



**Energy-Environment Policy
Integration and Coordination
Study**

Congressional Briefings

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EPRI Environment Sector

The E-EPIC Study

- Study of effects of potential air emission reduction requirements
- Response to concerns that these may
 - be insufficiently coordinated
 - lead to unproductive investments
 - effectively dictate future U.S. energy policy
- Study sponsored by group of EPRI members and peer reviewed, but responsibility for results is EPRI's

Key Findings

Current Policy Direction could lead to

- Large swings in fuels used for electricity
- Unsustainable rate of natural gas use
- Unproductive use of electric generating assets and U.S. energy infrastructure

Root cause of these effects:

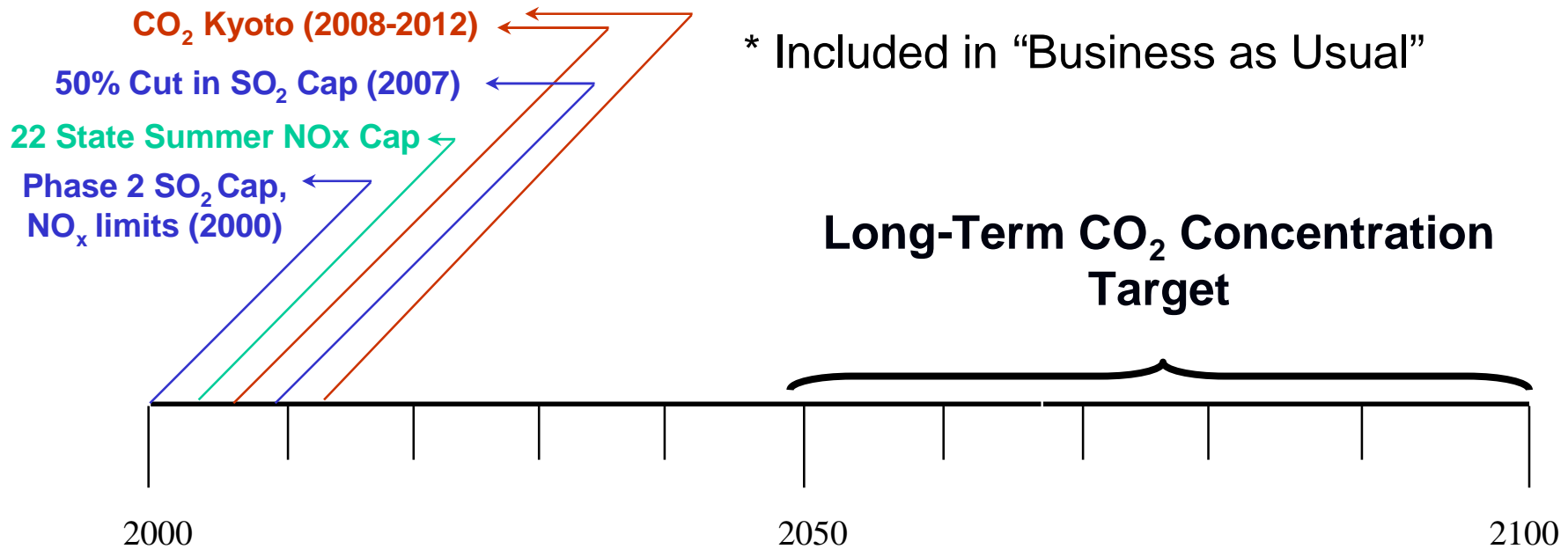
The timing of CO₂ reductions is not aligned with the availability of advanced technologies

E-EPIC Study Methodology

- Used DOE Energy Information Administration's National Energy Modeling System (NEMS)
- EPRI model incorporating NEMS Electricity Market Module extended analysis period from 2020 to 2050
- Additional analyses as necessary (e.g., natural gas infrastructure issues)

The Current Policy Direction

- NO_x (2000*, 2003*)
- SO₂ (2000*, 2007)
- CO₂ Kyoto (2008-2012)



CO2 Reductions Under Current Policy Direction

- 1997 Kyoto Protocol provides basis for U.S. CO₂ reductions under CPD
 - 7% less than 1990 emissions by 2008-12
- Actual reductions depend on credits from
 - Domestic carbon sinks
 - International emission trading
- We assumed a case in mid-range of EIA Kyoto cases (9% above 1990 levels)

Short Term Effects

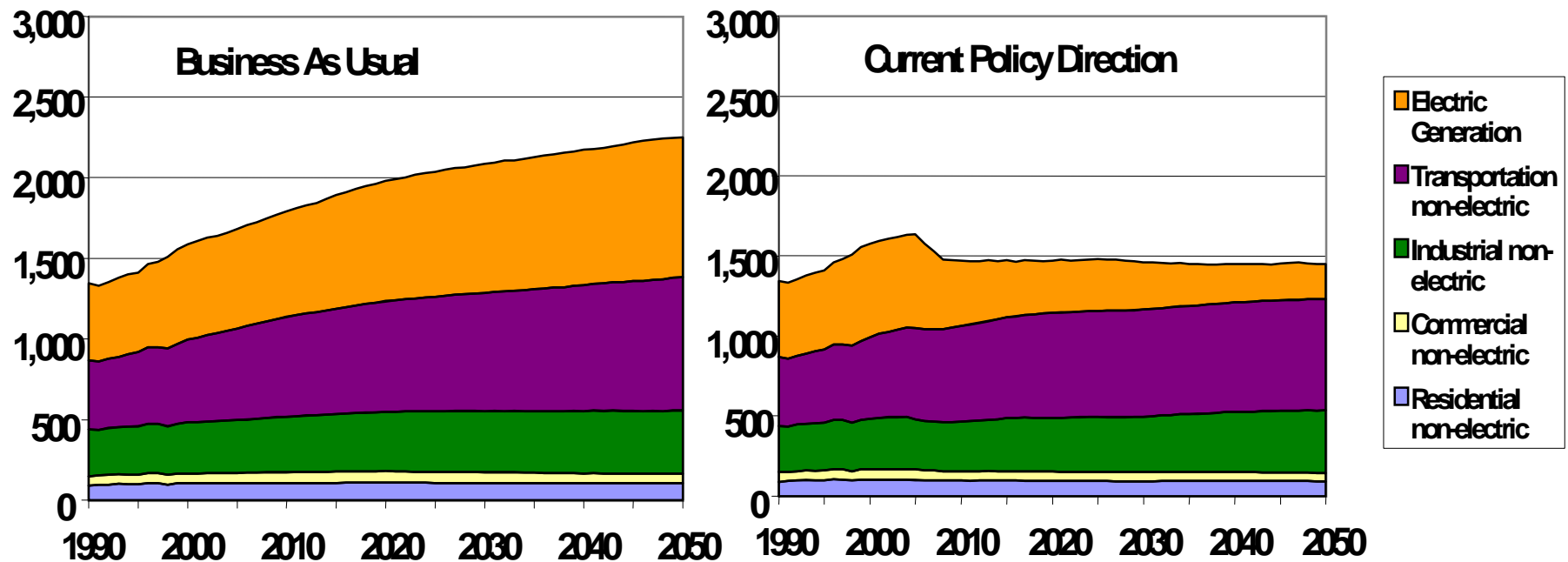
Effects on U.S. economy

- Electricity price up 50% 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

Short Term Effects

Electric generation would make most CO₂ reductions

U.S. Carbon Emissions by Sector (million metric tonnes per year)

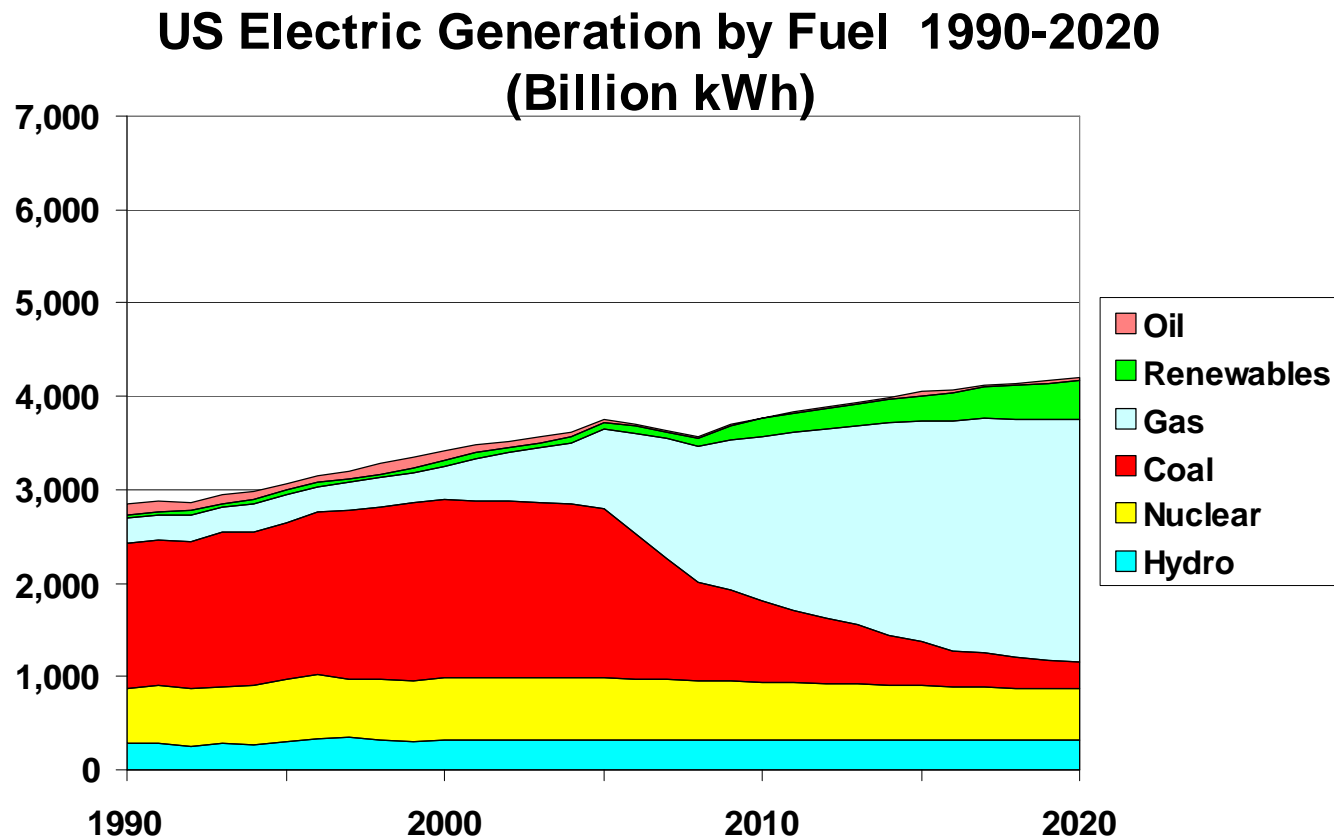


Short Term Effects

- To make these reductions
 - Natural gas generation would need to increase from 10% to 60% of total generation by 2020
 - 500 GW of natural gas-fired generating capacity would be built at a cost of \$160 billion by 2020
 - Coal generation would decrease from 56% to 10% of U.S. total generation by 2020
 - Non-hydro renewables generation would increase from 3% to 11% of total generation by 2020

Short Term Effects

Shift from coal to gas generation by 2020



Short Term Effects

This increase in natural gas use would be unprecedented and possibly infeasible to achieve the required reductions

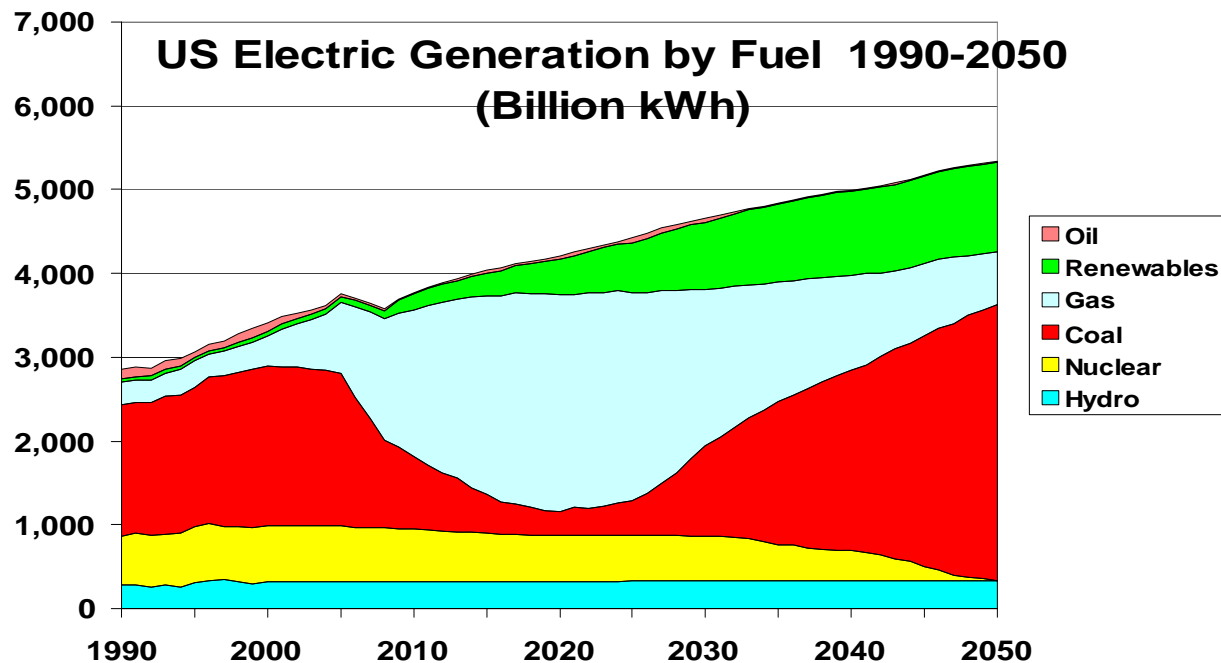
- Well completions
- Well productivity
- Canadian imports increase
- Gas transportation system expansion
- Siting and permitting of new generating plants

Short Term Effects

- NO_x emission control investments would be stranded by CO₂ requirements
 - 140 GW or more generating capacity (>90% of it coal) retrofitted during 2000-2012 for NO_x reductions in Eastern U.S.
 - By 2020, 85% of this generating capacity would be retired or under-utilized, rendering NO_x controls unproductive
 - Contributes to inflation increase

Long Term Effects

Natural gas use will decline by 2030, to be replaced by coal in these projections



Long Term Effects

Swing toward, then away from natural 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 under-utilized or retired prematurely after 2025

Long Term Effects

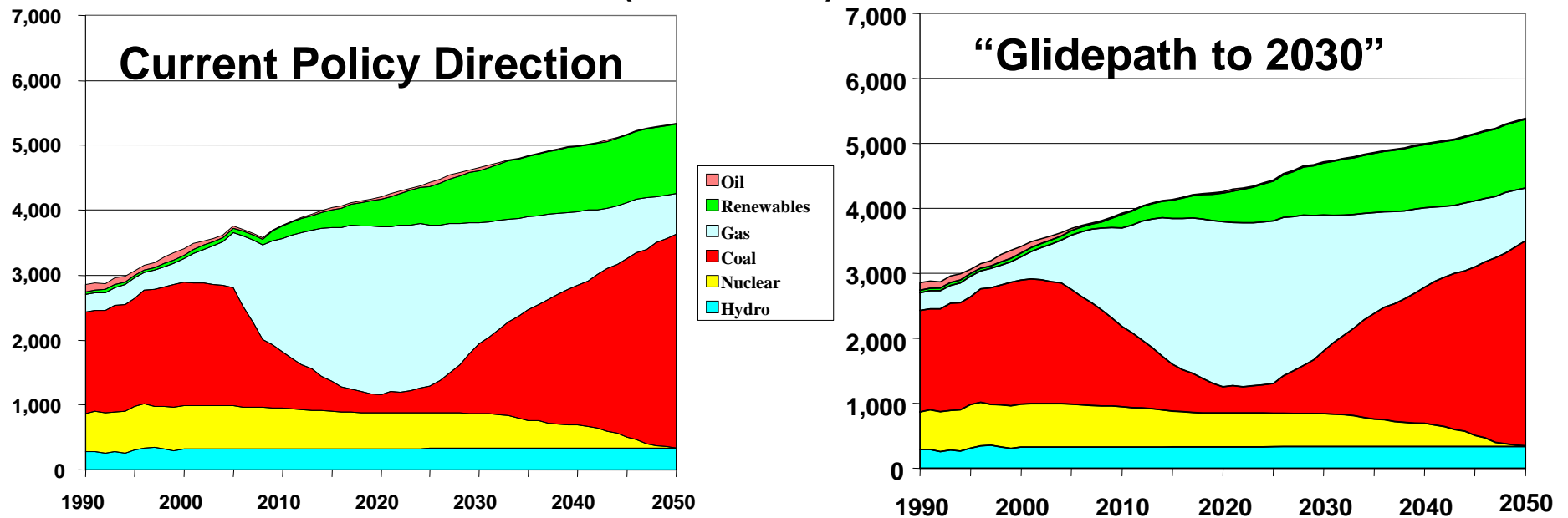
These effects are due to a gap between technology advances, carbon reductions

- New low-emission generation technologies will not be competitive when carbon reductions are initially required
- Natural gas generation is ready now, but cannot be sustained at necessary levels for the very long term

Alternative Policy Considered

Short term economic effects lessened, but long term problems are not relieved

US Electric Generation by Fuel 1990-2050
(Billion kWh)

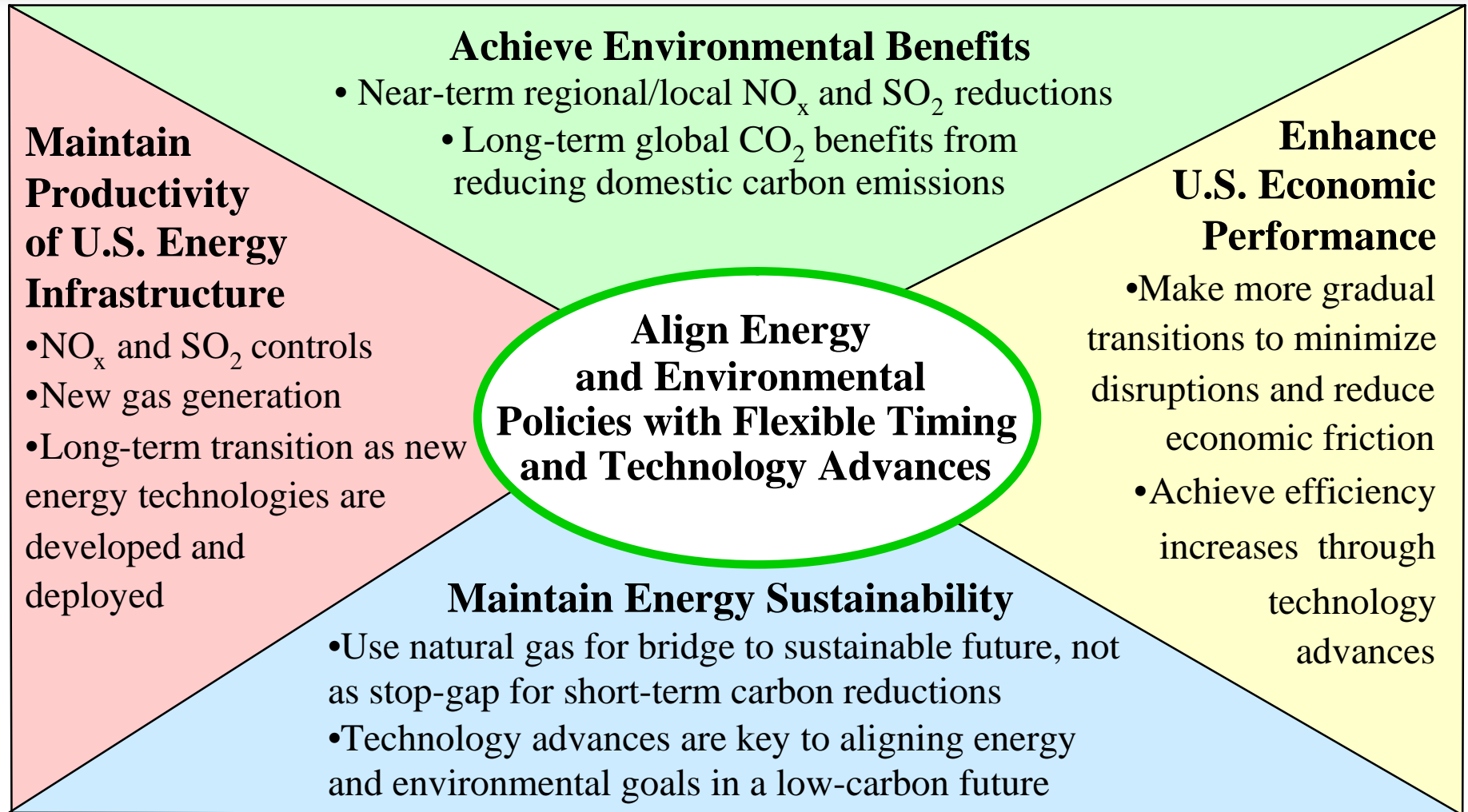


Related EPRI Programs

Electricity Technology Roadmap

- Collaborative exploration of opportunities for electricity-based innovations through 2050
- Evaluates ways to resolve “ The Energy/Carbon Conflict”
- Identifies needs for technological advances, R&D resources

E-EPIC Policy Insights



E-EPIC Conclusions

- Need to coordinate emission reductions with accelerated development of advanced, low-emitting technologies
- Analytic process to evaluate the ability of alternative policies to achieve this should be undertaken before policy decisions are finalized
- E-EPIC is a step in that direction

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