THE ELECTRIC INDUSTRY PERSPECTIVE ON CLIMATE CHANGE AND CARBON SEQUESTRATION

APPALACHIAN COAL AND ELECTRIC UTILITIES INDUSTRIES

Lexington, Kentucky
November 6, 2001

Gary Kaster
Manager, Forestry & Recreation Programs
gkaster@aep.com

Credentials

- Chair of Edison Electric Institute's Utility Forest Carbon Management Program, representing 55 utility companies, and whose goal is to promote forest carbon management as a means of addressing climate change.
- Chairman of the UtiliTree Carbon Company, a non profit corporation established by 41 companies which have invested over $3.2 million dollars in nine domestic and international forest carbon management projects.
- AEP's Technical Advisor for the Noel Kempff Mercado Climate Action Project in Bolivia, and the Guaracacaba Climate Action Project in Brazil.
- Manager of AEP's forest carbon management projects on company lands, which includes the planting of 20 million trees on 23,000 acres of company land.

Overview

- Industry perspective - impact of Kyoto Type Agreements
- Industry forest carbon management projects
- AEP's perspective - impact of Kyoto Type Agreements
- AEP's forest carbon management projects

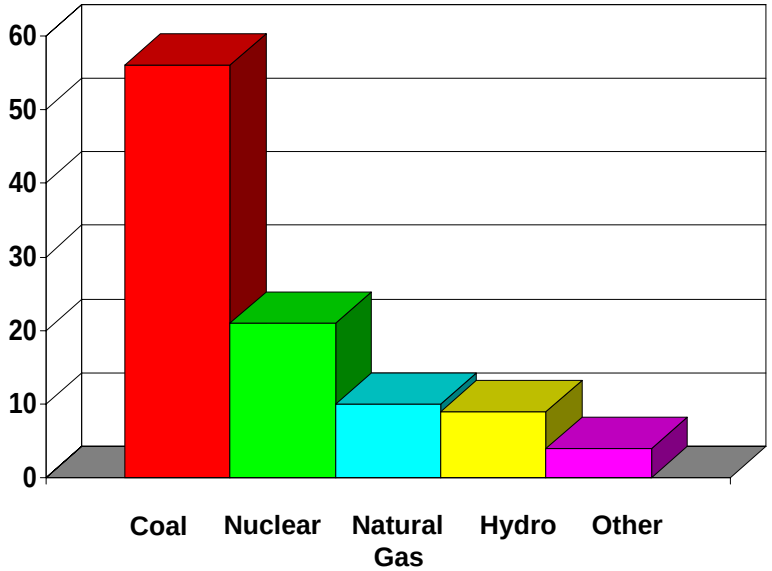
Electricity Fuels Economy

- **Economy relies more than ever on electricity**
- **Electricity use continues to grow with economy**
- **Electricity use in industry can help to increase overall energy efficiency/reduce emissions**
- **Crucial to support diversity of fuel to maintain affordable electricity prices**

Coal Equals Low Cost Electricity

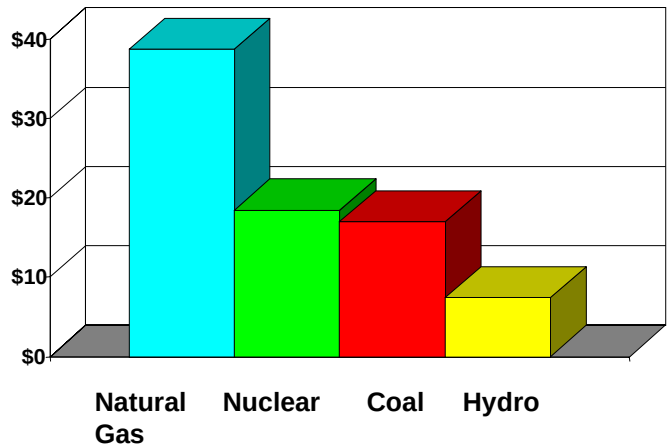
- **Electricity generation by source**

Coal	56%
Nuclear	21%
Natural Gas	10%
Hydro	9%
Other	4%



- **Average electricity production costs***

Natural Gas	$38.73
Nuclear	$18.42
Coal	$16.92
Hydro	$ 7.36

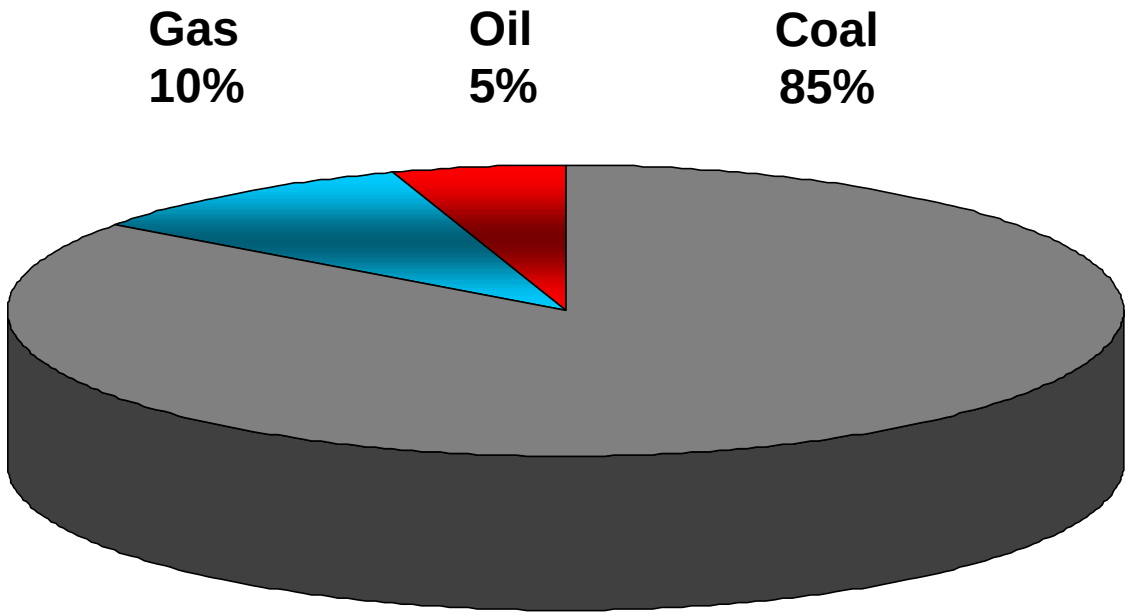


* Includes variable costs and fixed O and M

Source: Resource Data International, January-September 1999, RDI modeled costs
National Mining Association Steam Electric Market Analysis, March 2000

Coal is the Nation's Most Abundant Energy Resource

U.S. Fossil Fuel Resources



Coal: Demonstrated reserve base (measured & indicated)

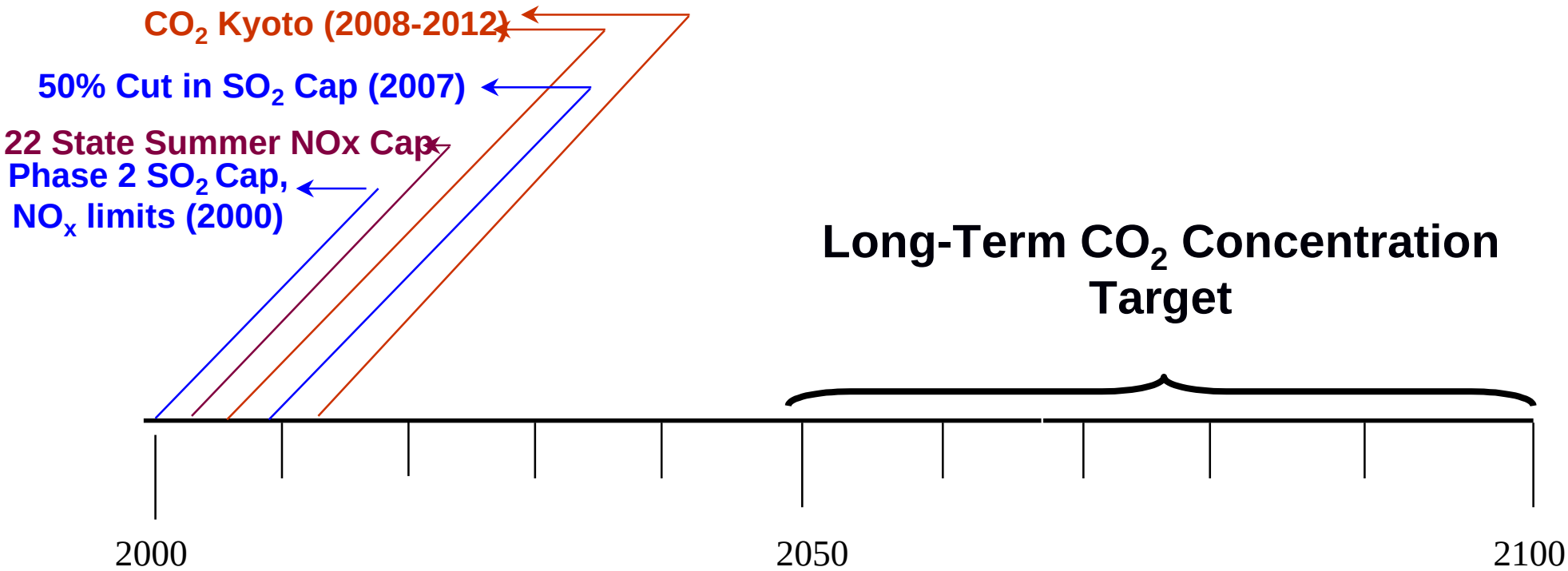
Oil & Gas: National total for undiscovered technically recoverable conventional oil & gas, growth in reserves of known fields, technically recoverable resources in continuous-type (unconventional) accumulations & measured reserves

Source: USGS, 1995 National Assessment of United States Oil & Gas Resources, EIA, U.S. Coal Reserves, 1997 Update

The Current Policy Direction

NO_X (2000*, 2003*)
SO_2 (2000*, 2007)
CO_2 Kyoto (2008-2012)

* Included in “Business as Usual”



Coal-Fired Electricity Generation at Risk

- **Currently, industry faces numerous regulations, implemented in a piecemeal fashion**
- **Collectively, environmental regulations are setting energy policy, limiting fuel choices**
- **This is occurring at a time when other fuel choices are also at risk**

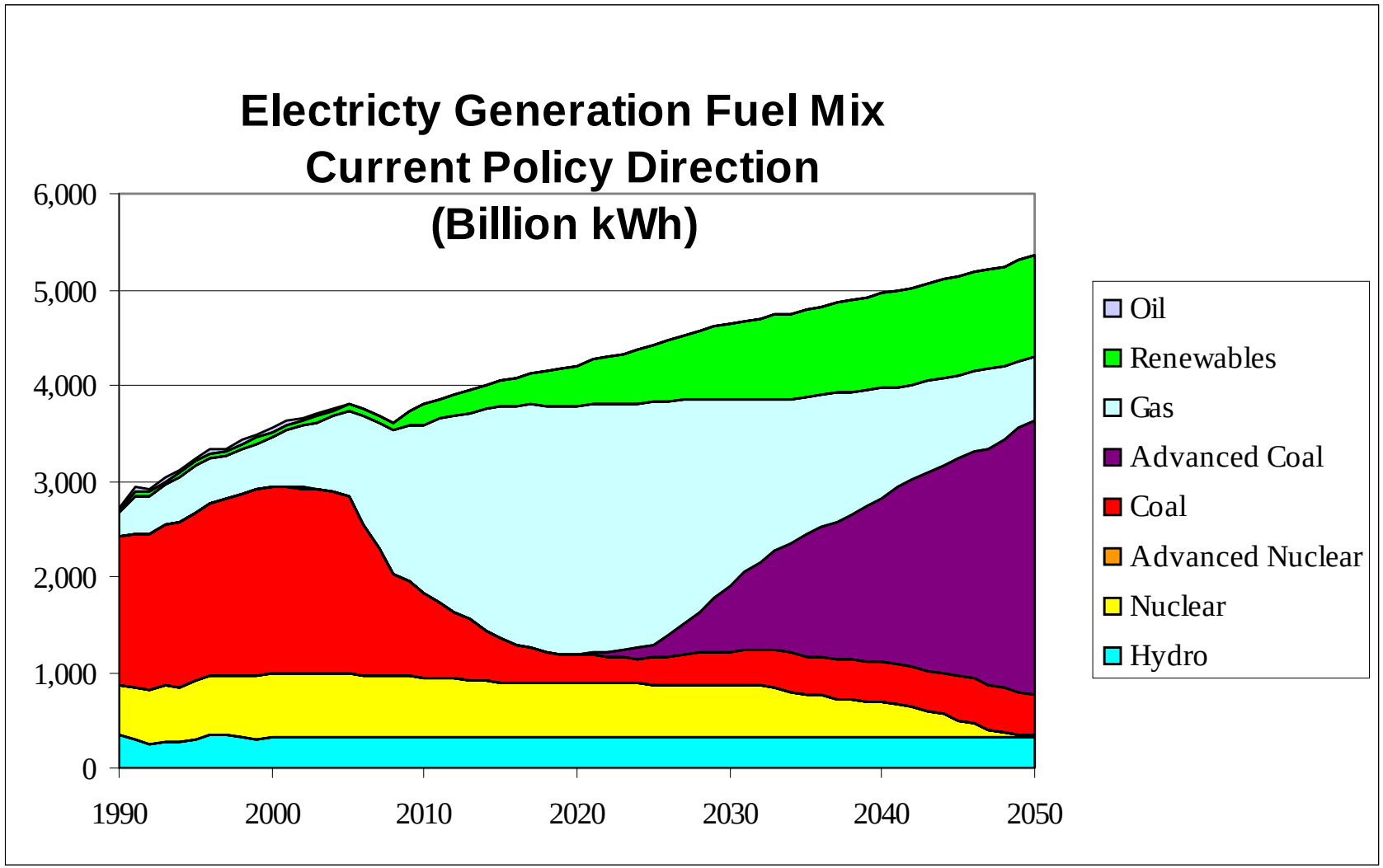
Short Term Effects

EFFECTS ON U.S. ECONOMY

- Electricity price up 43% by 2020
- Consumer prices averaging about 2% higher over the period 2005-2020
- Potential GDP down 1.9% in 2010
- Coal producing regions would be most affected

Long Term Effects

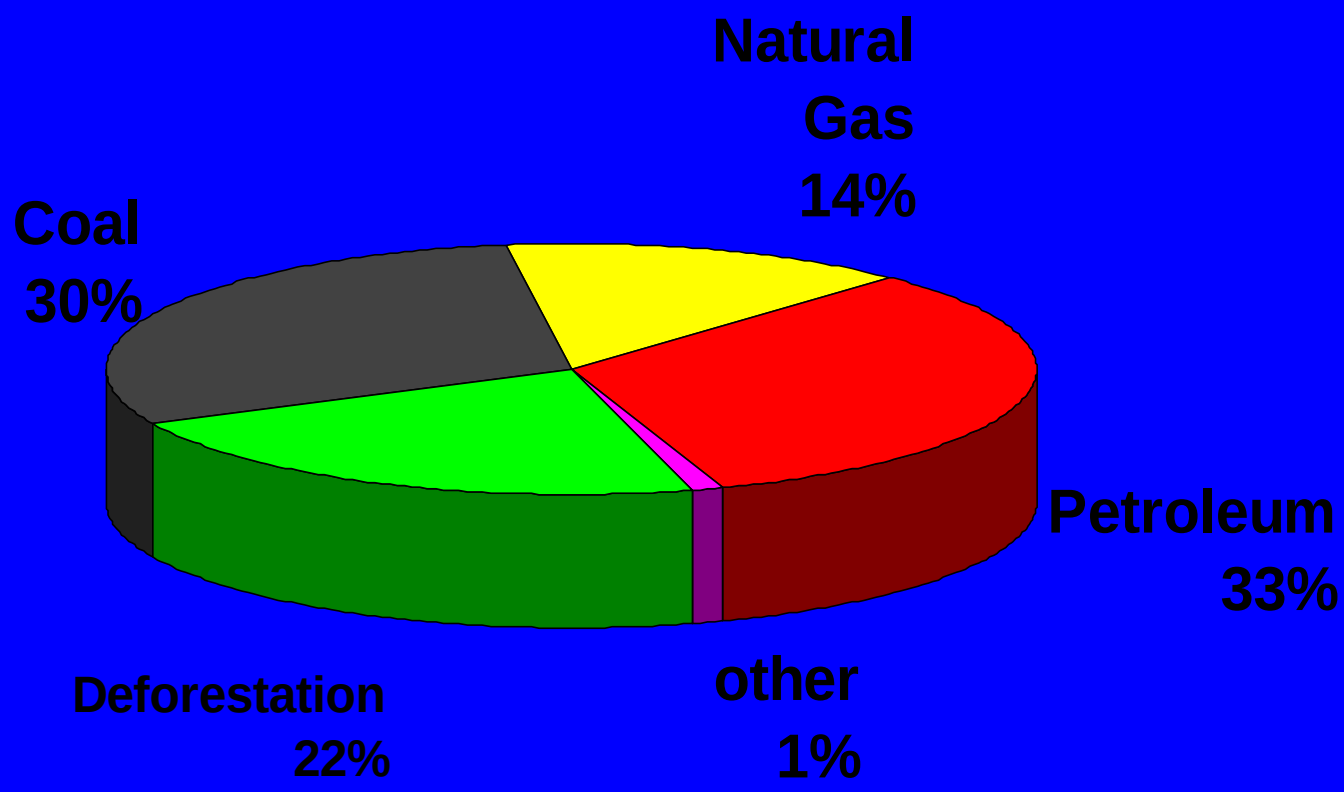
Gas use would decline by 2030, to be replaced by advanced coal-fired generation



Long Term Effects

- **Swing toward, then away from gas use could be costly, disruptive**
- **Current coal generating plants would be retired (175 GW by 2020)**
- **Coal supply infrastructure greatly diminished, reviving it would be costly**
- **Gas generation plants underutilized or retired prematurely after 2025**

Annual Global CO_2 Emissions Caused by Humans



Source: IPCC, WRI, 1996

Recent Climate Change Policy Actions Addressing Forestry as an Option

- **UN FRAMEWORK CONVENTION ON CLIMATE CHANGE RIO DE JANEIRO 1992**
  - Voluntarily Reduce Year 2000 Emissions to 1990 Levels
- **CLINTON ADMINISTRATION CLIMATE CHANGE ACTION PLAN**
  - Administration's response to Rio de Janeiro Treaty
  - Return US GHG Emissions to 1990 levels by 2000
- **ENERGY POLICY ACT OF 1992**
  - Implementation of Climate Action Plan and Deregulation
- **KYOTO PROTOCOL - 1997**
  - 7% below 1990 levels - Many unresolved issues
- **COP 6 - The Hague**
  - First unsuccessful Conference - Flawed Process & Overly Ambitious Agenda
- **COP 6 1/2 - Bonn**
  - 178 countries accept protocol - LU&LUCF & agriculture in BUT …
  - what about United States ?

AEP

Global Climate Change

Where's this leave us?

- **Immutable Fact: Issue Will Not Go Away**
- **Target is Fossil Fuel Use, Especially Coal**
- **Pressure to Reduce CO2 Emissions Will Be Relentless**
- **Uncertainty over unresolved issues and the ability to gain credit for carbon sequestration projects will impact private sector willingness to invest**
- **AEP and other utilities waiting for Bush Plan - (to be unveiled possibly at next Earth Summit) - and will support it**

What Utilities Support

Voluntary, Cost-Effective Programs Like The Climate Challenge

A VOLUNTARY INITIATIVE WHEREBY ELECTRIC UTILITIES AND THE DEPARTMENT OF ENERGY ARE EXPLORING AND PROMOTING ACTIVITIES TO REDUCE, LIMIT, AVOID OR SEQUESTER GREENHOUSE GASES.

A. More than 640 utilities pledged to reduce, avoid or sequester more than 170 million metric tons of C02 - Equivalent Emissions in 2000. Includes 5 IOU Industry-Wide Initiatives and 4 Public Power Initiatives

B. Companies with over 70 percent of industry electricity generation and C02 emissions are committed.

C. 1605(b) reporting show dominance by utility industry in voluntary GHG reduction activities - e.g., 96 of 108 reporters in 1995.

D. Current levels of climate challenge reductions will not reduce utility C02 30 percent below 2010 levels, but:

What Utilities Support

1. **Commitments Will Reduce Carbon Emissions by 50 mmt in 2000.**
2. **Levels are substantial given that there is no certainty of any credit for any of these voluntary actions to date or in the future.**
3. **Climate Challenge has led to the issue being addressed in all corporate decision making.**

Policies Must Be Comprehensive: All Sources, All Gases, Sink Enhancements, Adaptation

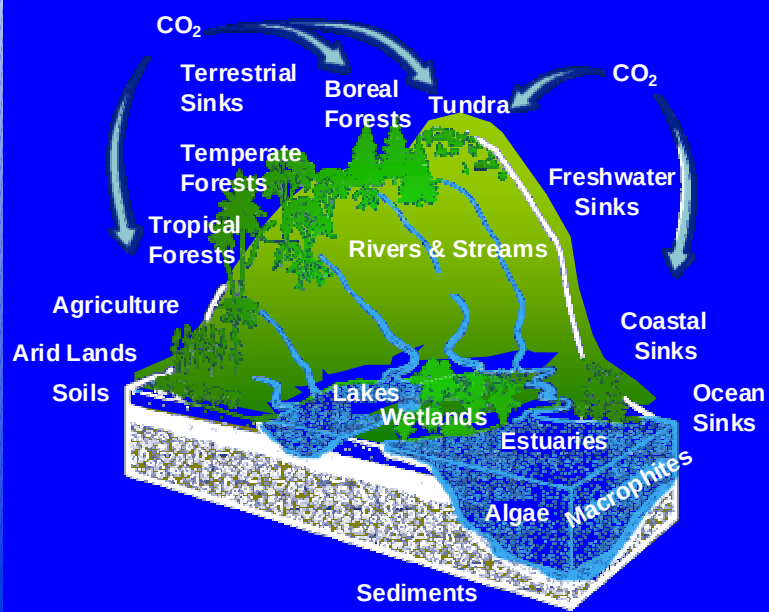
- **Fuel switching**
  - **Nuclear**
  - **Renewables**
  - **Natural Gas**
  - **Advanced Clean Coal**

What Utilities Support

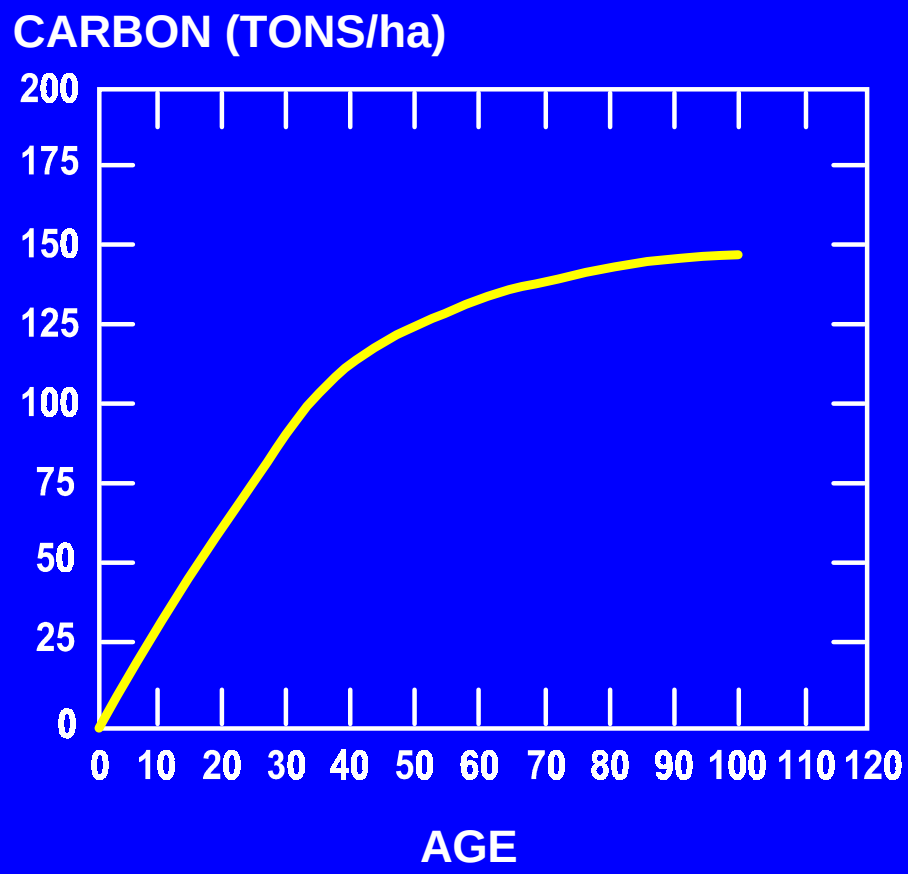
Electric Utility Industry Supports All Options For CO_2 Emission Reductions

- **Sequestration Technologies - both biotic and capture**
- **Joint Implementation: Utility Industry is Leader in both energy sector and the forestry/land use change sector**
- **Emissions Trading**
- **Conservation**

THE CARBON CYCLE



CARBON STORAGE BY TREES



SOURCE: WATER, AIR, SOIL POLLUTION, VOLUME 64: 181-195, 1992

AEP

Managing CO_2 via Forestry and Land Use

- Forest preservation/management projects maintain carbon by reducing deforestation and harvest impacts.
- Forest management to enhance existing carbon sinks.
- Creation of new carbon sinks by planting on pasture, agricultural land or degraded forest sites.
- Storing carbon in wood products.
- Biomass can be used as a substitute for energy from fossil fuels.
- Carbon can be sequestered in halophytes, organic matter in soil, in oceanic seaweed, or in microalgae in the ocean.
- Improved agricultural practices - conservation tillage.
- Energy conservation through shading buildings and homes.

AEP

Why Utilities Support Forest Carbon Management Projects

- There is a large technical potential for forest carbon management. A single project can offset millions of tons of carbon emissions.
- Forestry options to manage carbon are cost-effective in many cases - e.g., costing only a few dollars per ton of CO_2 offset. Forest carbon management opportunities can be among the most economical ways to address CO_2 emissions.
- Forestry carbon management adds flexibility, thus expanding the electric utility repertoire of options.
- Forestry options to manage CO_2 are well received by the public and environmental groups.
- Forestry efforts have positive secondary environmental - e.g., restoration of degraded lands and protection of biodiversity -- and social benefits.
- International projects help to demonstrate the effectiveness of joint implementation activities with other nations, which is a critical tool for economically addressing GHG issues.

AEP

UTILITREE CARBON COMPANY

CO_2

WHAT THE INDUSTRY HAS DONE COLLECTIVELY

Formed a non-profit corporation in 1995 by 41 utilities to sponsor forestry projects to manage CO_2. Over $3.2 million is being invested in a pool of projects representing a diverse mix of rural tree planting, forest preservation, forest management and research efforts at both domestic and international sites. Over 3.0 million tons of CO_2 benefit will result from the projects over their lifetime. Participants will share on a *pro rata* basis.

UTILITREE CARBON COMPANY

Rio Bravo Climate Action Project – Belize

- UtiliTree plus 4 utilities, (WEPCo, Pacificorp, Cinergy, Detroit Edison) Nature Conservancy & Program for Belize
- Protection of 14,400 acres of threatened rain forest
- Sustainable management on 120,000 acres
- First fully funded USIJI Project
- Maintain critical wildlife & bird habitat plus major Mayan archeological sites
- 5 million tons CO_2 benefit (UtiliTree = 1 million)

UTILITREE CARBON COMPANY

CO_2

Protection of 14,400 Acres Of Tropical Rainforest From Agricultural Deforestation

UTILITREE CARBON COMPANY

CO_2

UTILITREE CARBON COMPANY

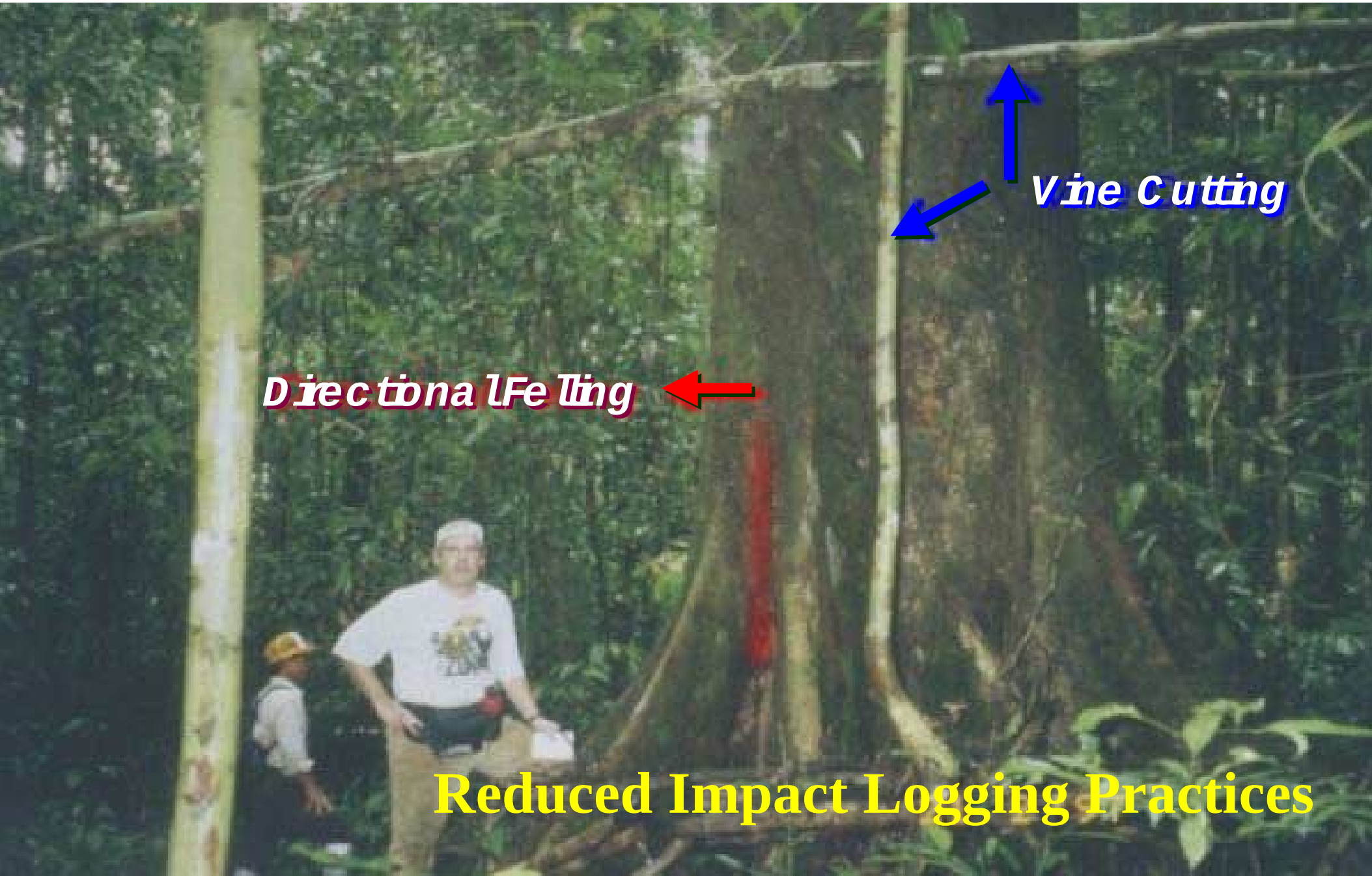
Reduced Impact Logging Project - Malaysia

- PG & E National Energy Group, Rainforest Alliance and SABAH Foundation
- Reduced harvesting damage on 2,000 acres
- Habitat and watershed protection
- 380,000 tons CO_2 benefit over 40 year project term

UTILITREE CARBON COMPANY

CO_2

UTILITREE CARBON COMPANY



Reduced Impact Logging Practices

UTILITREE CARBON COMPANY

CO_2

Minimizes Damage to Residual Stand

UTILITREE CARBON COMPANY

CO2

Western Oregon Reforestation Project

- Trexler and Associates / Oregon Woods Inc.
- Planting on 310 acres unforested private/public land
- Douglas Fir and ponderosa pine
- 200,000 tons CO_2 benefit over 65 year project term

UTILITREE CARBON COMPANY

CO2

Several NWR Reforestation Projects - La, Miss, Arkansas

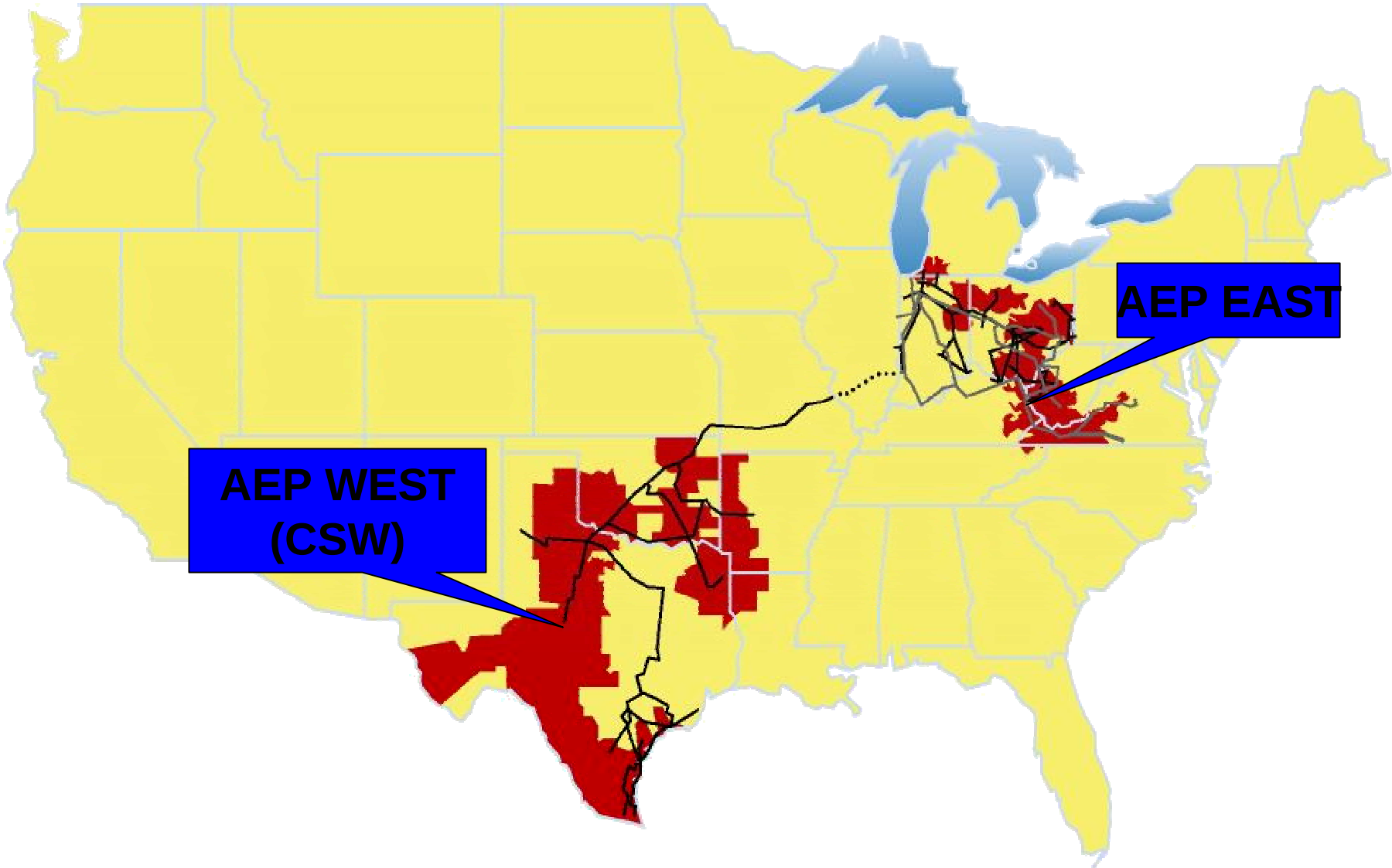
- 2,980 acres bottomland hardwood restoration on marginal farmland
- US Fish and Wildlife Service and La. Tech Univ.
- Waterfowl, neotropical bird and bear habitat
- 1,690,000 tons CO2 benefit over 70 year project term

UTILITREE CARBON COMPANY CO_2

St. Francis River Reforestation Project - Arkansas

- Two private landowners; West and McClendon
- Area to be planted totals 351 acres
- Species to be planted; bald cypress, tupelo, overcup oak, nuttall oak, willow oak , green ash and sugarberry
- 164 acres will be converted into natural wetland and flooded for waterfowl
- 150,930 tons CO_2 over 70 year project term

AEP's Service Territory



AEP'S Profile

- Company Serves 4.8 Million Customers in 11 States (197,500 square miles); Over 4 million customers outside the U.S.
- $35.7 Billion in Assets; $12.5 Billion in Operating Revenues (1999)
- 38,000 MW of Generating Capacity (domestic)
- Operates more than 186,000 miles of distribution lines and 38,000 miles of transmission lines
- Net sales of 306 Billion Kilowatt Hours in 1999
- 67% Coal-fired (78 Million Tons Burned in 1999), 23% Gas, 7% Nuclear; 3% Hydro & Other Renewables

AEP's Compliance with Kyoto Protocol
(7% Reduction Below 1990 Levels in 2008-2012)

- **Compliance with Kyoto Protocol, in the Absence of JI/CDM/Trading, Would Force Premature Retirement of 11 GW, $1.2 Billion Write-off**
- **Generation Replaced with 10 GW of Natural Gas Combined Cycle at Cost of $5.3 Billion**
- **Generation Cost - 25% - 45% Increase Depending On Natural Gas Price Trends**
- **Coal Burn Reduced 30 million Tons/year Replaced with 485 billion Cubic Feet of Natural Gas**

AEP Commitments

- Contribute to Four EEI Industry Initiatives
  Major investor in UtiliTree Carbon Company
- Undertake a Broad Portfolio of Supply-Side and Demand-Side Efficiency Improvements, Tree Planting and Forest Carbon Management, and Other Actions
- Initially Projected to Avoid 10 Million Tons of CO_2 Emissions in 2000
- Incremental to 18.5 Million Tons Avoided by System Efficiency, Land Management Practices

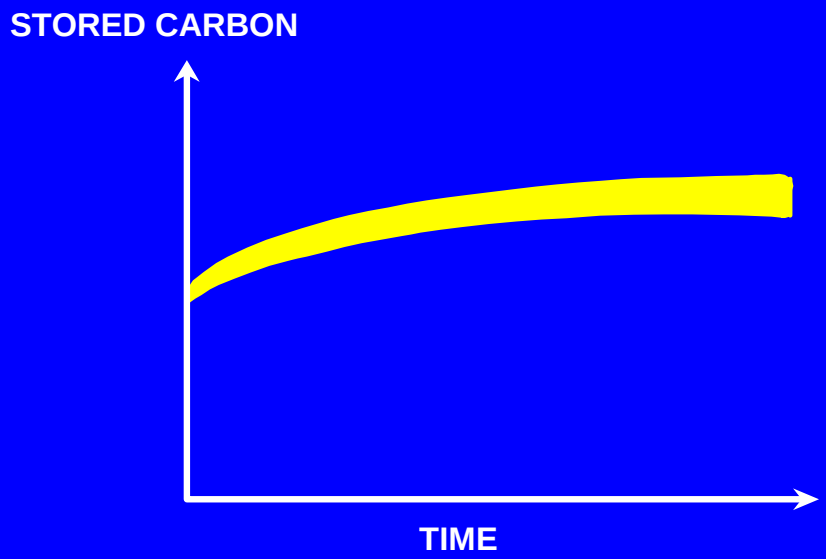
AEP's Land Use Change and Forest Carbon Sequestration Projects

- Invest in UtiliTree Carbon Company Projects
- Enhanced Forest Management
- Climate Challenge Tree Planting Projects
  - Total Trees Planted To Date - 56,145,022
  - Number of Species Planted to Date - 64
- Noel Kempff Climate Action Project - Bolivia
- Guaraquecaba Climate Action Project - Brazil
- Catahoula Lake Reforestation Project- Louisiana

Enhanced Forest Management

Increase Managed Forest Acreage

- 200,000 Total forest acres
- 140,000 acres under management
- 60,000 new acres placed under management - Completed



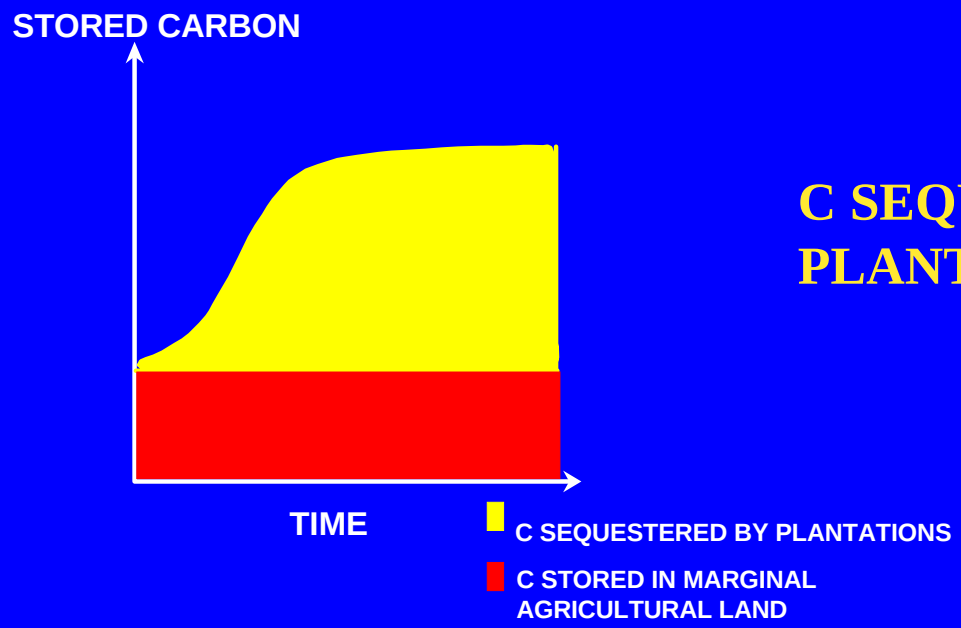
C SEQUESTRATION BY ACTIVE FOREST MANAGEMENT

Source: DOE Forestry Sector Options, EPAct 1992, Section 1605 (b), December 1993

Climate Challenge Tree Planting Projects 1996 - 2005

Plant 20,660,000 trees on 23,200 acres of company land

- 10,200 acres of marginal agricultural land
- 12,900 acres reclaimed grassland
- Total CO2 over project life = 4,831,000 tons @ $.99/ton



C SEQUESTRATIONS BY PLANTATIONS

Source: DOE Forestry Sector Options, EPAct 1992, Section 1605 (b), December 1993

Marginal Agricultural Land

Marginal Agricultural Land
Bottomland Hardwoods

Reclaimed Grassland Plantation

Noel Kempff National Park - Bolivia

- Protection from logging degradation on 1.6 million acres
- Protection from deforestation from agricultural conversion
- Protection of biodiversity habitat and threatened species
- 5 - 7 million metric tons carbon over 30 years
- Partners - American Electric Power, Nature Conservancy, BP Amoco
- $9 million invested by partners

Noel Kempff Climate Action Project

Noel Kempff Climate Action Project

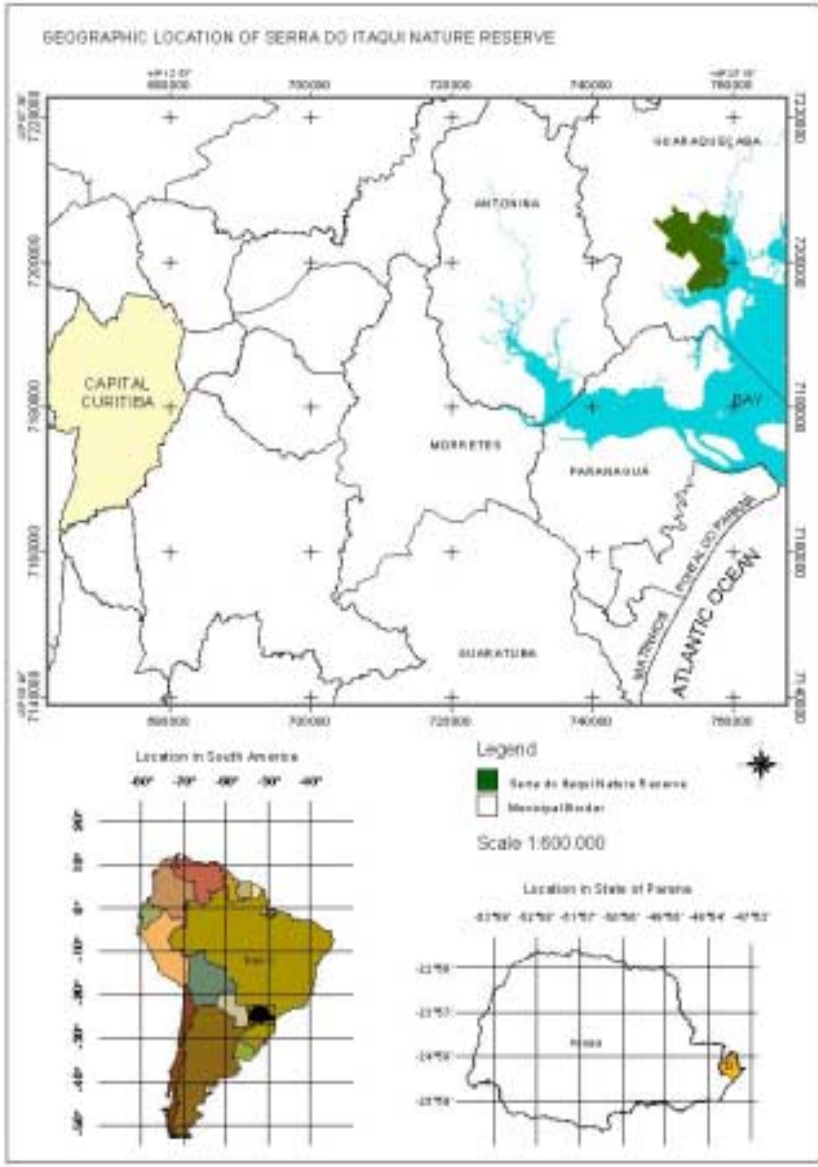
Noel Kempff Climate Action Project

Guaraquecaba Climate Action Project

LOCATION - Atlantic Forest - Guaraquecaba, Brazil

PARTNERS - The Nature Conservancy (TNC), and Society for Wildlife Research (SPVS)

PROJECT CONCEPT - Protection and reforestation through purchase of water buffalo ranches - 1million tons - 40 Years



Catahoula Lake Reforestation Project

- 18,115 acres added to the Catahoula NWR in Louisiana
- 10,000 acres marginal agricultural land planted to bottomland hardwoods
- 5,000,000 tons CO_2 benefit over 70 year project life

OPPORTUNITIES FOR APPALACHIAN REGION

OPPORTUNITIES FOR APPALACHIAN REGION

OPPORTUNITIES FOR APPALACHIAN REGION

OPPORTUNITIES FOR APPALACHIAN REGION

OPPORTUNITIES FOR APPALACHIAN REGION

OPPORTUNITIES FOR APPALACHIAN REGION

OPPORTUNITIES FOR APPALACHIAN REGION

OPPORTUNITIES FOR APPALACHIAN REGION

OPPORTUNITIES FOR APPALACHIAN REGION

OPPORTUNITIES FOR APPALACHIAN REGION

TAKE HOME MESSAGES

- Reforestation project crying out to be done
- Avoid the disconnect - this is a win - win opportunity for coal operators, for utilities, and for the environment