U.S. Coral Reef Task Force
August 23 - 30, 2008

Addressing Global Climate Change

An Industry Perspective

Dennis E. Welch
Executive Vice President
Environment, Safety, Health & Facilities
dewelch@aep.com

Company Overview

- 5.2 million customers in 11 states
- Industry leading size and scale of assets:
  - #2 Domestic generation with 38,000 MW
  - #1 Transmission with 39,000 miles
  - #1 Distribution with 213,000 miles
- Coal & transportation assets
  - Control over 8,400 railcars
  - Own/lease and operate over 2,650 barges & 52 towboats
  - Coal handling terminal with 20 million tons of capacity
  - Consume 76 million tons of coal per year
  - 2007 – emitted 150 MM tons of CO_2e
- 21,000 employees

AEP Generation Portfolio				
Coal	Gas	Nuclear	Hydro	Wind
68%	23%	6%	2%	1%

Coral Reefs and Climate Change

Corals will begin to disappear in 50 to 75 years due to steadily warming temperatures and increasing ocean acidification caused by carbon dioxide emissions. The impacts on marine biodiversity and human livelihoods will be devastating, especially in developing nations that depend on reefs for much of their economic well-being.

NOAA Coral Reef Watch

December 2007

Our Position On Climate Change

We believe the scientific community, led largely by the Intergovernmental Panel on Climate Change (IPCC), has enough scientific information that human activity has contributed to global warming. We believe AEP should be part of leading the discussion nationally and internationally to reach achievable, reasonable solutions and a federal energy policy that is realistic in timeframe, without causing serious harm to the U.S. economy. It should also support technology development to allow coal to continue to be the important energy resource that it is to the U.S. today.

AEP's Long-Term CO_2 Reduction Commitment

Existing Programs

- Existing plant efficiency improvements
- Renewables
  - 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 CO2:
- **2003-2007: 43 MMT**
- **By 2010 (proj.): Additional 3 MMT**

New Program Additions

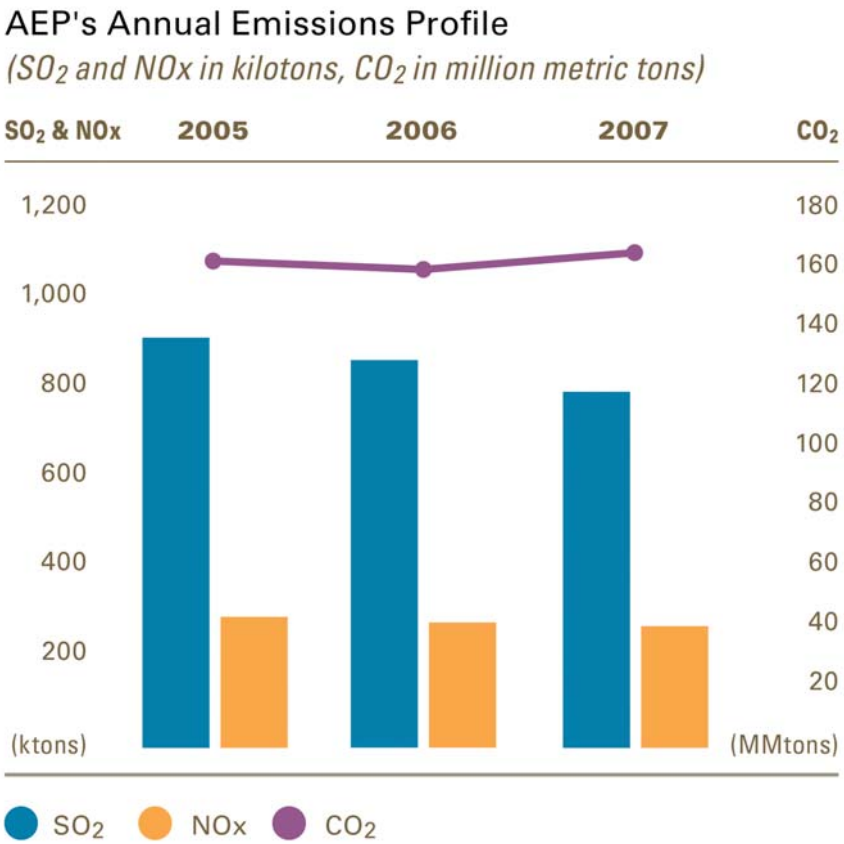
- Timing: Implement during 2007 to take effect/receive credits by 2011
- Methods
  - +1000 MWs of Wind PPAs: 2MM tons/yr
    - YTD 422 MW of Wind
  - Domestic Offsets (methane): 2MM tons/yr
  - Forestry: Tripling annual investment to increase to 0.5MM tons/yr by 2015
  - Fleet Vehicle/Aviation Offsets: 0.2MM tons/yr
  - Additional actions to include DSM and end use energy efficiency (1000 MW), biomass and power plant efficiency: 0.2MM tons/yr
  - Modern interstate transmission grid

AEP's reductions/offsets of CO2:
2011+: 5 MMT/YEAR

AEP's Climate Strategy

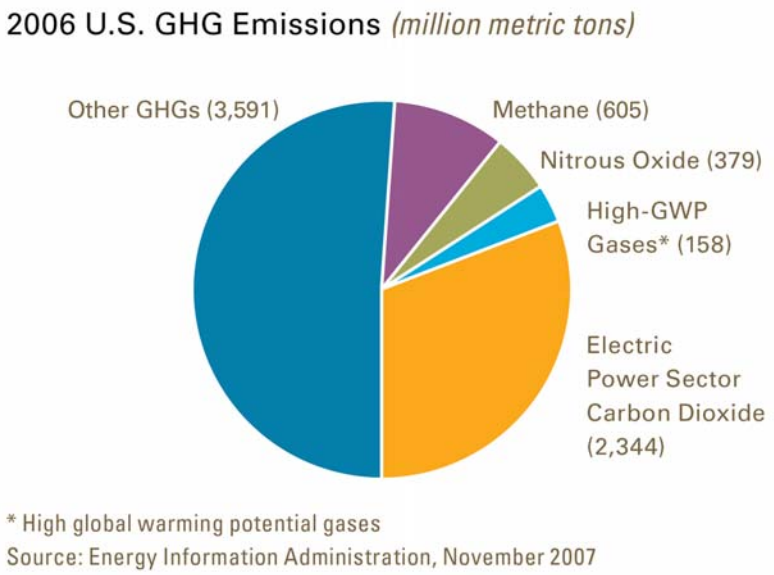
- Actions to reduce or limit GHGs:
  - Advanced clean coal plants for baseload: Integrated gasification combined cycle (IGCC) and ultra-supercritical pulverized coal
  - Deploy carbon capture and storage technology
  - Natural gas
  - Retirement of less efficient capacity
  - Emission offsets (e.g., forestry, methane)
  - Renewables (e.g., biomass firing, wind)
  - Supply and demand side efficiency improvements
  - Transmission grid upgrade and expansion

AEP's Emissions Profile



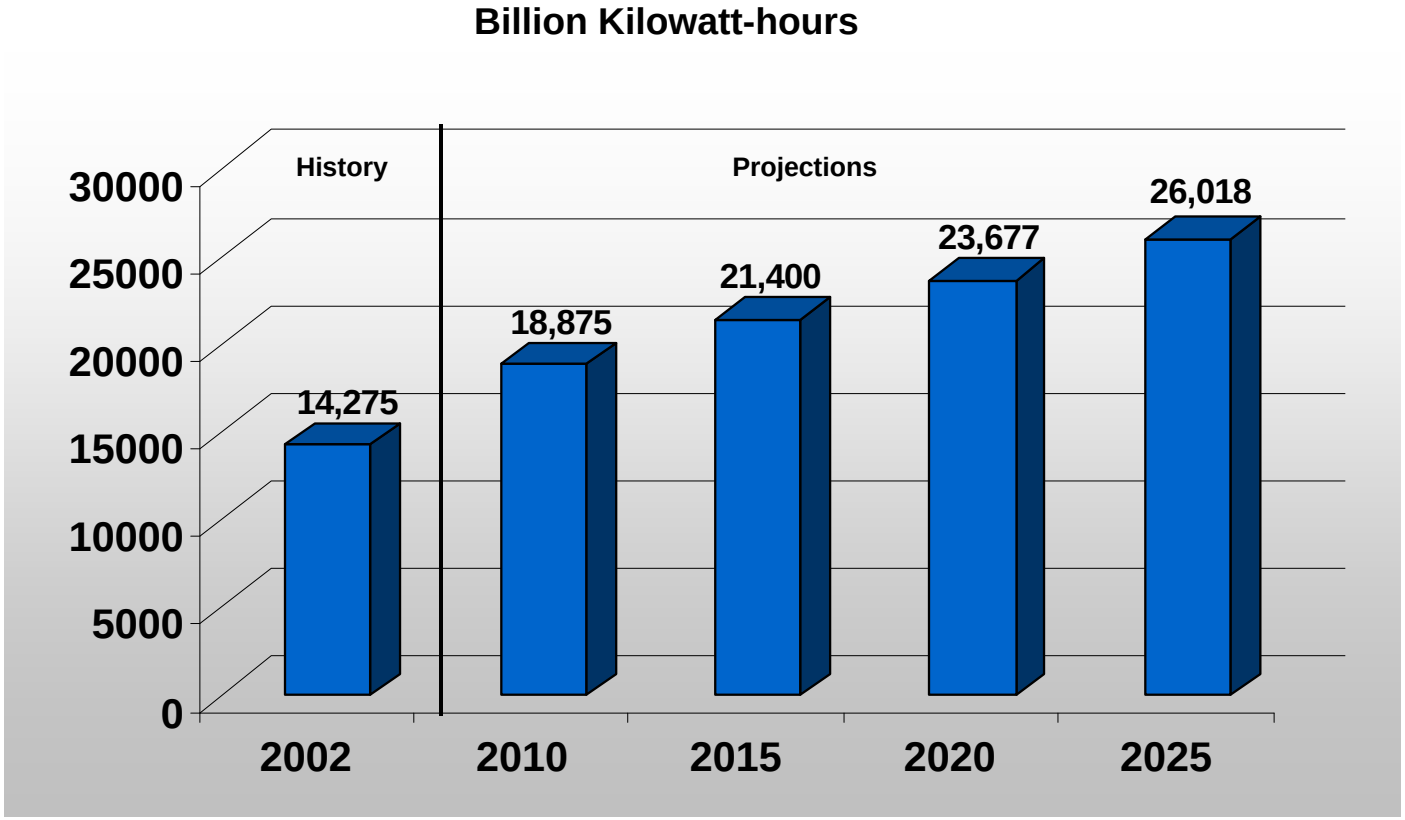
In 2007, AEP's CO_2 emissions increased 2.8 percent while electricity demand grew 3.6 percent. The decline in SO_2 emissions reflects the success of our environmental programs.

U.S. Greenhouse Gas Emissions Make-Up



There are several types of greenhouse gases; carbon dioxide is one of them. Other GHGs, such as methane, are much more damaging to the environment.

World Net Electricity Consumption 2002 - 2025



Sources: 2002 – EIA, International Energy Annual 2002, DOE/EIA-0219 (2002) (Washington, DC, March 2004), web site www.eia.doe.gov/iea/. Projections: EIA, System for the Analysis of Global Energy Markets (2005)

Electricity Generation: U.S. Government Forecast

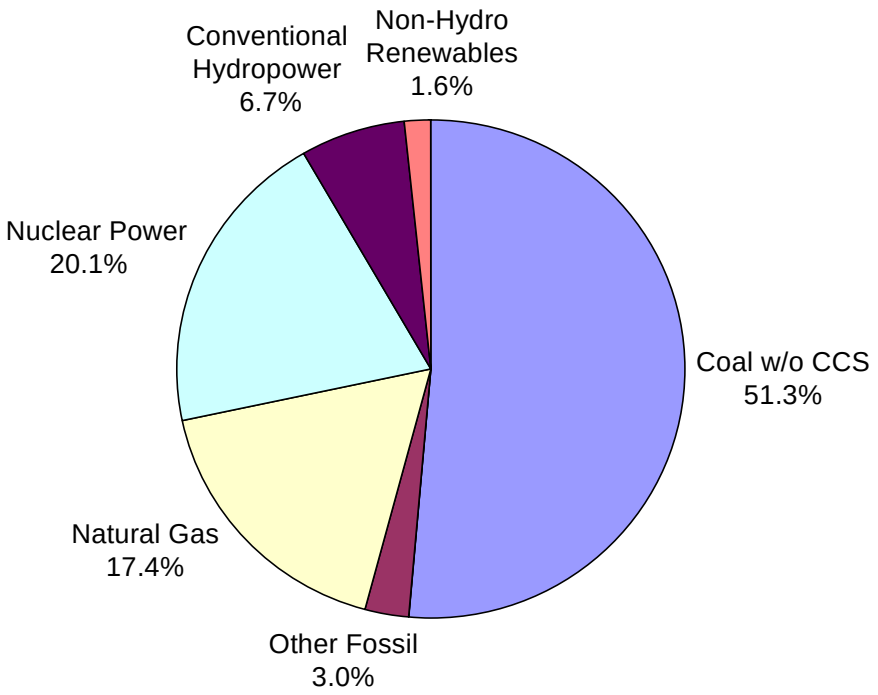
2005

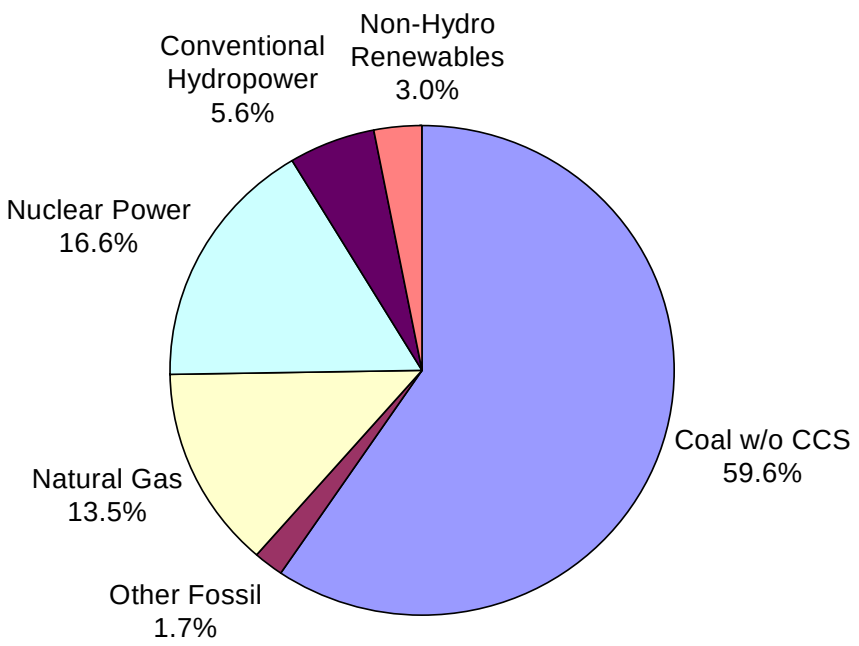
3826 TWh

41% Growth

2030

5406 TWh



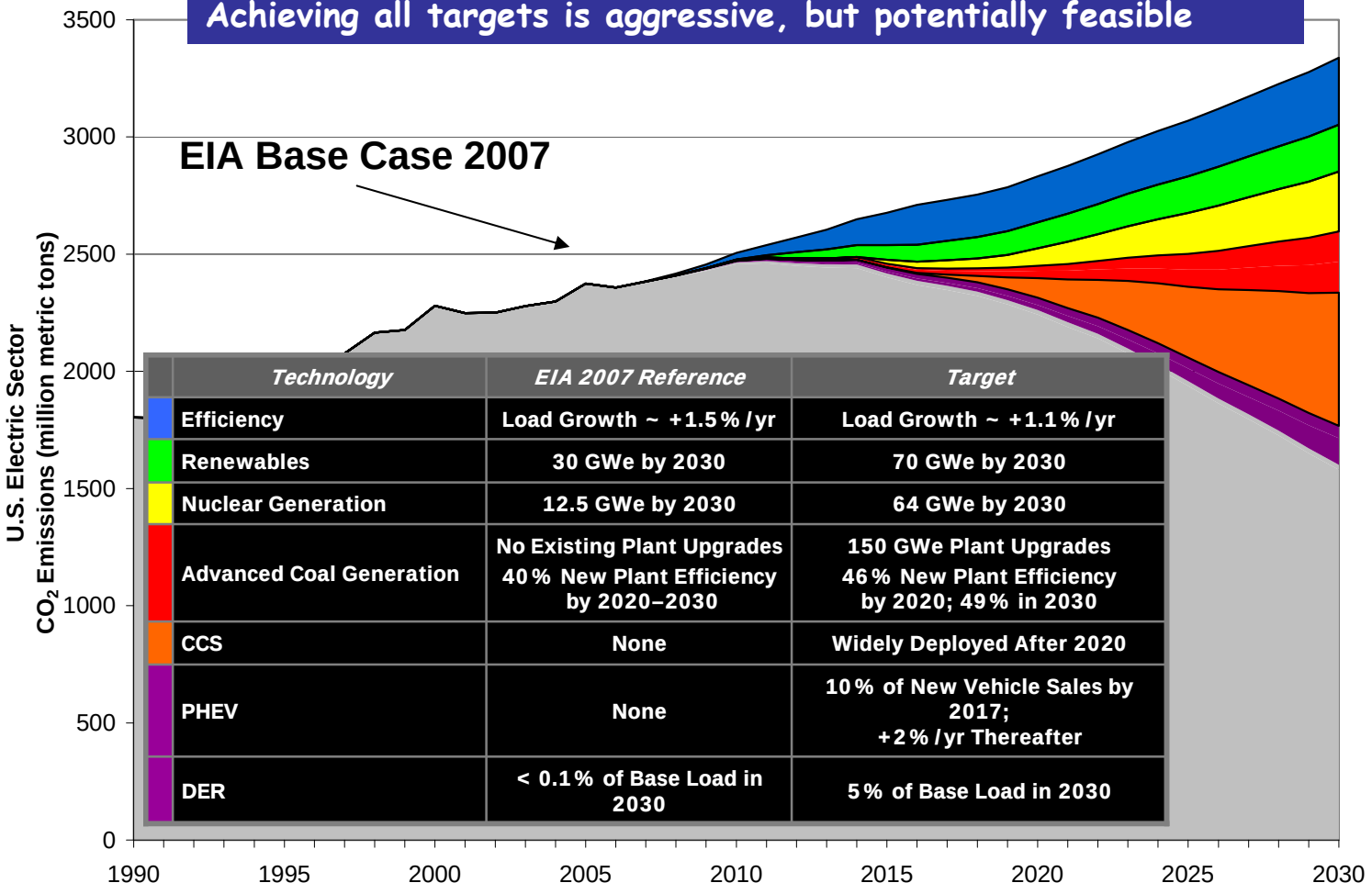


** Base case from EIA "Annual Energy Outlook 2007"*

EPRI CO_2 Reduction "Prism"

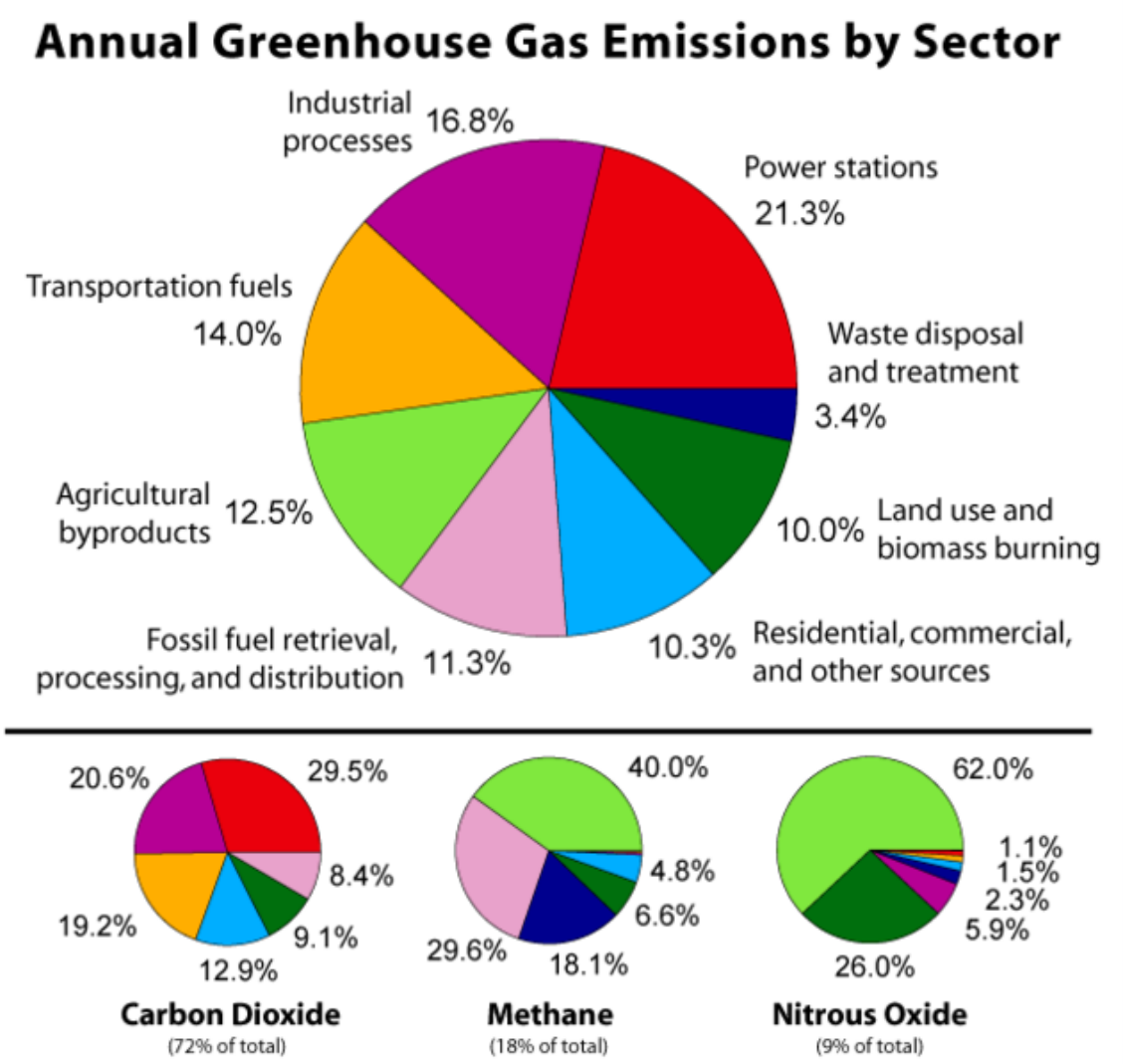
2030 CO_2 below 1990 level

Achieving all targets is aggressive, but potentially feasible



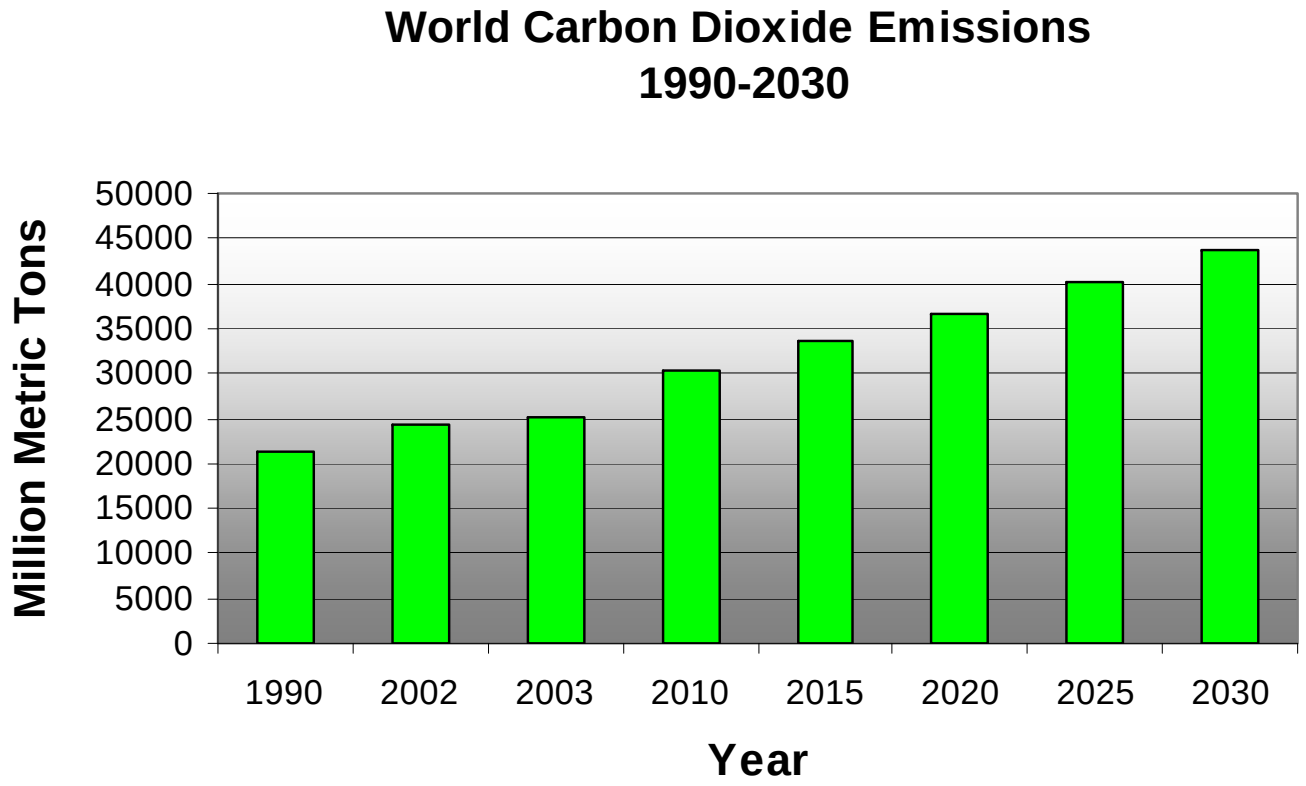
Technology	*EIA 2007 Reference*	*Target*
Efficiency	Load Growth ~ +1.5% /yr	Load Growth ~ +1.1% /yr
Renewables	30 GWe by 2030	70 GWe by 2030
Nuclear Generation	12.5 GWe by 2030	64 GWe by 2030
Advanced Coal Generation	No Existing Plant Upgrades 40% New Plant Efficiency by 2020–2030	150 GWe Plant Upgrades 46% New Plant Efficiency by 2020; 49% in 2030
CCS	None	Widely Deployed After 2020
PHEV	None	10% of New Vehicle Sales by 2017; +2% /yr Thereafter
DER	< 0.1% of Base Load in 2030	5% of Base Load in 2030

Global CO2 Emissions, By Source (2000)



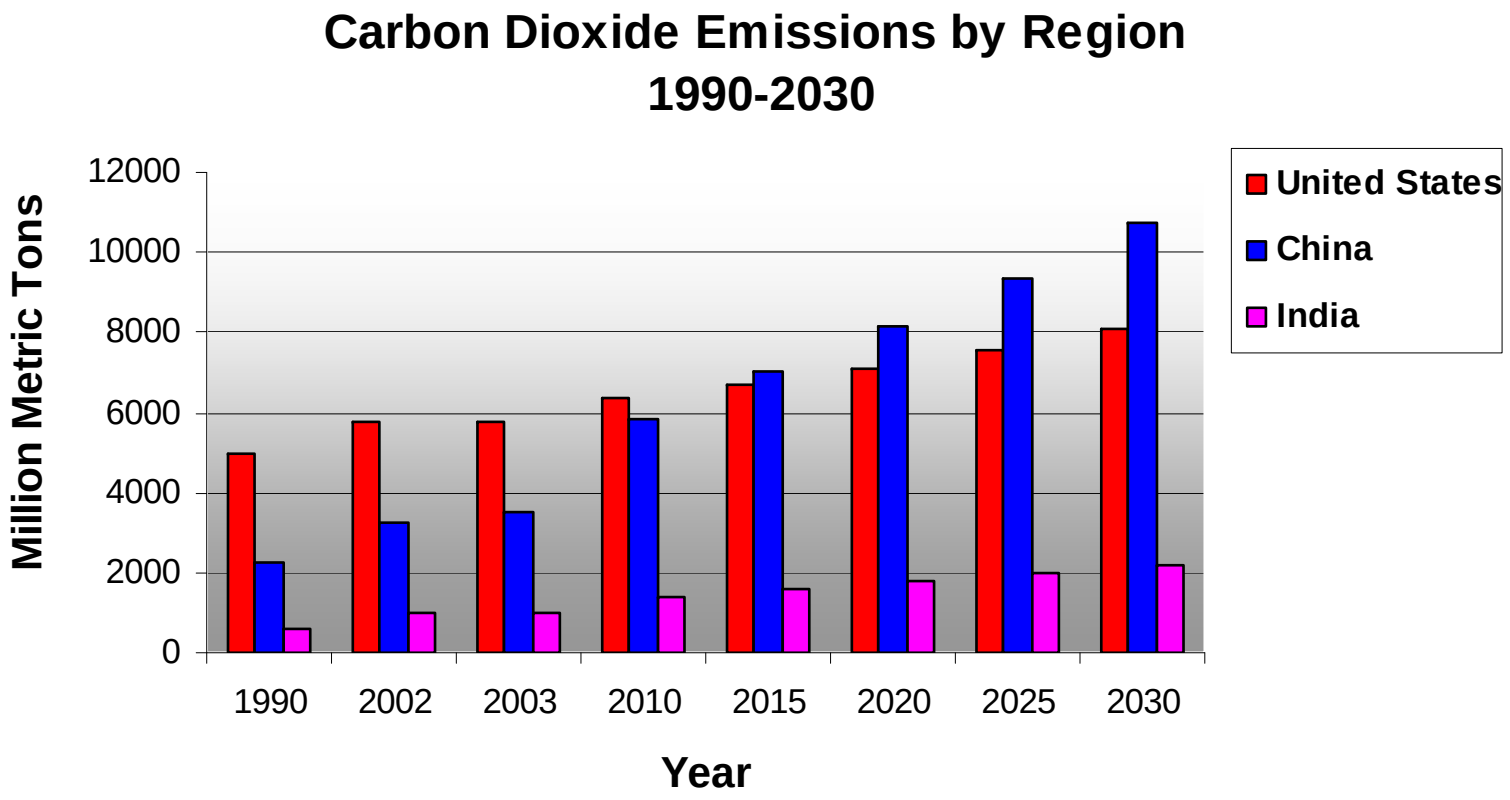
Source: Oak Ridge National Laboratory, 2000

Steady CO_2 Emissions Growth Projected Worldwide



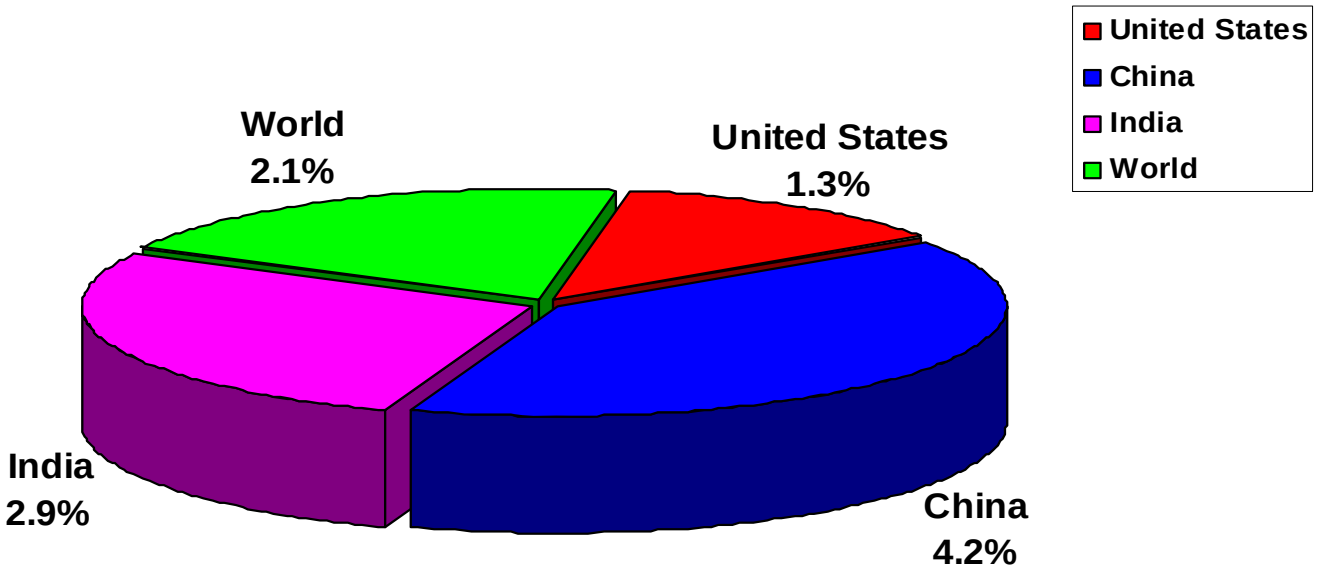
Source: EIA/IEA 2006

Projected Emissions Growth – U.S., China, India



Source: EIA/IEA 2006

Average Annual Increase in Carbon Dioxide Emissions 2003 - 2030



In the U.S., 41% of CO_2 emissions come from the power sector. Of that, 70% comes from coal.

Keys To Reducing CO_2 Emissions

- Establish energy policy that incentivizes investment
- Support innovation and R&D efforts
- Customize policy intervention
- Ensure complementary implementation of policy tools
- Use an effective blend of policy tools
- Promote realistic pricing
- Realize the potential of emissions reduction along the entire supply chain
- Fully recognize the importance of transmission and distribution
- Establish strong integrated infrastructure planning
- Increase developing countries' capacity to adopt climate change related technologies
- Expand the use and effectiveness of the CDM and other future mechanisms

International Collaboration Part Of The Solution

Through the Asia-Pacific Partnership and e8, AEP has supported information and technology transfers through plant visits and hands-on learning.

World Business Council For Sustainable Development

Powering a Sustainable Future

World Business Council for Sustainable Development

Policies and measures to make it happen

San Cristobal Wind Project – An Example Of Environmental Success

- 2.4 MW (3 x 800 kW) wind turbine fleet.
- 52% displacement of diesel generation on an annual basis.
- 80% wind energy to grid at daily load peak in high wind season.
- Local partner retains responsibility for the thermal plant.
- New 'Commercial Trust' formed by e8 and local Ecuadorian partner to build, train, operate and maintain.

Galapagos Solar Power Training Program

- In parallel with the wind project, the e8 implemented a training program for the local power company engineers to operate and maintain photovoltaic (solar electric) systems and education on energy efficiency

- More of these PV systems are planned for all of the islands and to keep them operating, the engineers are now capable of repairing them for optimal power to the grid.

The Path Forward

"The hope is that we will continue to share the knowledge that we all develop in our own nations, so that we can all benefit from the shared knowledge. We'll continue to move forward with the production of cost-effective and environmentally responsible electric production, so that the economies of all these nations have an opportunity to grow."

Michael G. Morris
AEP Chairman, President & CEO
Asia Pacific Partnership, AEP Site Visit 2006

Appendix

Current U.S. State Policymaker Goals

- Ensuring electricity remains affordable, reliable and secure from domestic sources
- Addressing rising electricity demand
- Moderating electricity price increases
- Sustaining the engine of economic growth
- Increasing environmental protection

Policy Support for Technology Deployment

- Keys:
  - New technology deployment, including baseload generation
  - Technology financing policies encouraging investment and reducing costs
  - Policy design that supports technology deployment
    - National cap and trade
    - Reduction targets and timelines that allow commercial technology deployment
    - Carbon credits allocated to emitters
    - Storing CO2 underground
    - Streamlined air quality and siting permitting
    - Funding focused on advanced technology and CCS technology
  - Understand economic consequences of choices

Federal Climate Change Bill Principles

(June 6 letter, 10 Democratic U.S. Senators)

- Contain costs and prevent harm to the U.S. economy
- **Invest aggressively in new technologies and deployment of existing technologies**
- Treat states equitably
- Protect America's working families
- Protect U.S. manufacturing jobs and strengthen international competitiveness
- Fully recognize agriculture and forestry's role
- Clarify federal/state authority
- Provide accountability for consumer dollars

Our Position on Climate Change

- Our policy position on climate change:
  - AEP supports a reasonable, achievable approach to carbon controls in the U.S.
  - We support a federal cap-and-trade program that includes all sectors and greenhouse gases (GHG)
  - We have taken measurable, voluntary actions to reduce GHG emissions
  - We support a well-thought out U.S. mandate to achieve additional, economy-wide reductions
  - We support input-based allocations, not auctions
  - This is a global issue but we believe the U.S. should take the lead in developing an international response
  - We must collaborate with others globally, nationally and locally on a roadmap to address climate change
  - Regulatory or economic barriers must be understood and addressed
  - Recognition for early actions/investments in GHG mitigation
  - Inclusion of adjustment provision if largest emitters in developing world do not take action
  - A price-based safety valve that sets a ceiling on the cost of C02 allowances, thereby limiting the economic effects placed on an individual company or the economy due to a rapid or large increase in the price of emission allowances. Companies with compliance obligations can buy emission allowances from the Federal Government at the safety valve price.

AEP Leadership in Technology: IGCC/USC and IGCC/CCS

NEW ADVANCED GENERATION

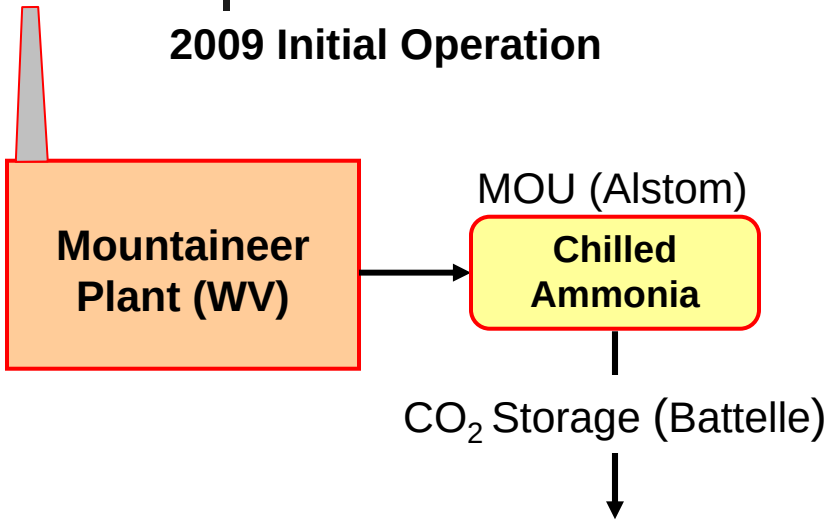
IGCC -- AEP first to announce plans to build two 600+ MW IGCC commercial size facilities in US (OH and WV) by mid next decade. (WV PSC approved; VA disapproved)

USC -- AEP will be first to employ new generation ultra-supercritical (steam temperatures >1100^{o}F) coal plant in U.S. (AR, TX and LA PSC approved)

FutureGen - First fully integrated IGCC with CCS - Near Zero Emissions Hydrogen/ Electric (coal-fueled IGCC with CCS) - DOE, AEP and Alliance members in FutureGen. (DOE reallocated its financial share to CCS projects)

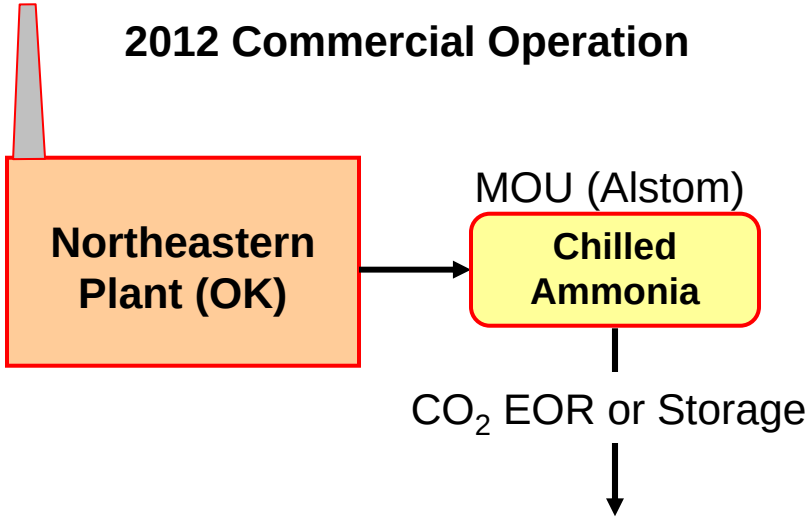
Chilled Ammonia Technology Program

2009 Initial Operation



- 20 MW (electric) equivalent slip stream.
- ~ 100,000 to 165,000 metric tons of CO_2 per year
- In operation 3Q 2009
- Approximate cost $100MM
- Key objectives to evaluate the Alstom chilled ammonia process and the effectiveness of using deep saline reservoirs for permanent CO_2 storage
- 3-5 years of operation

2012 Commercial Operation



- ~ 300 MW_e scale (megawatt electric)
- In operation 2012
- Target of 15 to 20% parasitic load (excluding compression)
- Require NOx Controls and FGD
- CO_2 to be used for Enhanced Oil Recovery (EOR) or storage depending on selected location
- Site will be selected based on geology for sequestration, EOR opportunities and possibility of rate recovery

Boucher Carbon Capture and Storage Early Deployment Act Summary

- Establishes a $1 Billion non-governmental fund annually and entity to accelerate the deployment of carbon capture and storage technologies.
- Authorizes establishment of a Carbon Storage Research Corporation.
- Will be operated as a division or affiliate of the Electric Power Research Institute (EPRI).
- Assess fees on distribution utilities for all fossil fuel-based electricity delivered to retail consumers. The assessment shall be applied to electricity generated from coal, natural gas and oil and will reflect the relative carbon dioxide emission rates of each fuel. The fee translates into a roughly $10-12 total annual increase in residential electricity rates.
- Distributes funds through grants and contracts to private, academic and governmental entities with the purpose of accelerating the commercial availability of carbon dioxide capture and storage technologies.

Chicago Climate Exchange Overview

- An unprecedented voluntary greenhouse gas emission reduction and trading pilot program administered by 100+ companies and organizations
- Total member emissions = About 240 MM metric tons CO_2 equivalent (~ 4% US CO_2 emissions)
- Member commitment to reduce GHG emissions below a "baseline" (average 1998-2001 levels):
  - 1% in 2003
  - 2% in 2004
  - 3% in 2005
  - 4% in 2006
  - 4.25% in 2007*
  - 4.5% in 2008*
  - 5% in 2009*
  - 6% in 2010*

*Extension Period

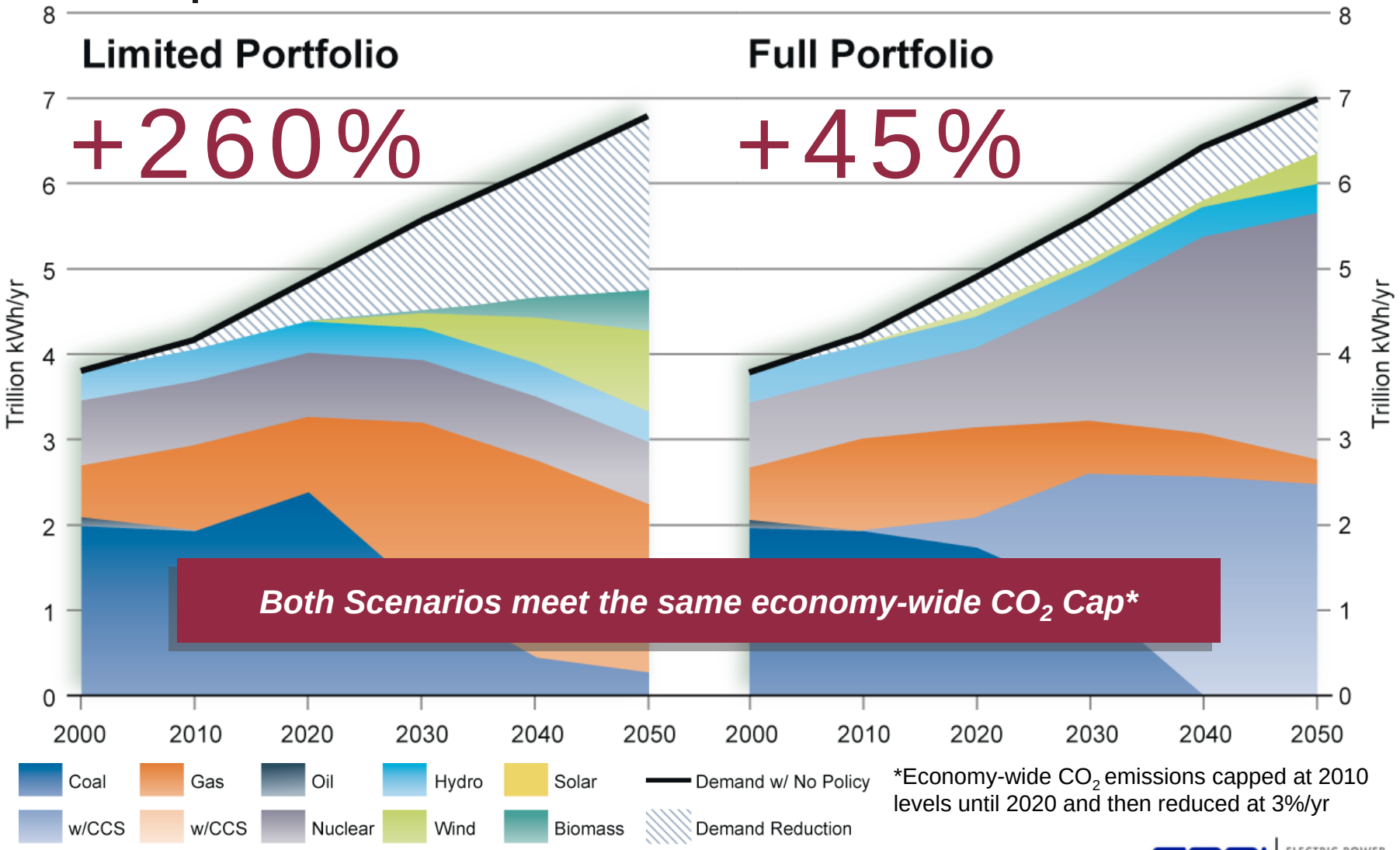
AEP Info:

- Current Baseline = 155 MM metric tons (adjusted for divestitures)
- Reduction or offset of about 46 MM metric tons of CO_2 during 2003-10
- **2003-07: Reduced 43 MM Tons**
- AEP one of 14 founding members and first to commit to extension period.

AEP Objectives in Participating in CCX

- Opportunity to set public policy precedents (e.g. market “trading” approach with all greenhouse gases and all reduction types counted)
- Central part of overall climate change strategy to meet the President's voluntary plan
- Learning opportunity from market & competitors
- Value as socially-responsible investment
- Opportunity to do so at a relatively low cost
- Incorporates greenhouse gas risks in capital and O&M decisions (through CO2 price), promoting cost-effective reductions (examples in past several years):
  - Plant efficiency improvements
  - Retirements/mothballing old gas steam & coal units
  - Nuclear availability improvements
  - Forest management and forestry projects
  - SF-6 leakage reductions
  - Wind plant development and purchases

Increase in Real Electricity Prices… 2000 to 2050



*Economy-wide CO_2 emissions capped at 2010 levels until 2020 and then reduced at 3%/yr