



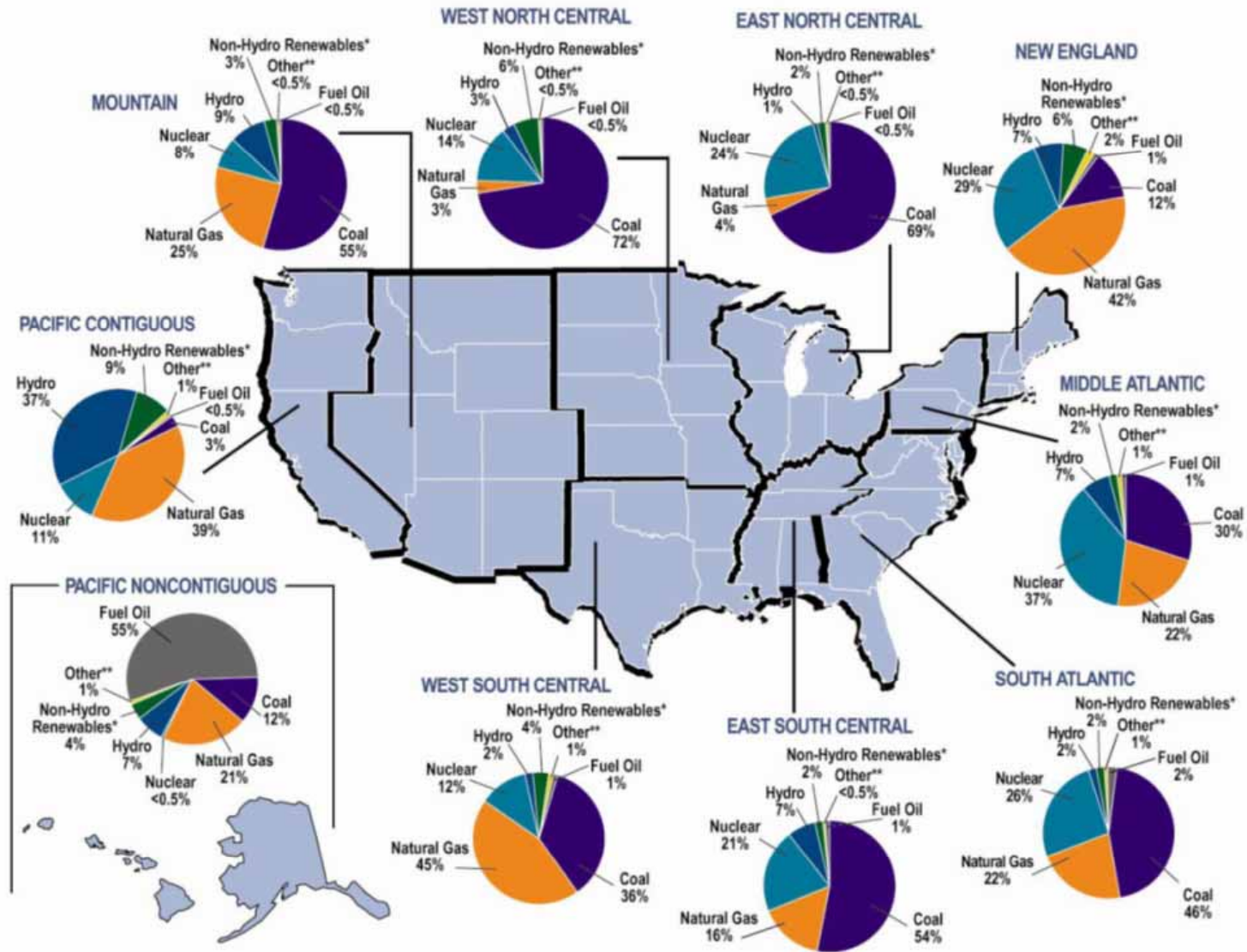
Integrating Natural Gas and Renewable Generating Resources: Natural Gas Pipeline Perspective

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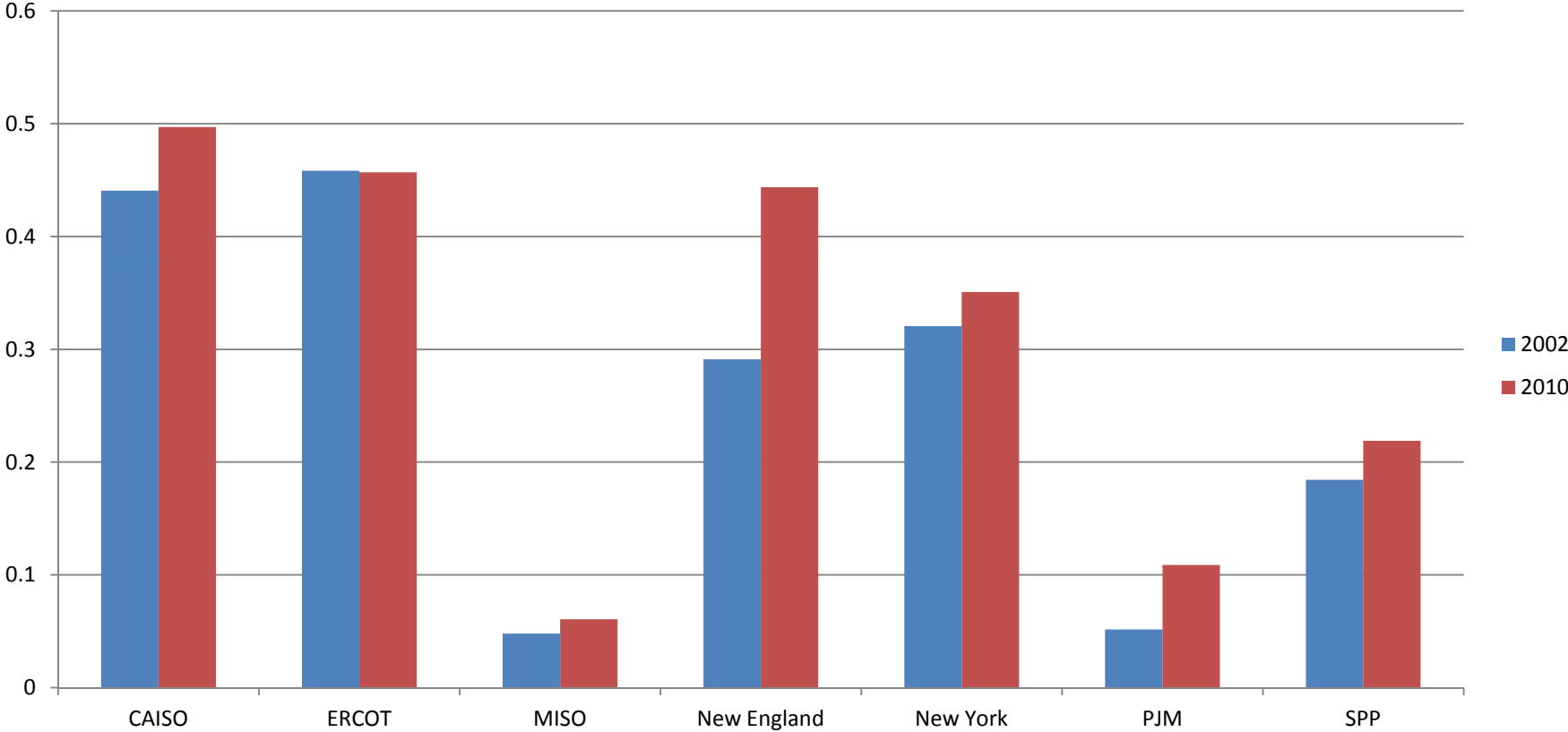


INGAA Recognizes the Diversity of U.S. Electric Power Markets



Source: Edison Electric Institute

Natural Gas Percentage of Total Generation 2002 vs 2010



Source: SNL





Assessment of New England's Natural Gas Pipeline Capacity to Satisfy Short and Near-Term Power Generation Needs

- The estimated winter design day surplus/deficit is generally between -100,000 and -200,000 dekatherms per day in most years, except in the highest gas demand case where the deficit averages roughly -600,000 dekatherms per day.
- The regional gas delivery system is in very tight balance on a winter design day even before any gas sector demand growth is assumed.
- This result suggests that regional gas supply capability is inadequate to satisfy regional gas demands on a winter design day over the next decade, barring incremental expansion of the gas delivery system beyond those expansions assumed herein.
- The regional gas delivery system will become even more tightly balanced on a winter design day under the Repowering scenario, and in need of additional gas supply capability beyond the amounts estimated herein.

Source:

Excerpted from several slides of ICF International's *Assessment of New England's Natural Gas Pipeline Capacity to Satisfy Short and Near-Term Power Generation Needs* Presentation



Why must we begin acting now?

- New England gas pipeline capacity already tight
- More gas-fired generation on the horizon
- Wind will be part of the New England solution
- Pipeline capacity cannot be added overnight



Do market electric power rules need to be re-examined in light of shift to natural gas?



Interstate Natural Gas Pipeline Model

- Open access transportation and storage
- Pipelines compete for market opportunities
- Customers ensure reliability individually by taking responsibility for portfolio of natural gas services that meets their needs

FERC Docket AD12-12-000

Coordination Between Natural Gas and Electricity Markets

- “This Nation must ensure outages and reliability concerns are not due to lack of coordination between industries.” – Commissioner Moeller
- “The electric industry’s increased reliance on natural gas has greatly heightened the need to address how these markets and operating networks can better work together.”
– Commissioner LaFleur



Regional Technical Conferences Should Address

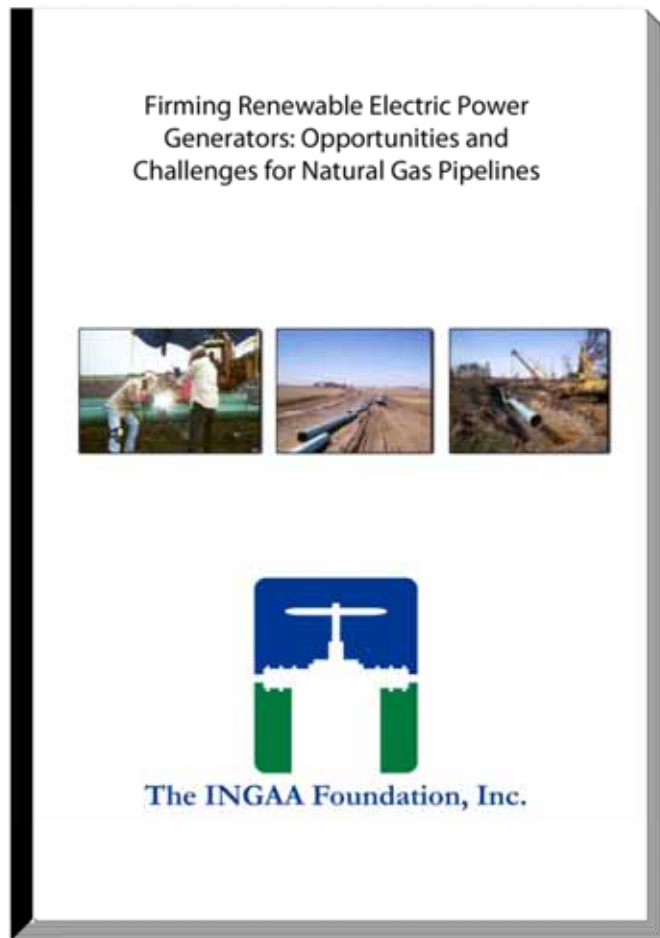
- (1) To what degree will natural gas-fired generation be relied upon to ensure the reliability of the electric bulk power grid?
- (2) How much and what type of firm pipeline capacity (or some other reliable back up fuel source) will be required, given other generating resources in the market, to ensure the reliability of the bulk power grid?
- (3) Who should be responsible for holding the necessary pipeline capacity (or some other reliable back up fuel source)?
- (4) How will the cost of holding that capacity be recovered?
- (5) What type of tailored pipeline services could be provided to better serve natural-gas fired generators?
- (6) How will the costs associated with providing those services be recovered from electricity customers?

Natural Gas Infrastructure: Large Scale Wind Integration Could Add Complexity

“The balancing of net load – essential for large-scale wind integration – was seen largely being provided by the region’s natural-gas-fired generating fleet. If future displacement of natural-gas-fired generation by wind energy is such that there is attrition of these types of flexible resources, the need for supplemental payments to flexible resources and/or energy storage technologies may increase.”

New England Wind Integration Study, November 2010, Prepared by ISO-NE Staff,
Summary at page 8

Firming Renewable Electric Power Generators: Opportunities and Challenges for Natural Gas Pipelines



- In the next 15 years, 105 GW of renewable power generation are forecast to be constructed; of which 88 GW could be new intermittent wind generation.
- The natural gas-fired generation needed to firm up wind generation could be approximately 33 GW generating some 45,500 GWh of electricity.
- Almost 5 (Bcfd) of incremental delivery capability could be required over the next 15 years to provide the new gas-fired firming generation with firm natural gas supply.
- The total capital cost of the natural gas infrastructure to support firming requirements could range from about \$2 billion to \$15 billion.

Pipeline Services for Power Generators

- Pipelines ready to offer tailored services that meet the needs of customers.
- Peaking generators and intermittent renewables may require new services to support faster ramping rates.
- As demand for natural gas increases, absent expansions, excess pipelines capacity/flexibility will be exhausted.
- Customers must contract for services that provide the desired level of electric reliability.
- Customers must be willing to pay costs associated with such services.

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