



Role of Coal and Nuclear Power in Our Future

May 6, 2009

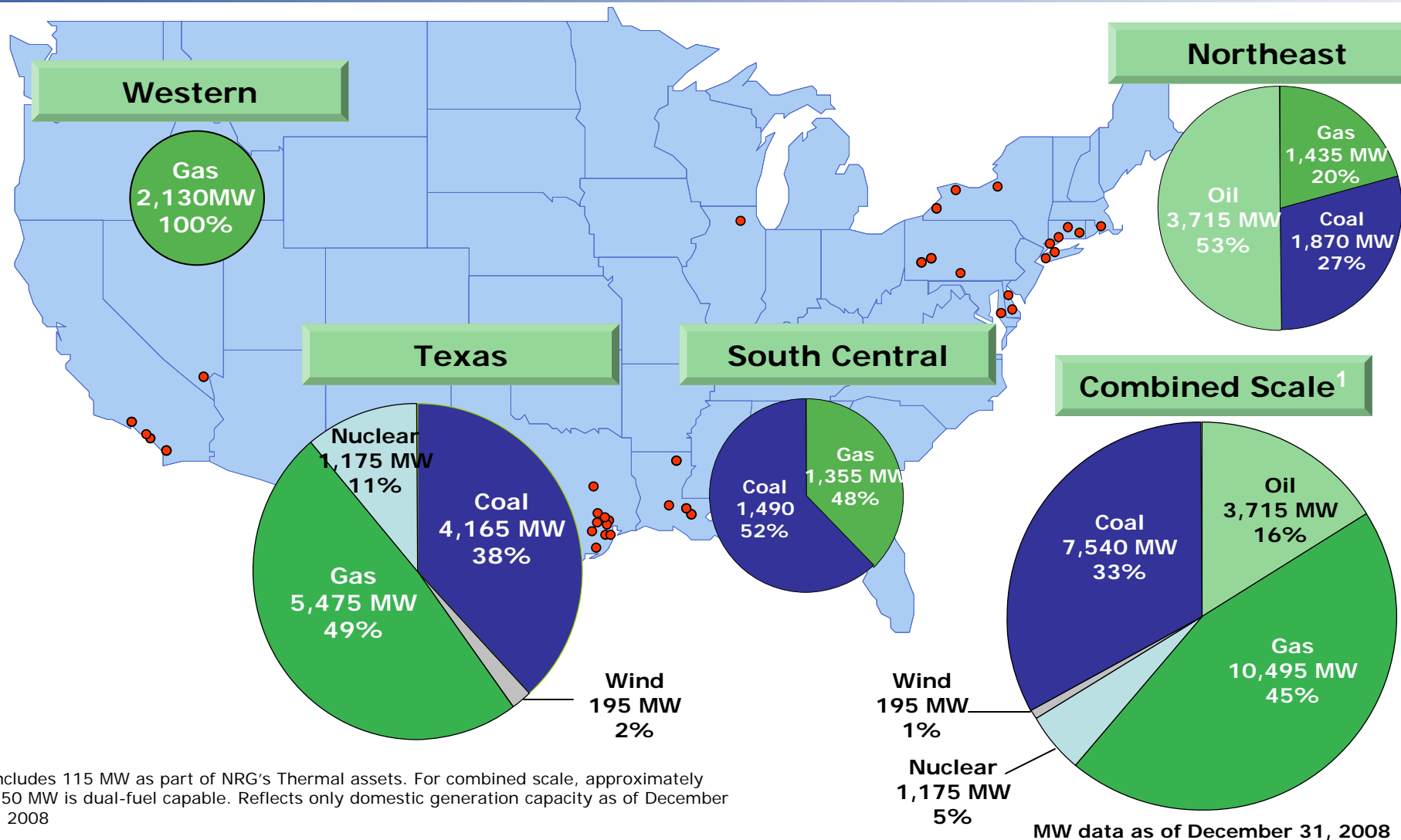
David Neal



Agenda

1. NRG Introduction
2. Power Industry is Central to the Solution of Reducing Greenhouse Gas Emissions
3. U.S. Power Industry Projections to 2030
4. Clean Coal – Gasification / Carbon Capture / Sequestration
5. Nuclear Power
6. Conclusion

NRG: Portfolio with Scale and Diversity



Asset scale and diversity of fuel and location provide value creation opportunities

NRG's Low/No Carbon Lineup

Committed to Development of New Generation Facilities



PADOMA WIND POWER

- NRG wind team – Padoma Wind Power – focused on projects across the nation.
- Approximately 270 MW of wind recently operational in west Texas.

NUCLEAR

- Nuclear partnership with Toshiba formed to bring proven advanced nuclear to America
- First effort is at South Texas Project for two nuclear generating plants capable of providing enough carbon free power for 2 million homes.

PLASMA GASIFICATION Biomass co-firing

- Plasma torches break down solid fuel into its molecular structures to form synthetic gas; similar emissions profile to IGCC.
- Can be used on smaller plants that might not otherwise be retrofitted.

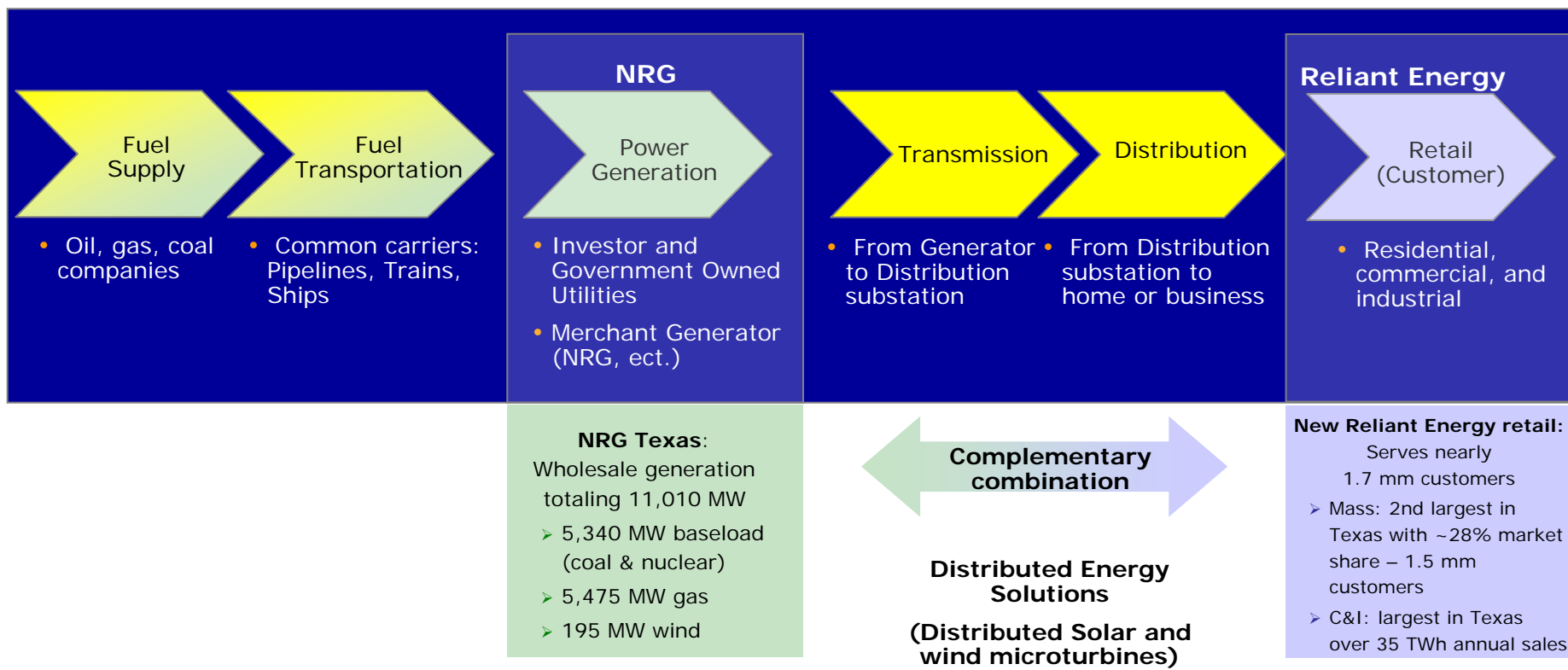
OTHER ALTERNATIVES

- Solar capability (eSolar)
- Continuing to develop IGCC
- Partnership to develop post-combustion carbon capture technology

New Reliant Energy retail – A Strategic Combination

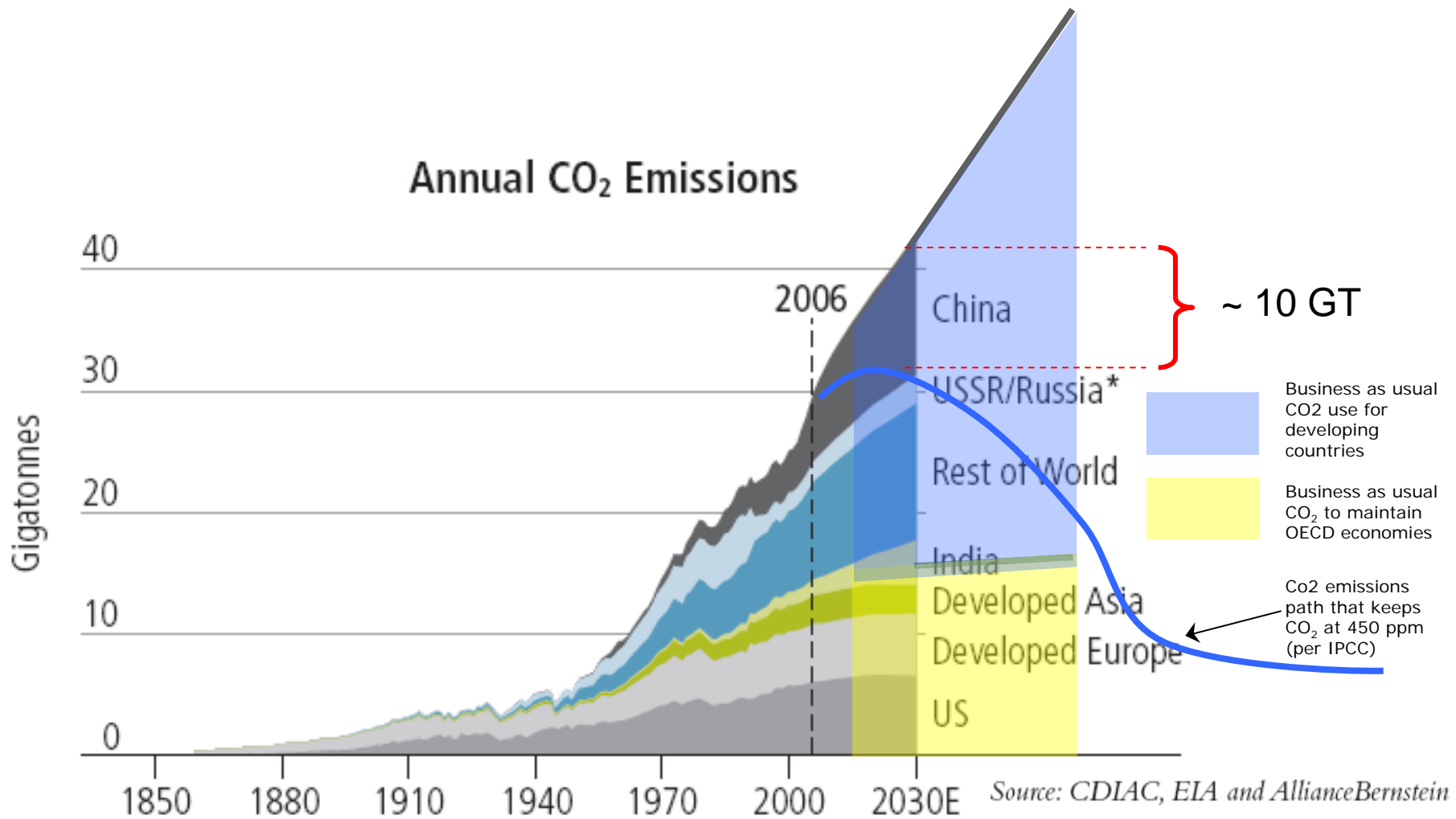


- ✓ Complements NRG's merchant generation position with a leading retail franchise business with an **enduring brand** name and outstanding customer operations
- ✓ Optimizes business model through matching of strengths of each business profile, including **NRG's risk management and commercial core competencies**
- ✓ Increases **collateral-efficient** contracting options for NRG's Texas generation assets



Value-enhancing upstream and downstream acquisition opportunities exist, which also enhance our positions in our core markets

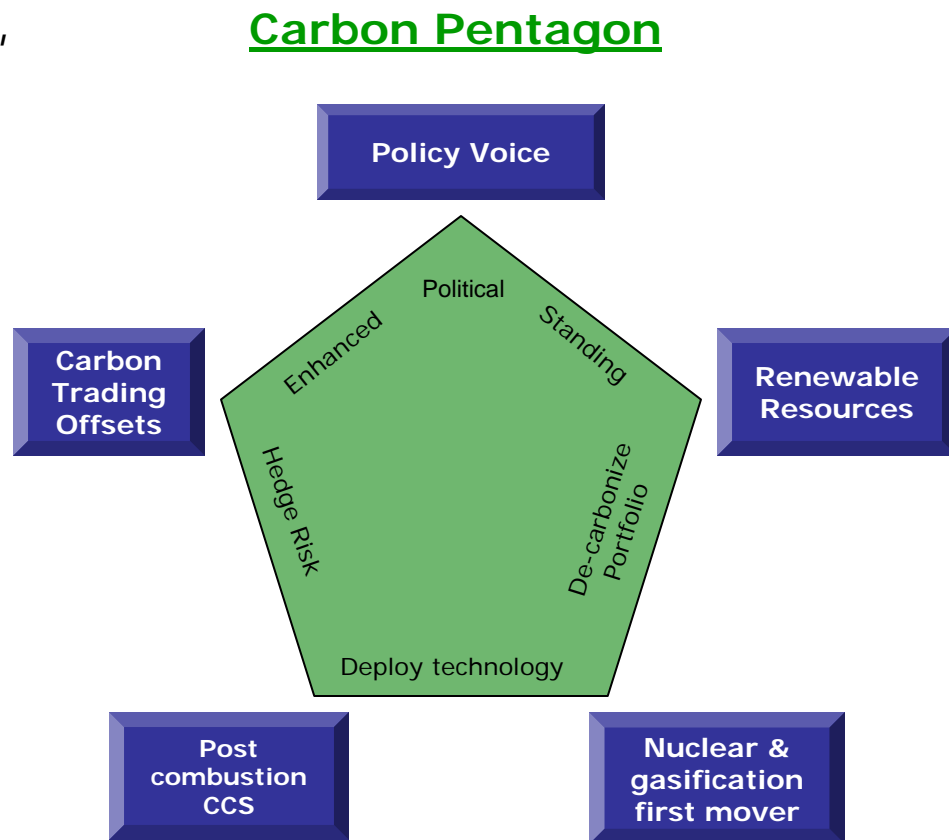
Global economic development or a stable climate is an *unacceptable* choice



★ Technology transformation is THE ONLY effective way
way to meet necessary greenhouse gas reductions ★

NRG Carbon Strategy

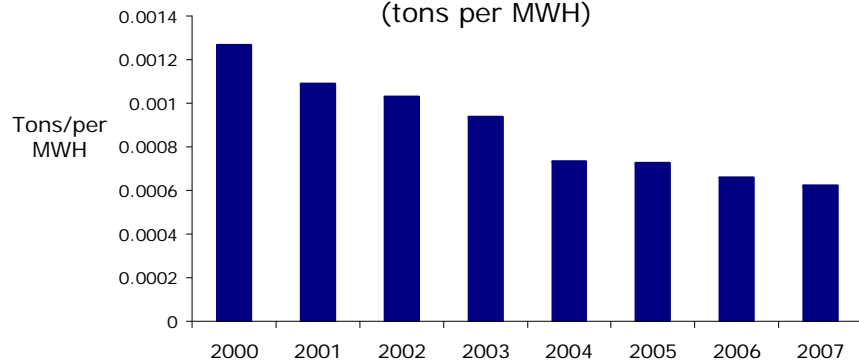
- Carbon constraints are necessary, inevitable and will significantly alter the face of the American power industry
- Three years ago we began to implement our carbon strategy (the carbon pentagon)
- We have developed critical capability and leadership in each area



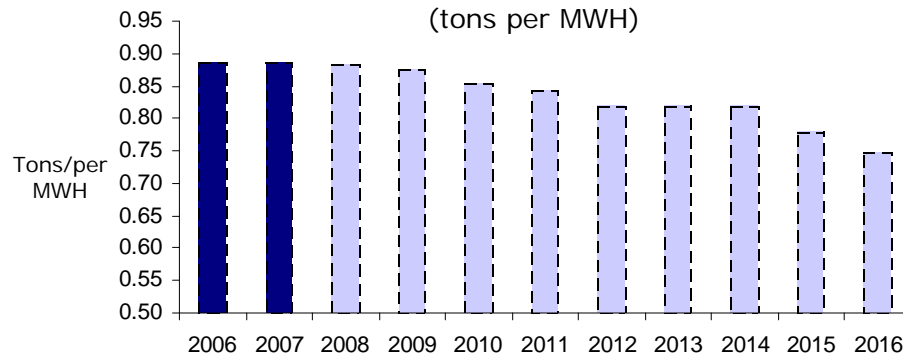
We are proceeding to transform our portfolio, our business and to help transform US policy

NRG Emissions Reductions

NRG Historical NOx Intensity
(tons per MWH)

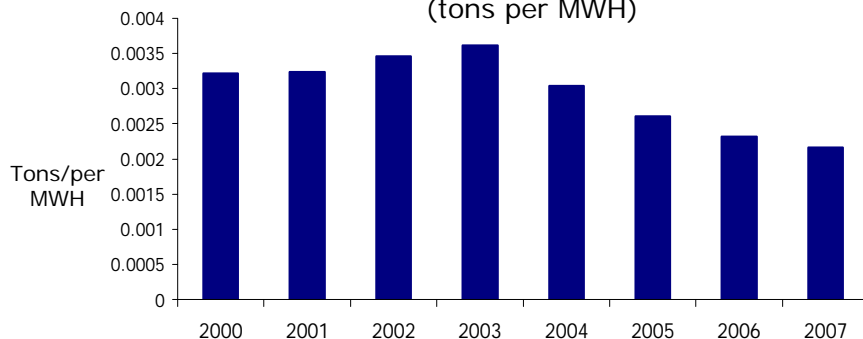


NRG Historical and Projected CO₂ Intensity
(tons per MWH)



Assumes: STP 3&4 Development, 125 MW PC capture at Parish, retirement of Indian River 1&2, installation of 500 MW of renewables, Limestone 3, BC 1, Cedar Bayou 4

NRG Historical SO₂ Intensity
(tons per MWH)



Key Drivers in Reducing our CO₂ Intensity

- Construction of STP 3&4 nuclear units
- Post combustion carbon capture demonstration
- Continued build-out of renewable assets
- Retirement of several older coal units

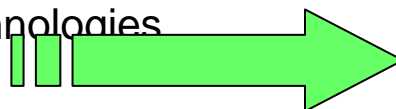
NRG has reduced SO₂ and NOx intensity – we plan on doing the same with carbon



Federal Climate Change Legislation is Needed Now

To be effective, national climate change legislation needs to meet three basic objectives:

1. Satisfy environmental need for aggressive emission reductions by mid-century and for developed economies to play the front of the field
2. Satisfy business and economic needs to avoid rapid shocks to shareholders and customers
3. Provide extremely strong incentives (carrots and sticks) to develop and deploy efficient new low/no carbon technologies



- *Early adoption of carbon capture and storage technology*
- *Effective CCS regulatory and transport infrastructure*
- *Development of advanced nuclear plants and renewable technology*
- *Incentives for electric vehicle advancements*



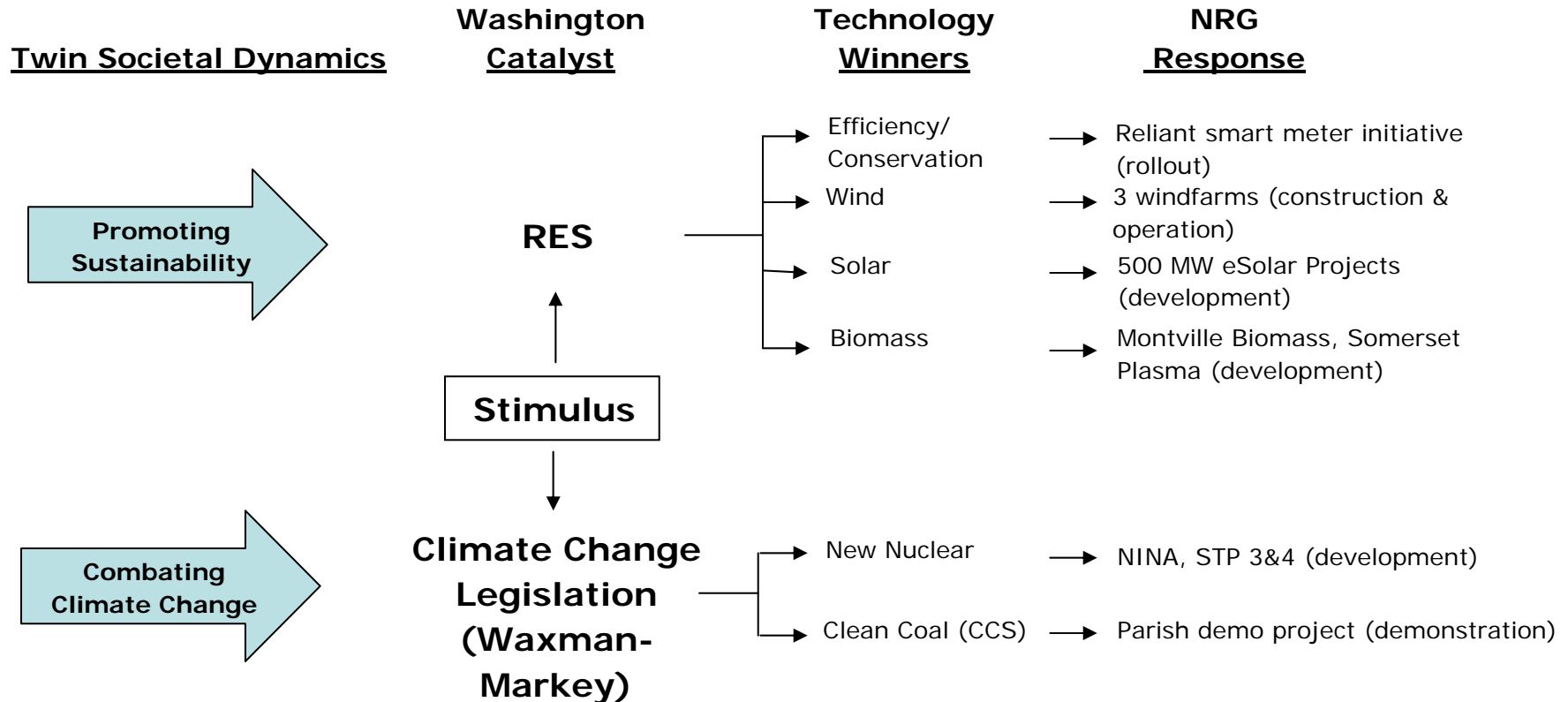
US Leadership Is Essential To Quickly Forge Global Consensus



Federal Energy Policies: NRG Response to Washington Landscape for Implementation

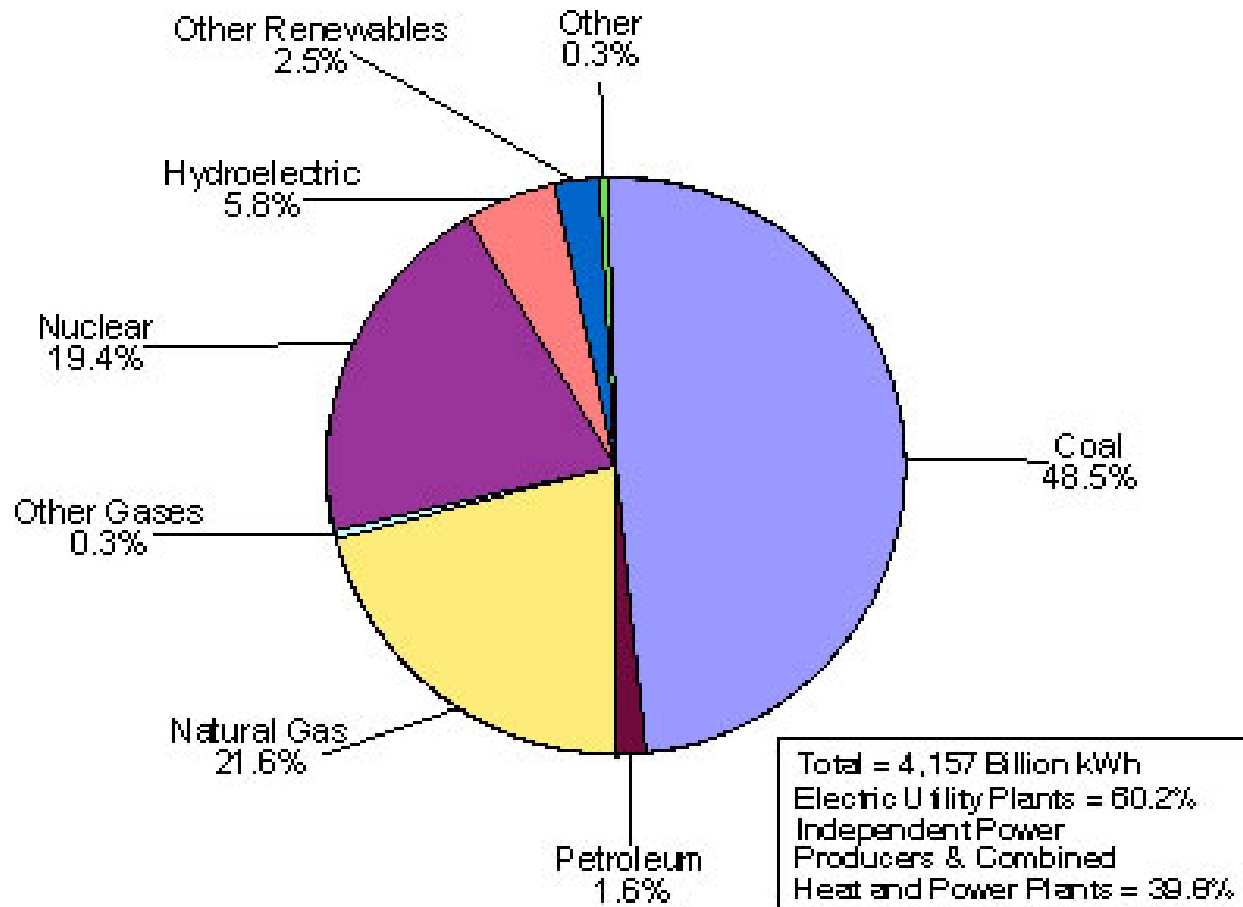


Policy drivers align with strategic new opportunities for growth



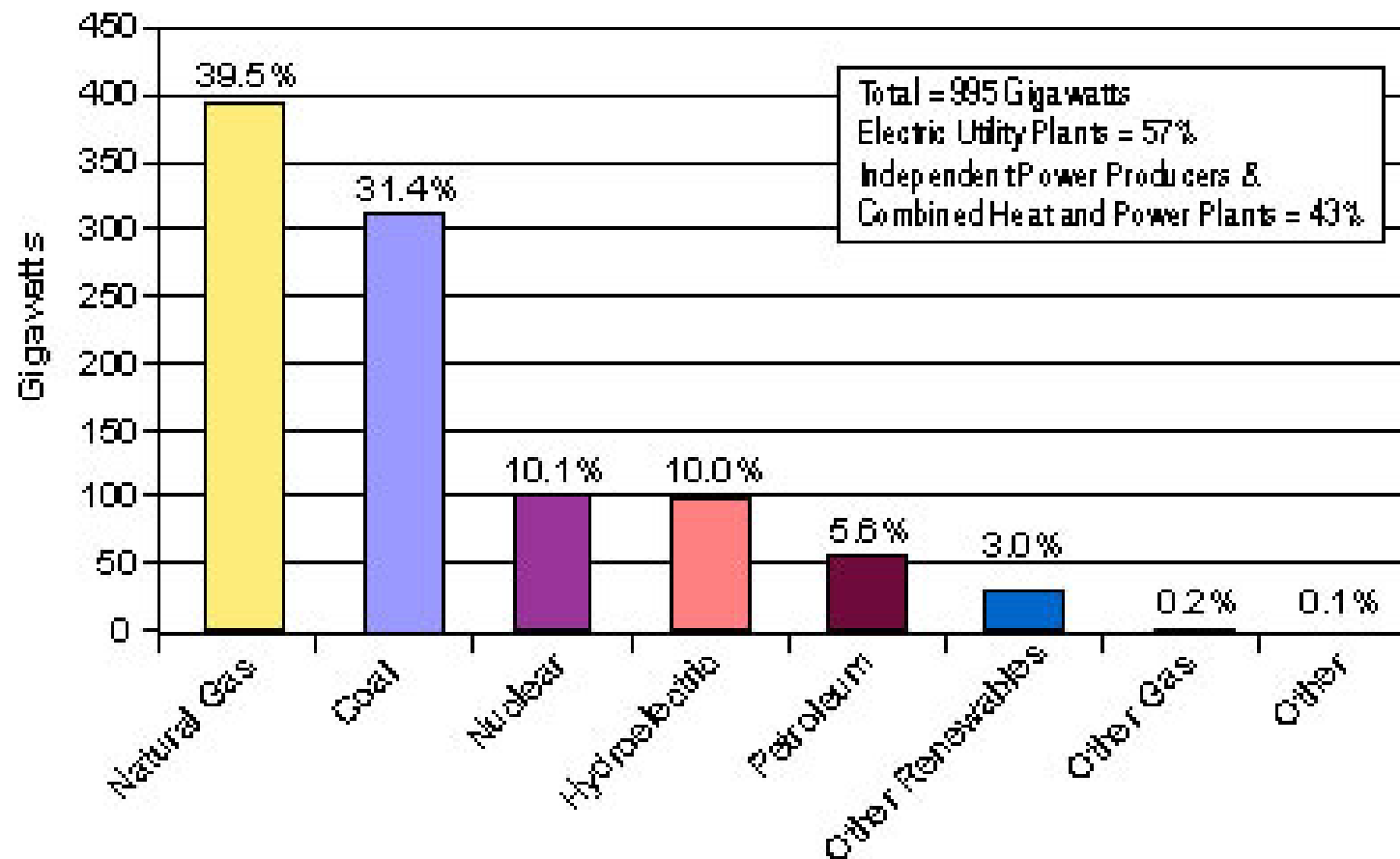
To capture these opportunities, scale (with a purpose) is useful, but nimbleness is absolutely critical

U.S. Electric Power Industry Net Generation, 2007



Source: Energy Information Administration, *Electric Power Annual 2007*

U.S. Electric Power Industry Net Summer Capacity, 2007



Source: Energy Information Administration, *Electric Power Annual 2007*

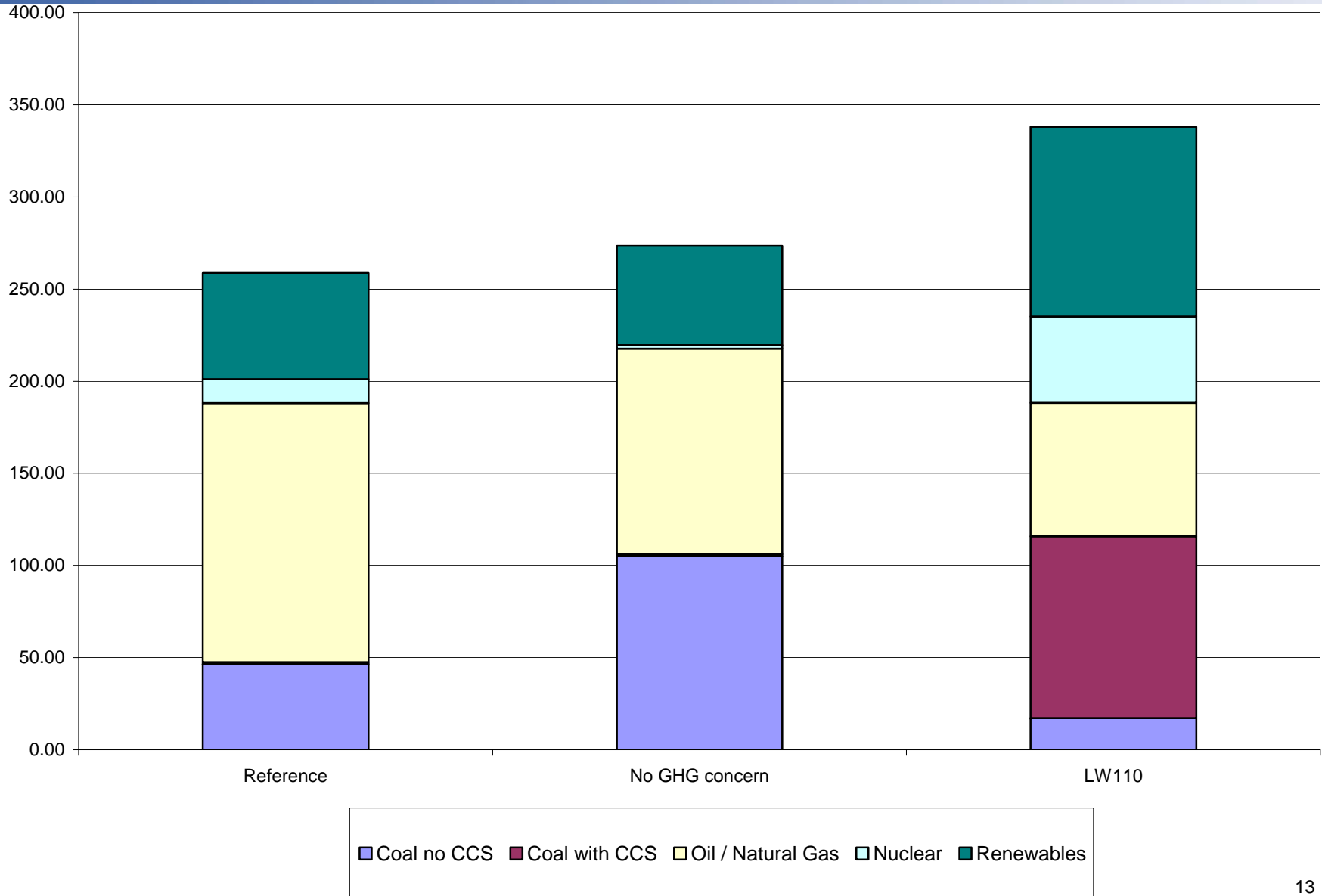
Three Projection Cases to 2030

EIA Annual Energy Outlook



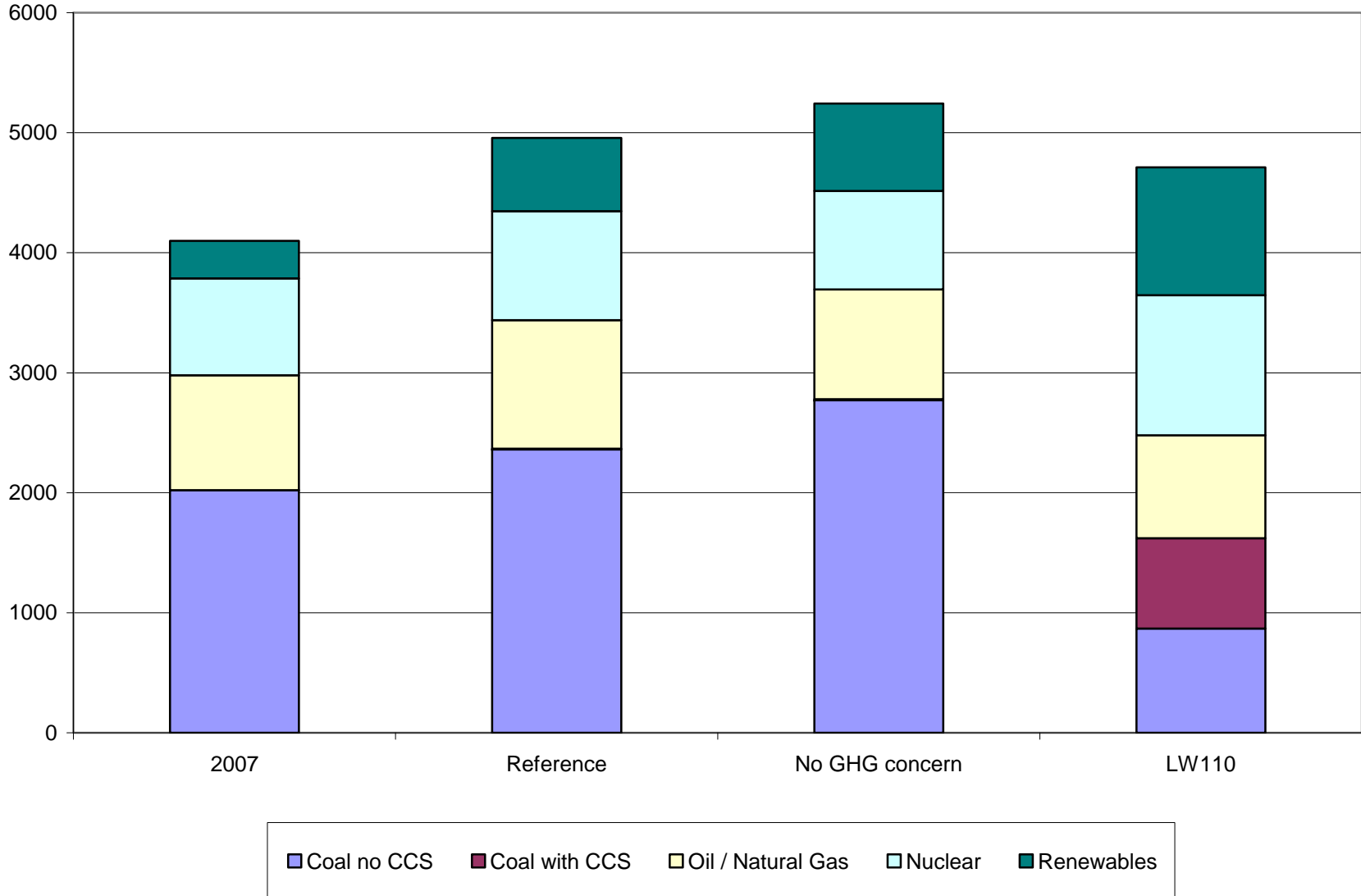
- Reference Case: Concerns about GHG emissions are recognized in the reference case and leads to limited additions of new coal-fired capacity and reliance on more new natural-gas-fired plants and smaller amounts of renewable, coal, and nuclear capacity.
- No GHG concern case: it is assumed that concern about GHG emissions will not affect investment decisions in the electric power sector.
- LW110 case, the GHG emissions reduction policy proposed by Senators Lieberman and Warner (S. 2191) in the 110th Congress is incorporated to illustrate a future in which an explicit Federal policy is enacted to limit U.S. GHG emissions.

Cumulative Additions to U.S. Generating Capacity 2008-2030 (Gigawatts)



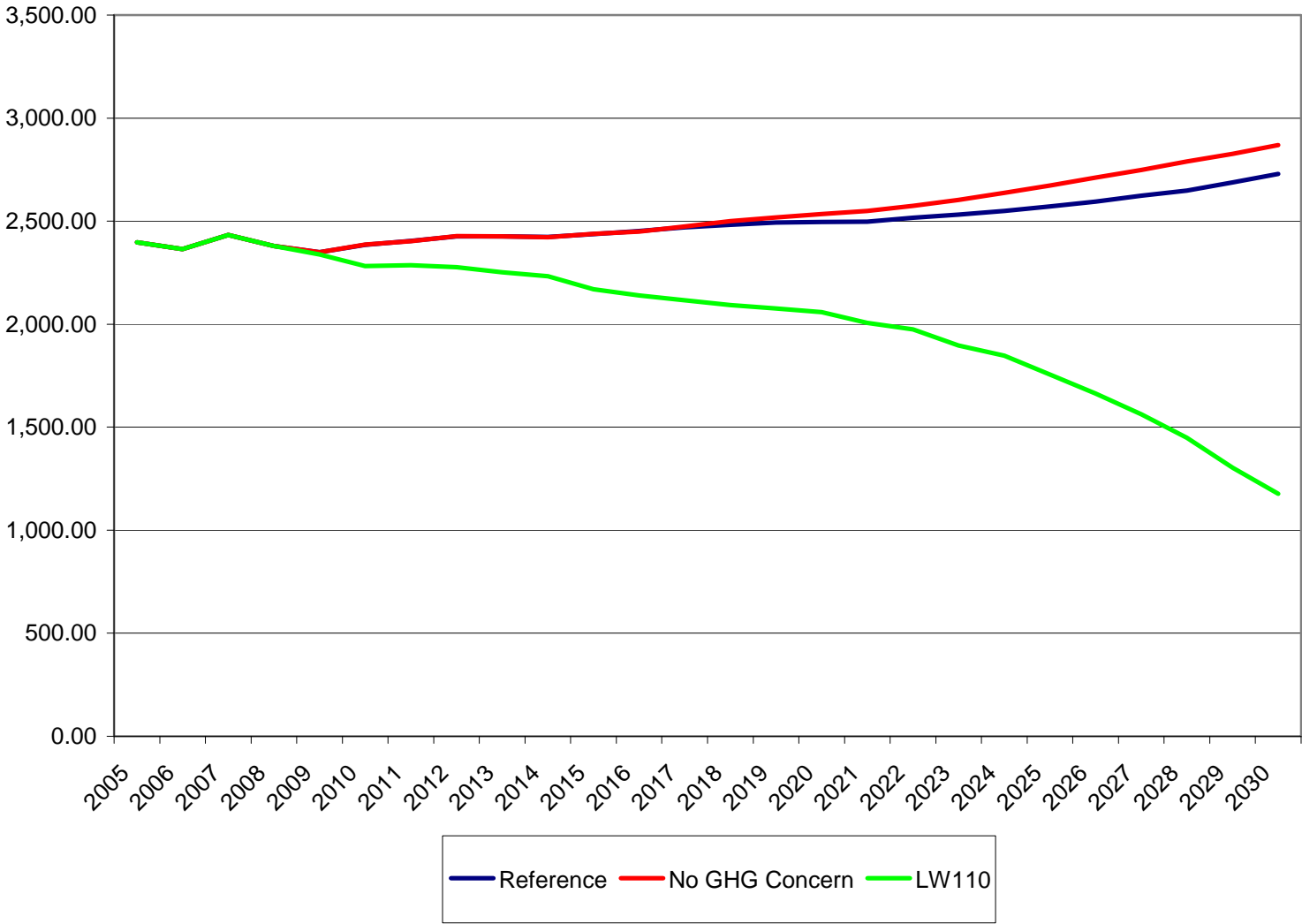
Source: Energy Information Administration, *Annual Energy Outlook 2009*

U.S. Electricity Generation by Source 2007 and 2030 (billion kilowatt-hours)



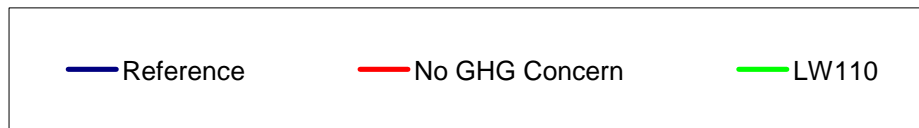
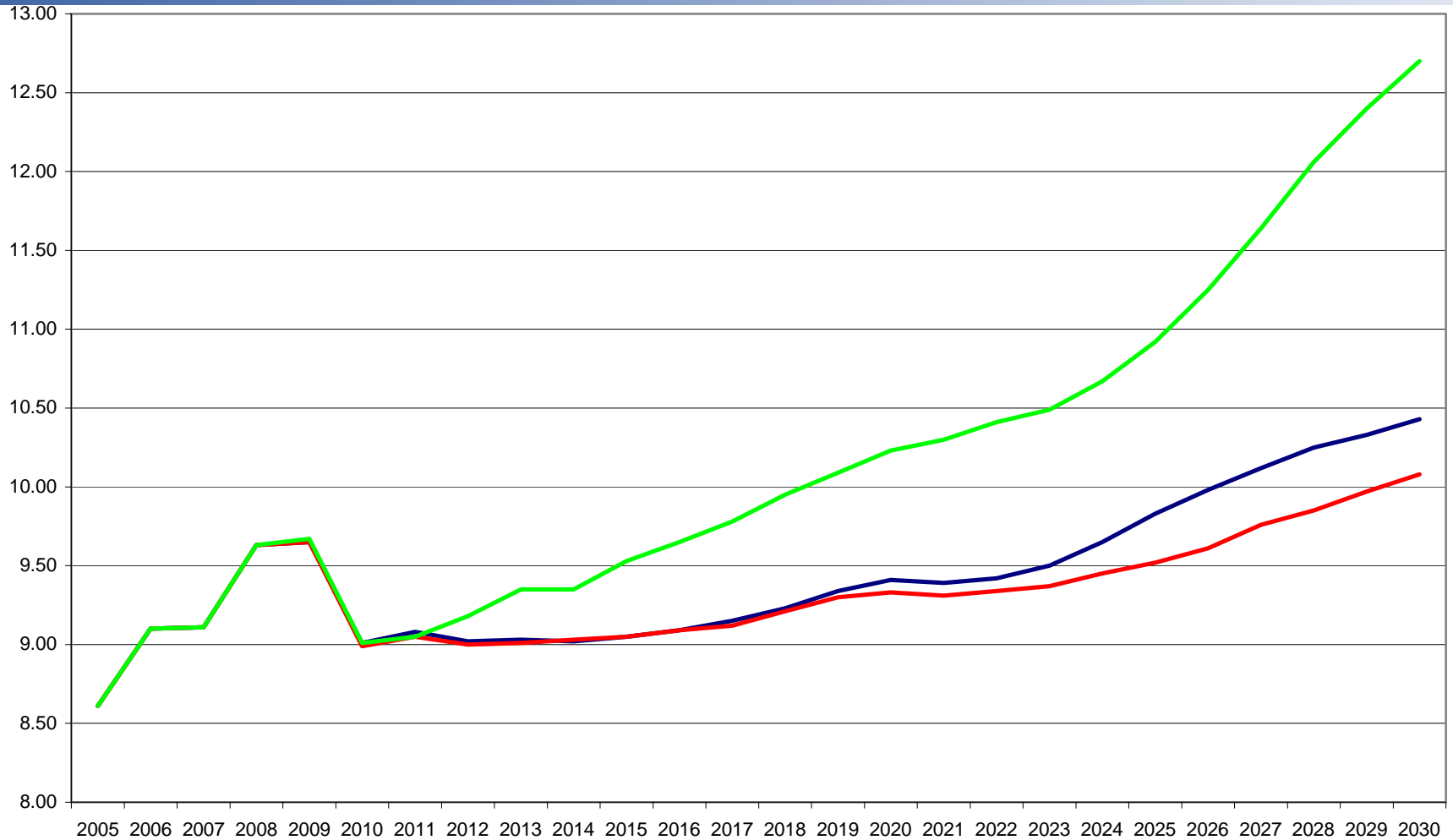
Source: Energy Information Administration, *Annual Energy Outlook 2009*

Carbon Dioxide Emissions from the US Electric Power Sector (Million Metric Tons)



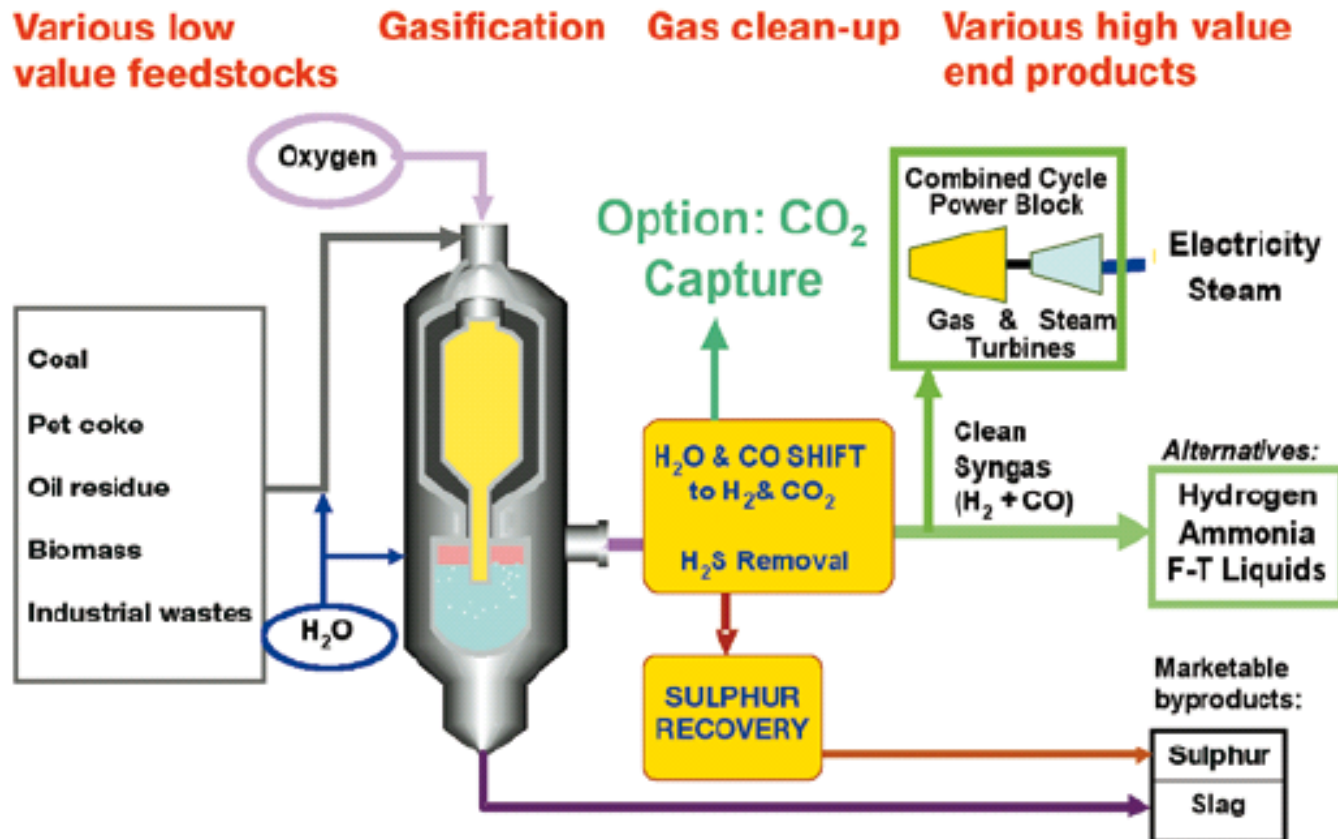
Source: Energy Information Administration, *Annual Energy Outlook 2009*

U.S. Electricity Prices 2005-2030 (2007 cents per kilowatt-hour)

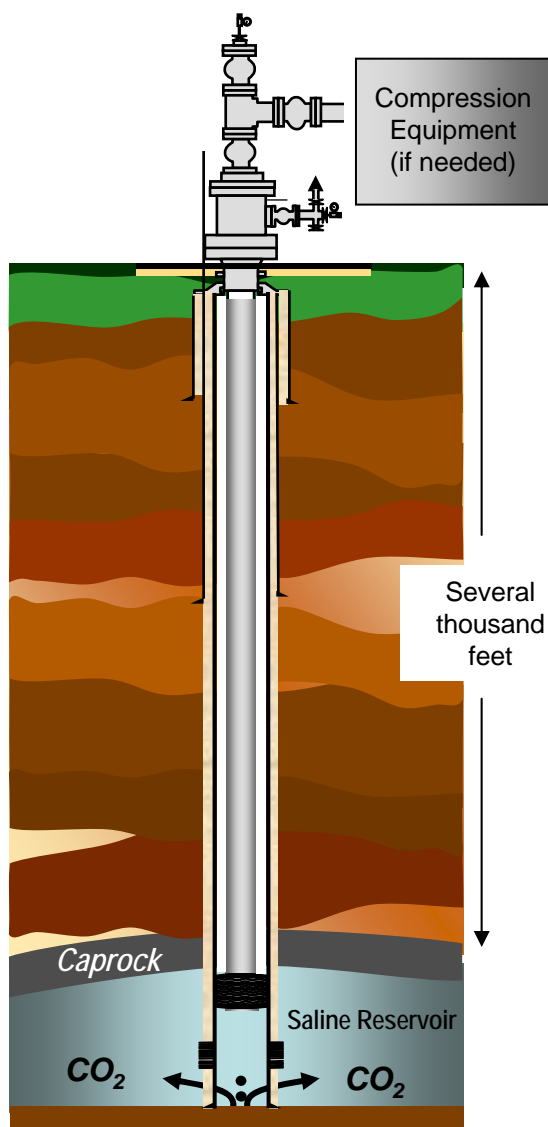


Source: Energy Information Administration, *Annual Energy Outlook 2009*

Gasification and CO₂ Capture Schematic



Basic Injection Schematic



CO₂ is dried and compressed at capture facility

Transported at pressure through pipeline

At Injection Site, CO₂ is compressed further (if necessary) and injected into reservoir

2008 – 3,500 mile CO₂ pipelines in the U.S.

CO₂ Injection Projects – A Brief History

- Large-scale commercial use of underground CO₂ injection began in the 1970s in Texas as a tool to extract more oil in a process called Enhanced Oil Recovery (EOR)
- CO₂ injection has grown steadily since the 1970's
 - 25 Mt of CO₂ pumped into West Texas oil reservoirs last year
 - Similar projects underway in Colorado, Wyoming and New Mexico
- CO₂ may be re-produced, cleaned, and recycled for additional oil recovery
- Current companies developing projects include: Southern Company (Citronelle Dome), Duke (Edwardsport IGCC - 2012), and Tampa Electric (Polk IGCC - 1996)
- More recently, CO₂-EOR operators have begun to include ultimate storage of CO₂ into their plans – Projects include:

Project

Salt Creek, Wyoming
(Anadarko)

Weyburn, Canada
(EnCana)

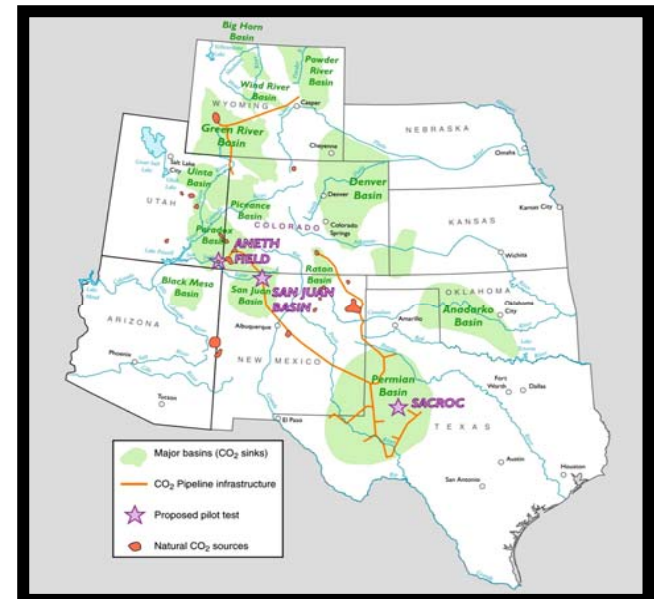
In Salah, Algeria
(StatoilHydro)

Planned Sequestration

29 Mt

30 Mt

20 Mt



1. Gasification has a number of benefits, including the environmental benefits of matching the air emissions of a natural gas facility
2. However, gasification faces a number of challenges:
 - Commercial – It is more expensive than conventional power generation – needs a carbon market in order to finance it
 - Operational – although CO₂ pipelines have been in place for a number of decades in the US, most jurisdictions are not familiar with the concept of long-term storage of CO₂
 - Regulatory – most Northeast states have not yet enacted necessary regulations for entities to capture, transport and store CO₂
3. Coal is such a large part of the global climate challenge that CCS – both gasification and post combustion capture – are essential to solving it.

“CCS alone cannot solve climate change, but without CCS, it can’t be solved”

NRG and Toshiba have partnered to form Nuclear Innovation North America (NINA) to develop Advanced Boiling Water Reactors (ABWR) in America



- **Proven Design** – The ABWR is the only design already certified by the NRC with a record of on-time and on-budget construction.
- **Best Site for Modern Nuclear** - One of the best sites in the country— originally licensed for four units with widespread public support and one of the best operating companies in the country.
- **Zero Emissions Power Generation** - 2,700 megawatts of base load electricity— enough to supply 2.1 million households—and no greenhouse gases.
- **Fuel Security** - Reduces dependence on fuel sources that are more susceptible to price volatility. Builds on new technology to increase energy independence.
- **Local and Statewide Economic Impact** - Construction will last approximately six years, employ 4,000 to 6,000 workers, and cost billions of dollars. Once operational, it will add more than 800 high-paid, full time employees to the STP workforce.

STP's application was the first complete operating license of the nuclear renaissance to be submitted to the NRC. Online in 2016.

Nuclear Innovation North America Strategy: Mitigating New Nuclear Development Risks



Risk...	...Mitigation
1. Cost	<ul style="list-style-type: none">➤ Pre-negotiated EPC terms (including fixed margin and risk premium)➤ Clear, open-book bidding process for major equipment
2. Design	<ul style="list-style-type: none">➤ Built four times, twice by Toshiba➤ Built on budget and in 39 months or less each time➤ Twelve year operating history
3. Licensing	<ul style="list-style-type: none">➤ Previously certified design➤ Some modifications to improve operation
4. Manufacture	<ul style="list-style-type: none">➤ Existing pipeline for components, with capacity to handle our units➤ Ability to secure long lead materials due to its vertical integration
5. Construction	<ul style="list-style-type: none">➤ Committed vendor with financial investment in project success
6. Operation	<ul style="list-style-type: none">➤ Technical sharing arrangement with Tokyo Electric Power, developer of the first two ABWRs, with successful operating history➤ Partnering strategy for new unit operations

Nuclear Innovation North America
business model provides enhanced certainty

1. When it comes to combating climate change, the best answer lies in the **center**, where both **environmental protection** and the energy security of the United States can be enhanced while avoiding the prospect of short to medium term dislocation to the **economy**.

2. A sensible balance between **auctioned allowances and allowances allocated** on an interim basis will avoid value destruction. Also complementary measures are required for clean coal and other core technologies.
 - It is nearly impossible to meet GHG reduction goals without the successful demonstration and global deployment of **clean coal technology and advanced nuclear plants**.

3. The **electricity industry**, currently the single largest emitting sector in the United States, as it decarbonizes will become a **central part of the solution**
 - **New technologies** to electric industries in other emitting nations
 - Displace other forms of carbon-producing energy in other sectors - the all **electric car**.

