or auctioned has NO environmental impact, it is the overall CO_2 cap that determines the amount of reductions.**

"Free" Allocation To Emitters Does Not Increase Profits

- Example: Company Emits 100 Tons, Receives 80 "No-Cost" Allowances (i.e. 20 % Reduction).



- Full Allocation to Emitters Does NOT Create a "Net Asset" or Windfall because of the Liability of Complying with the CO_2 Cap. In fact, it is a NET LIABILITY.

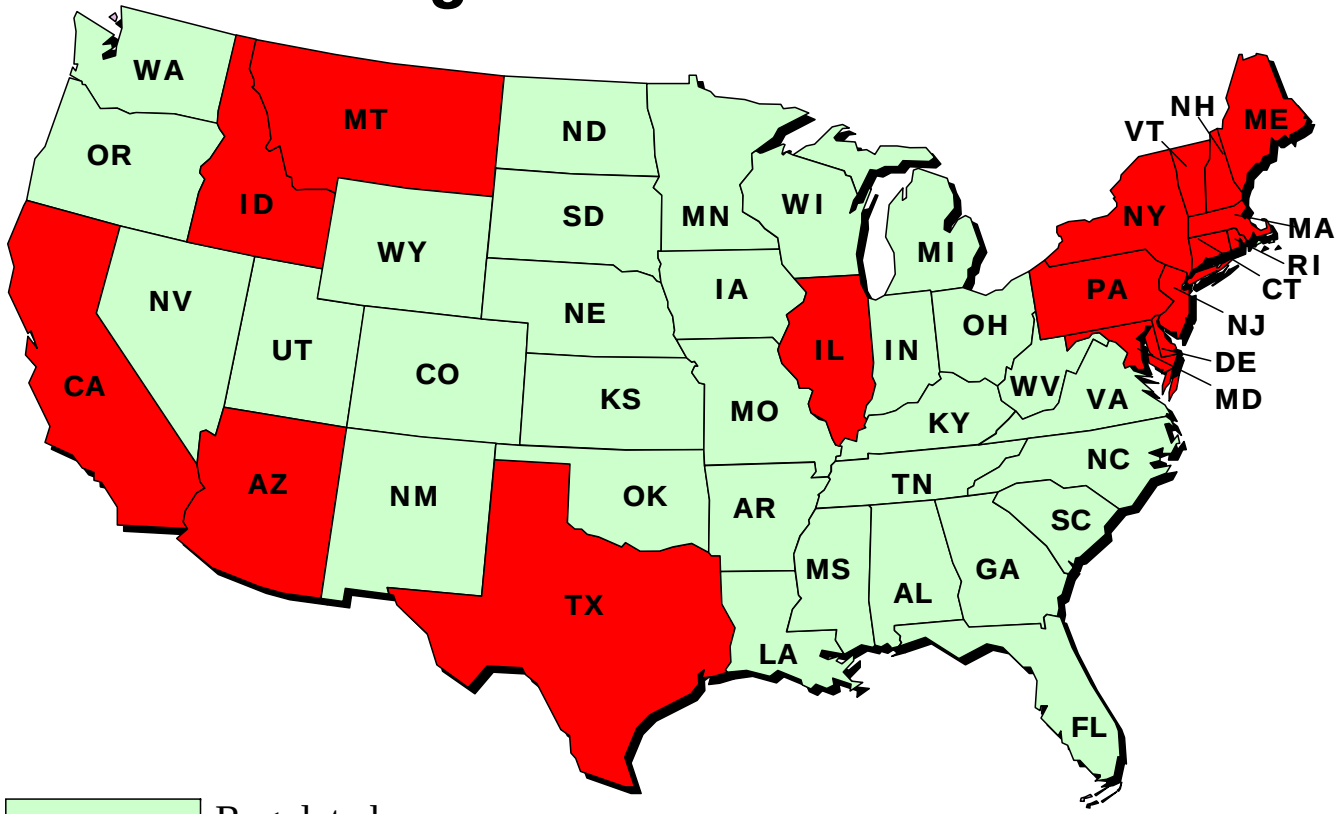
Electricity Deregulated vs. Cost Regulated States

- It is the CO_2 cap that increases electricity costs and prices. The key distinction is whether a generator is subject to:
  1. Cost-of-Service Regulation
  2. Deregulated Generation Markets
- Most states and the vast majority of coal fired generation are subject to cost-based regulation. There are NO WINDFALLS or PROFIT GAINS for these generators because they are regulated and can ONLY pass-thru their costs to customers.
- For the US power industry, allocation/auction is predominantly about electricity costs and rates:

Higher Auctions = Higher Electricity Rates

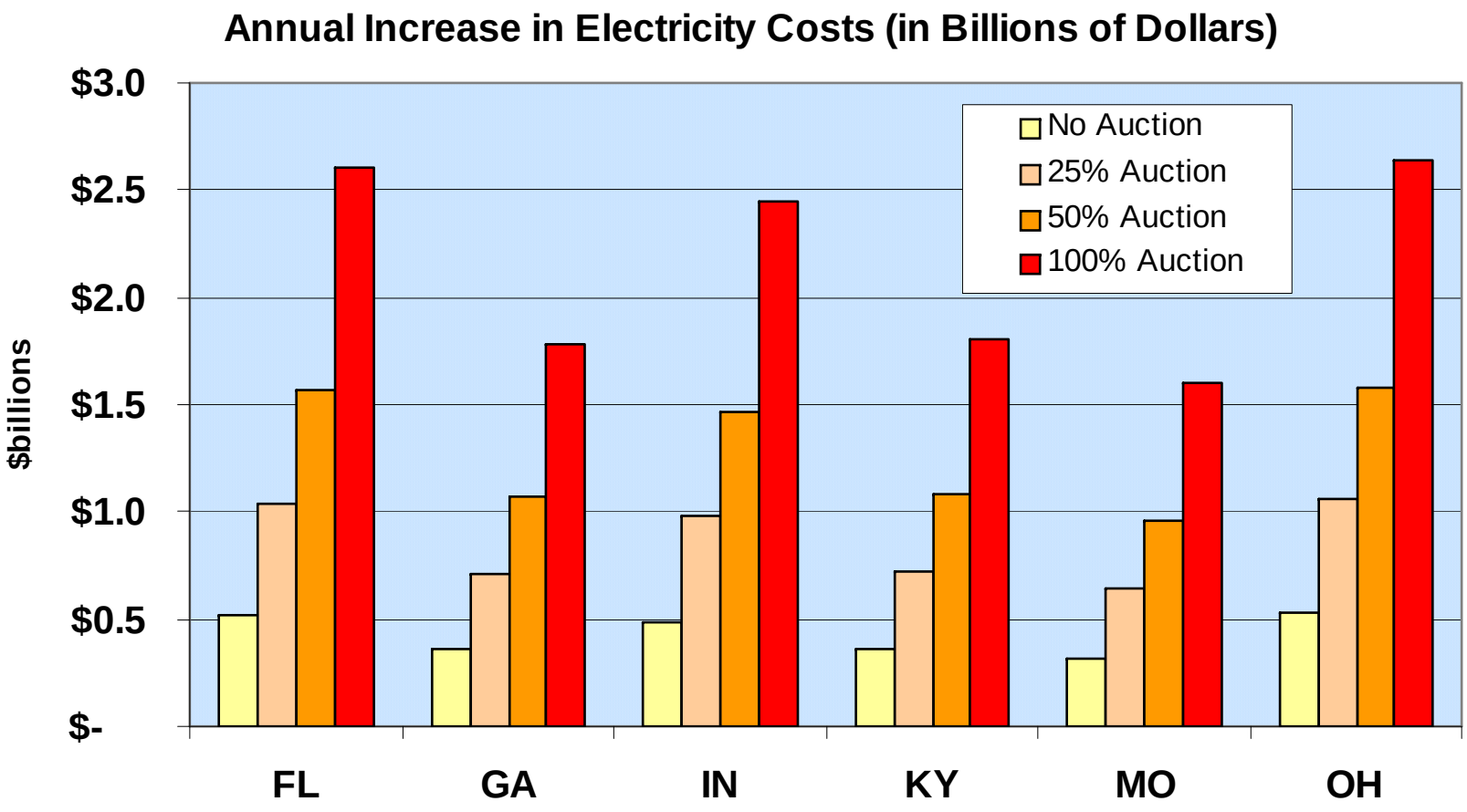
Most Coal Generation is Cost-Regulated

- **Most states are "cost-regulated" today with 80% of US coal fired generation in these states.**



Note: Based on "current" state status of regulation/deregulation. States that have continued cost-based POLR rates or transition rates are considered to have kept generation "regulated".

Increase in Customer Electricity Costs / Rates due to Auctions



Approximate Calculation based on a 20% reduction in electric sector GHG emissions with CO_{2e} reductions / allowances costing $20 / ton

Allocations and Auctions—Price Deregulated States

- **The CO_2 cap (not allowance allocation) will increase electricity prices and, for some participants, increase profits. BUT ONLY in states (primarily in the Northeast and West), where generation is "unbundled" and retail prices deregulated.**
- **In these states, SOME generators will have higher profits IF their revenues increase more than their costs:**
  - The majority of the profit increase will go to non-fossil generation (e.g. nuclear, hydro and renewables) because they have no emissions and because almost half of the generation is projected to come from non-fossil sources in these states.
  - Natural gas units will also see profit increases because their CO_2 reduction costs are small.
- **Thus, auctions do little to "tax away" higher profits since most profits come from non-emitting or low emitting units that don't need allowances. In fact, the main impact of auctions is to penalize ratepayers or coal-fired generators.**

Allowance Allocation Within the Electric Sector

- **Emissions-Based Allocations Are More Equitable---**Allowances should be allocated based on historic/current emissions to existing generators required to make reductions. **Allocation principle is all emitters make their "fair" pro-rata share of reductions**.
- **Output or Total KWh based Allocations Create Large Windfalls for Some Generators and Major Losses for Coal ----**
  - Allowances should NOT be allocated to sources that do not have emissions such as hydro and nuclear. Gas fired plants should not receive "excess" allocations.
  - Nuclear, hydro and gas plants will already benefit (to the extent they are in "deregulated" states) due to higher power prices.
  - Output based allocations increase costs to ratepayers of largely regulated, coal dependent states (e.g. the Midwest and Southeast) and provide large windfalls to deregulated gas and nuclear plants. For example, output-based allocation would increase costs to AEP and its customers by about $1 billion/year with no CO_2 benefit.

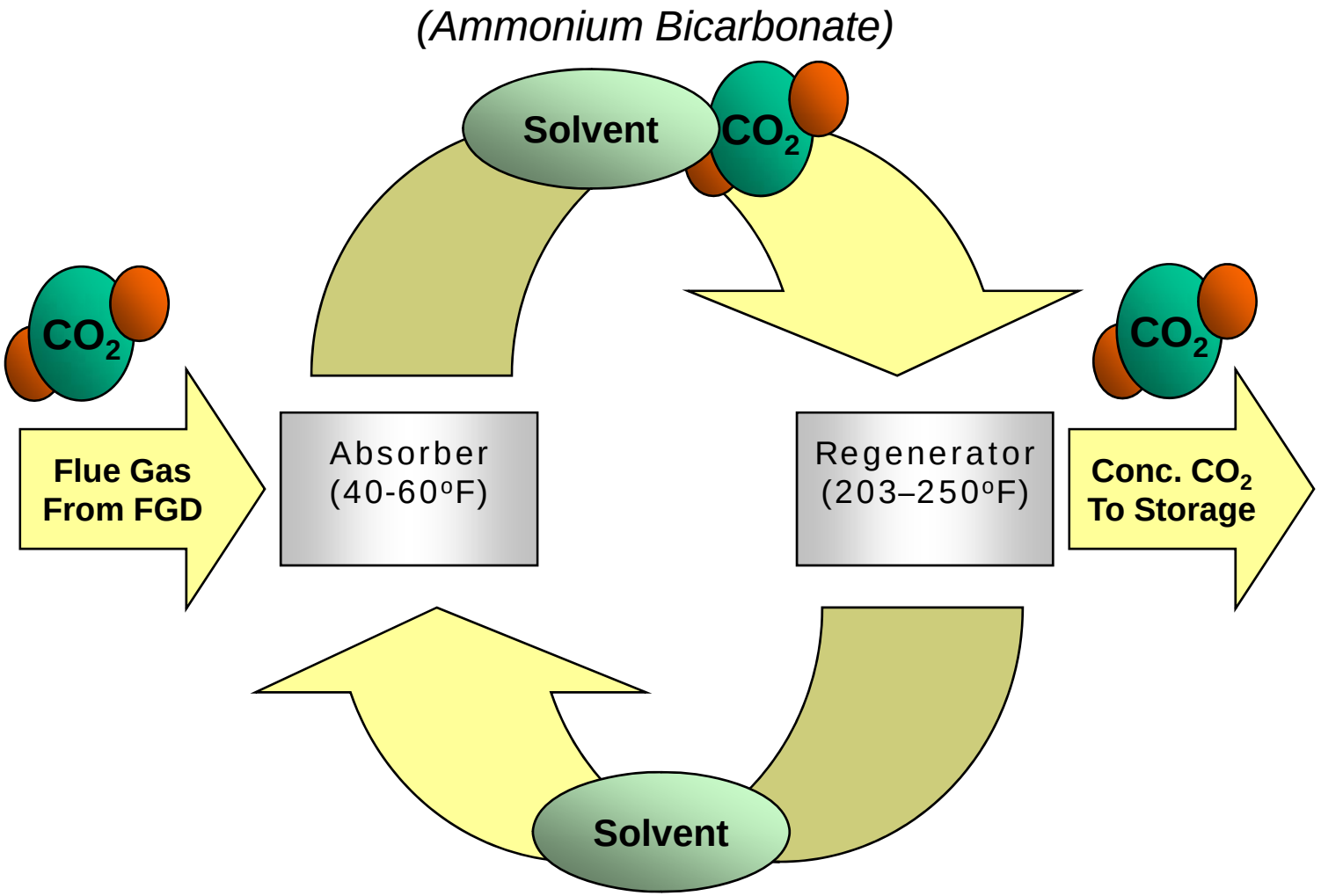
Technical Appendix

Carbon Capture and Storage

CO_2 Capture Techniques

- **Post-Combustion Capture**
  - Conventional or Advanced Amines, Chilled Ammonia
  - *Key Points*
    - Amine technologies commercially available in other industrial applications
    - Relatively low CO_2 concentration in flue gas – More difficult to capture than other approaches
    - High parasitic demand
      - Conventional Amine ~25-30%, Chilled Ammonia target ~10-15%
    - Amines require **very** clean flue gas
- **Modified-Combustion Capture**
  - Oxy-Coal
  - *Key Points*
    - Technology not yet proven at commercial scale
    - Creates stream of very high CO_2 concentration
    - High parasitic demand, >25%
- **Pre-Combustion Capture**
  - IGCC with Water-Gas Shift – FutureGen
  - *Key Points*
    - Most of the processes commercially available in other industrial applications
      - Have never been integrated together
    - Turbine modified for H_2-based fuel, which has not yet been proven at commercial scale
    - Creates stream of very high CO_2 concentration
    - Parasitic demand (~20%) for CO_2 capture - lower than amine or oxy-coal

Alstom Chilled Ammonia Process
Post-Combustion Capture



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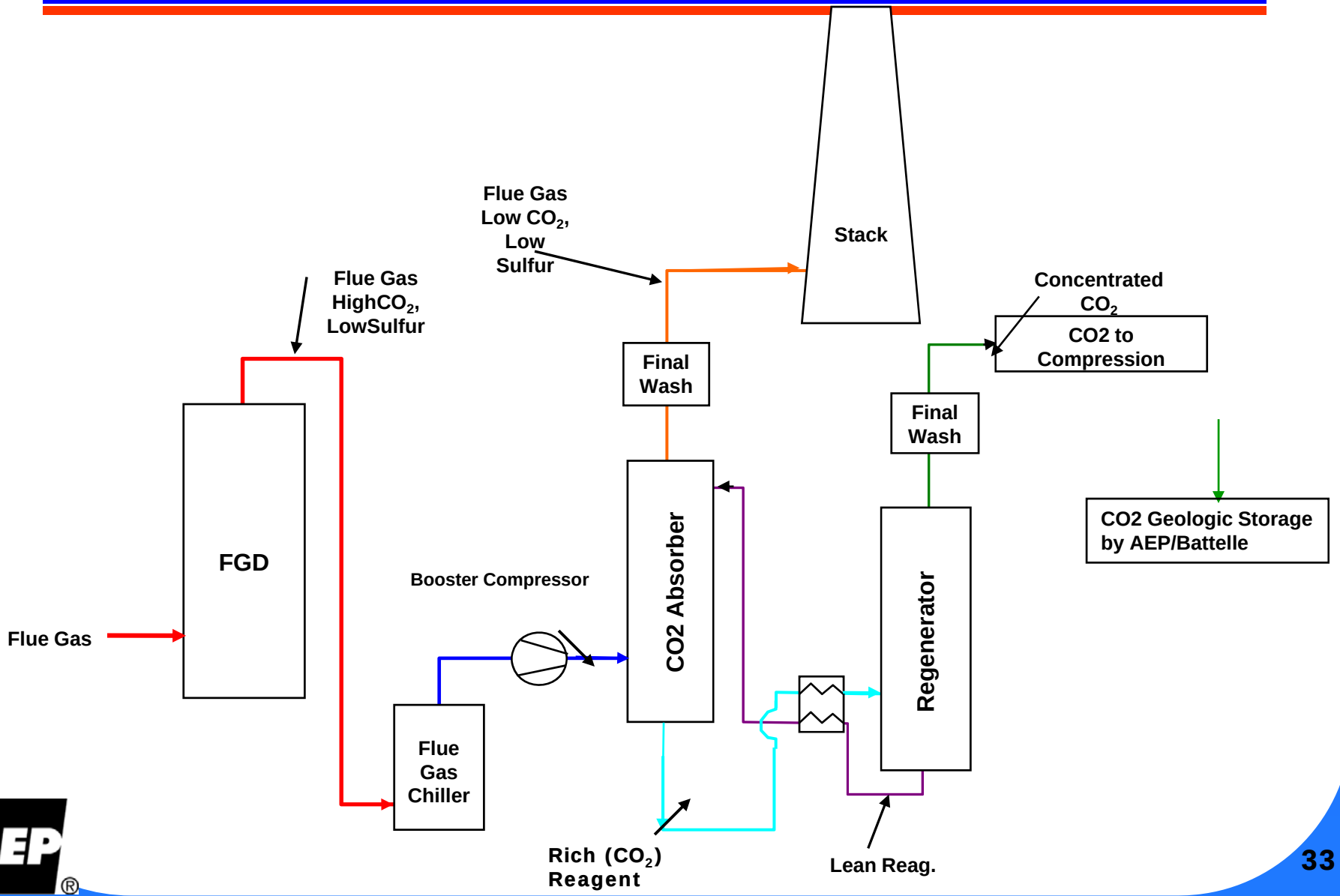
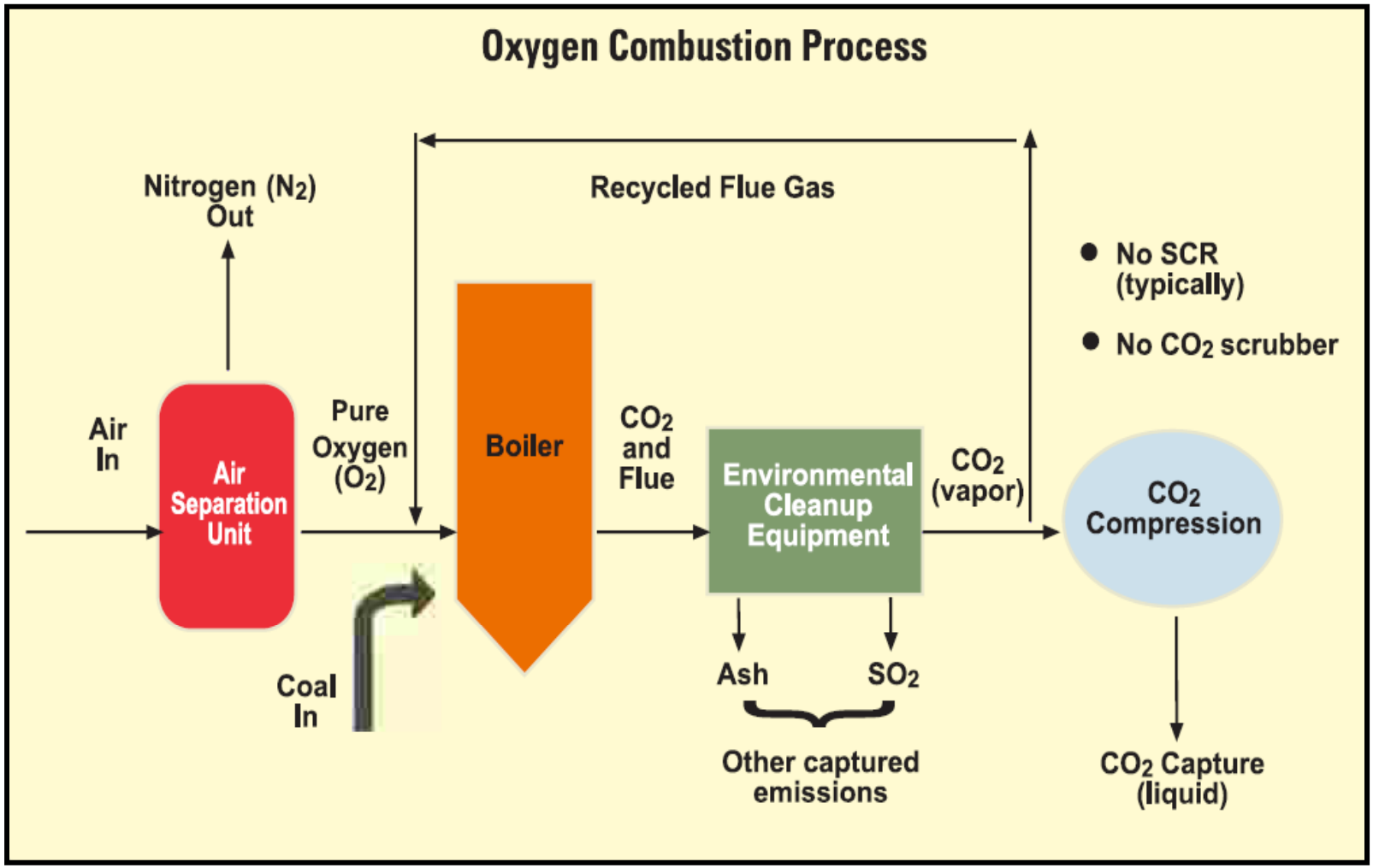
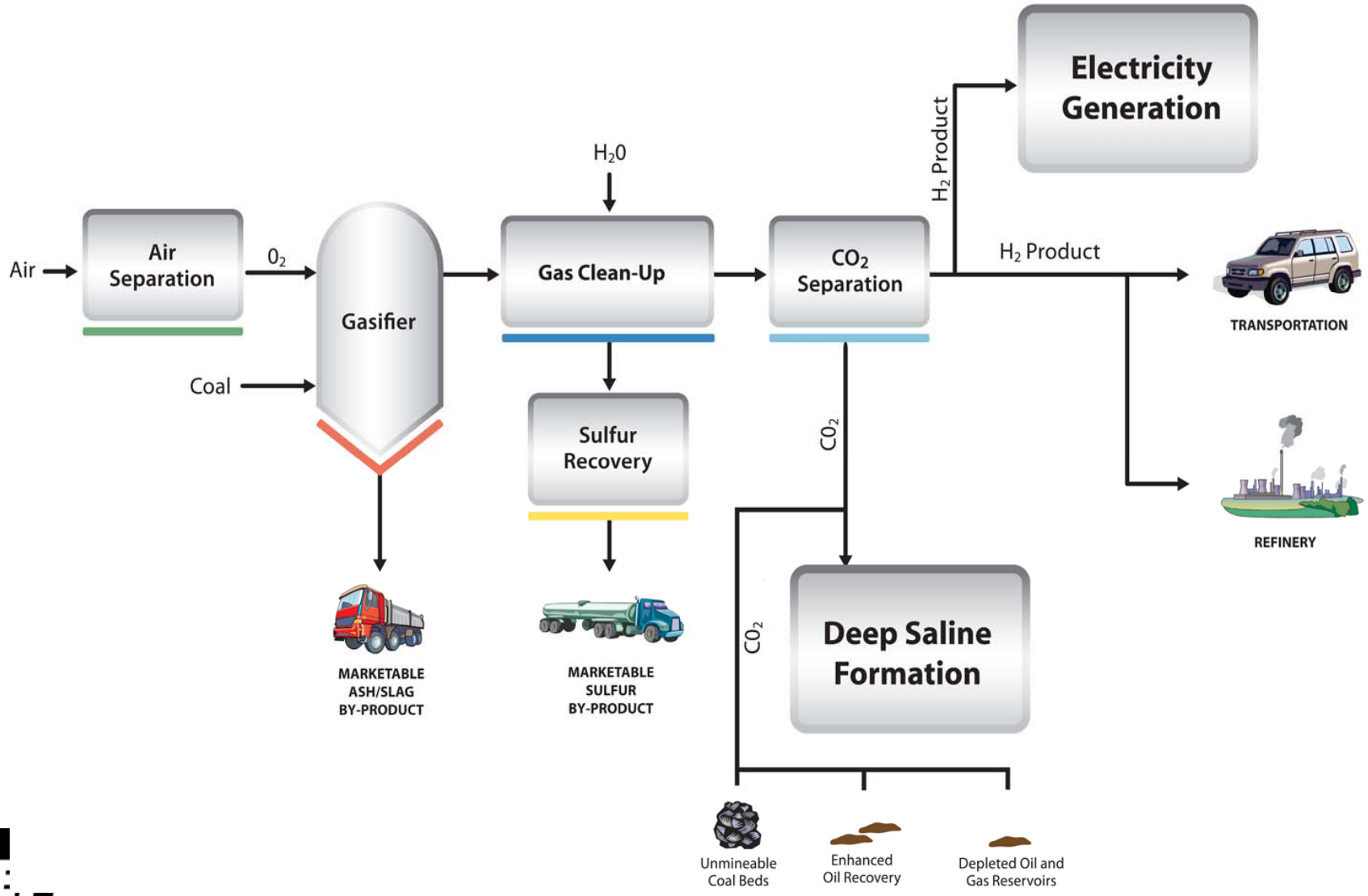


Babcock & Wilcox Oxy-Coal Process

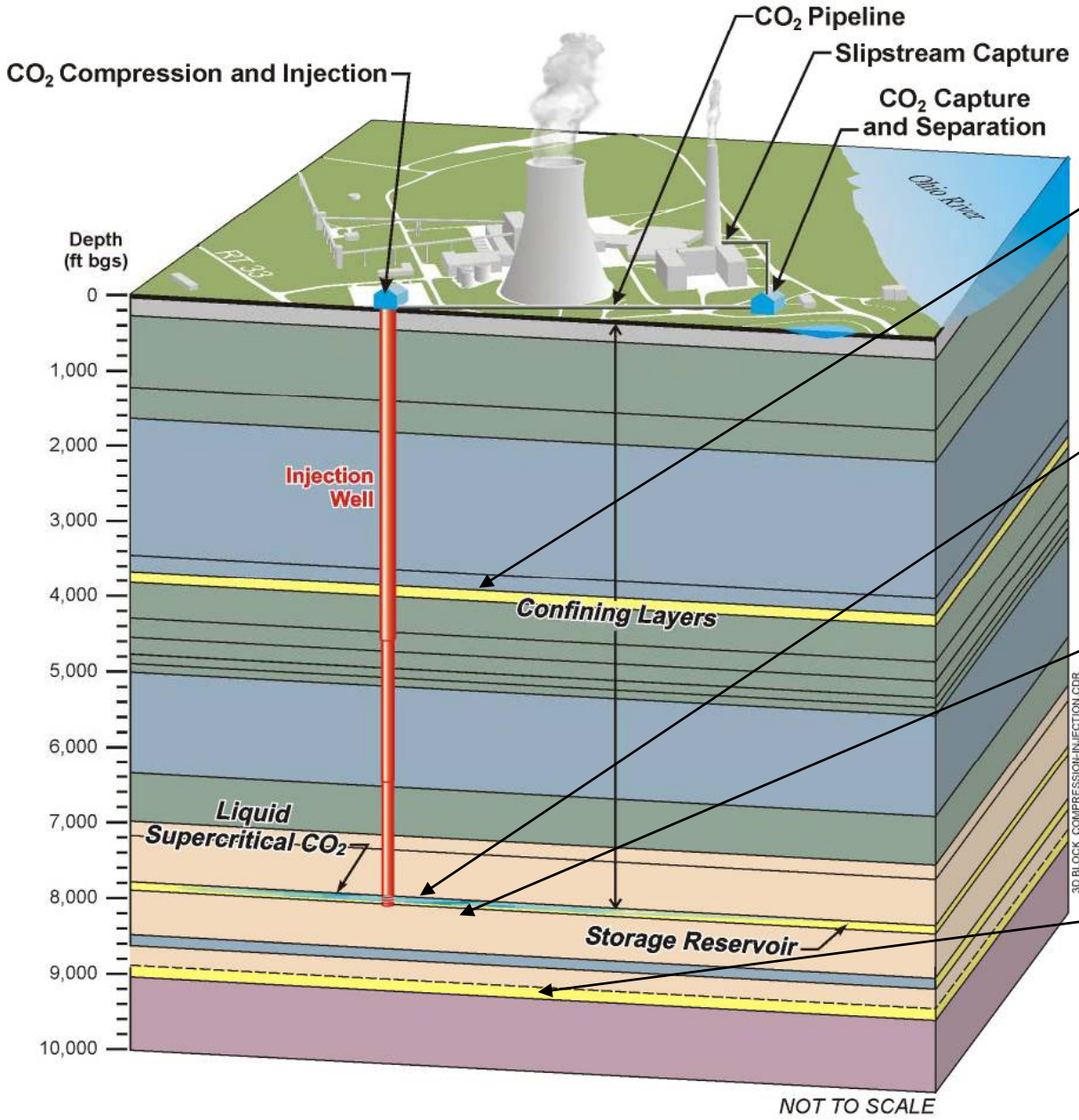
Modified Combustion Capture



FutureGen Water-Gas Shift Process
Pre-Combustion Capture



CO_2 Injectivity in the Mountaineer Area



CO_2 injection should also be possible in shallower sandstone and carbonate layers in the region

Rose Run Sandstone (~7800 feet) is a regional candidate zone in Appalachian Basin

A high permeability zone called the “B zone” within Copper Ridge Dolomite has been identified as a new injection zone in the region

Mount Simon Sandstone/Basal Sand - the most prominent reservoir in most of the Midwest but not desirable beneath Mountaineer site