A New Englander's Perspective:

Shale Gas-Quantities, Price and What's to be Done

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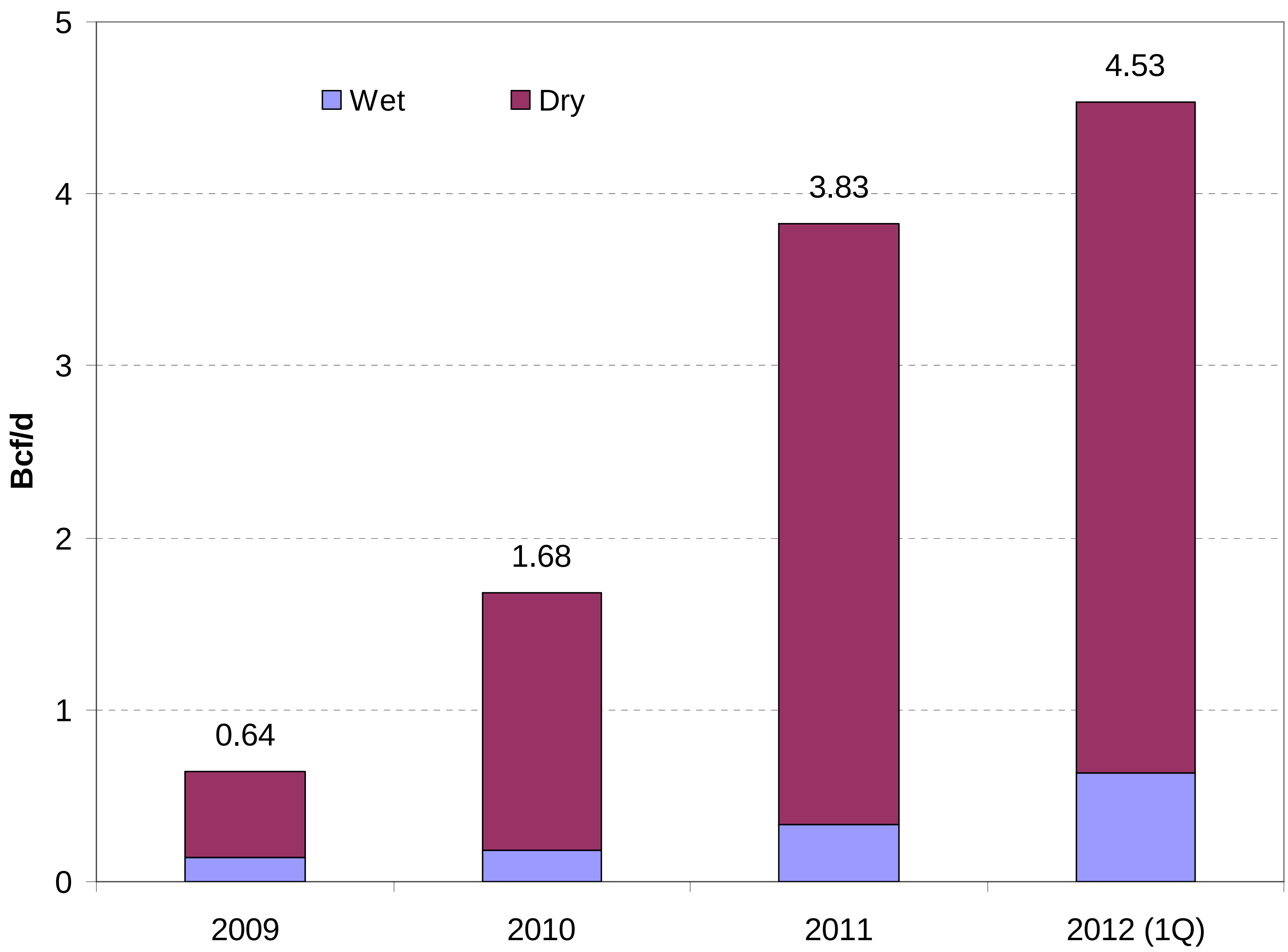
MARKET DESIGN, ECONOMICS AND POWER SYSTEMS

Marcellus production



Sources: Platts, Barclays Capital

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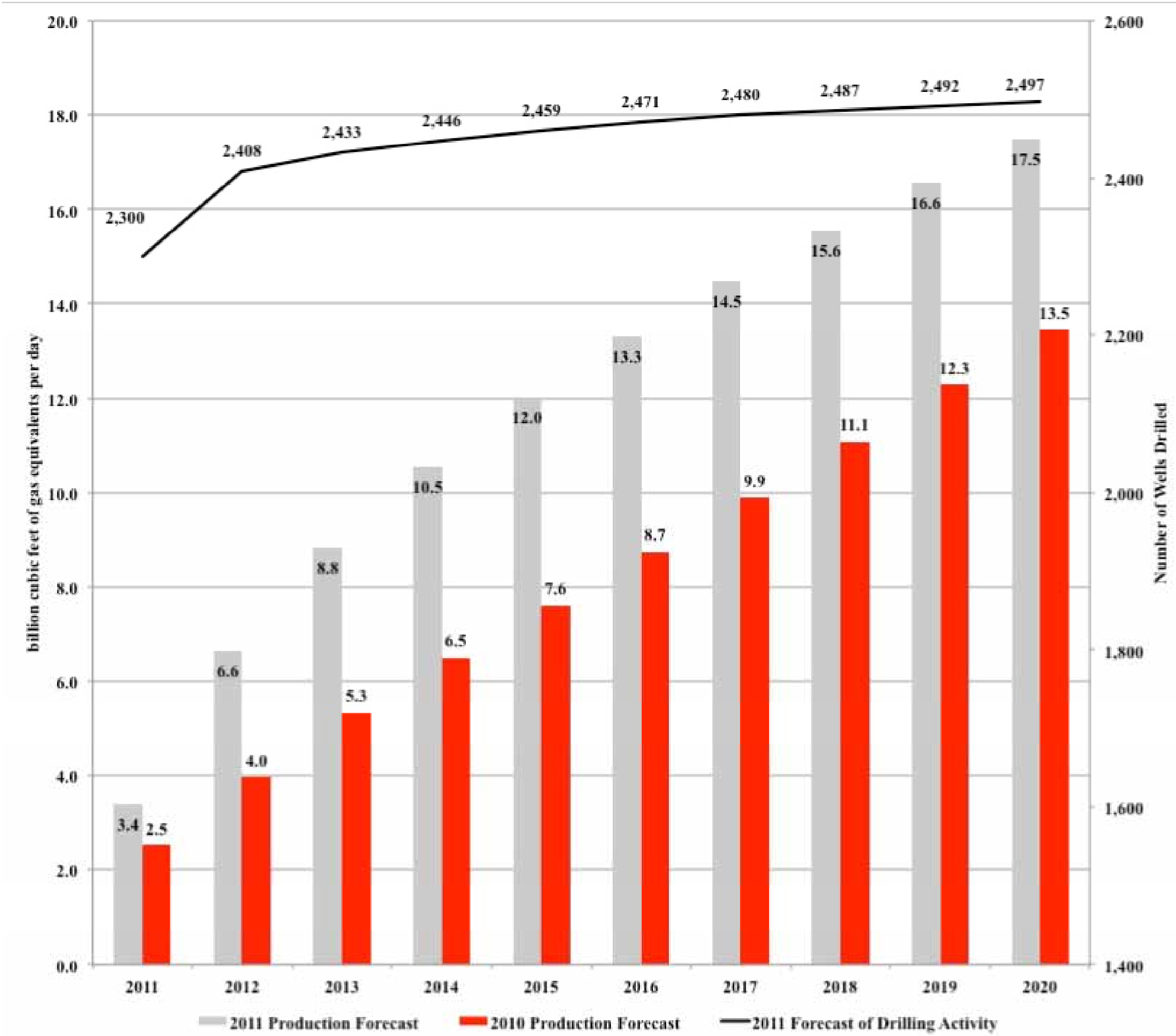
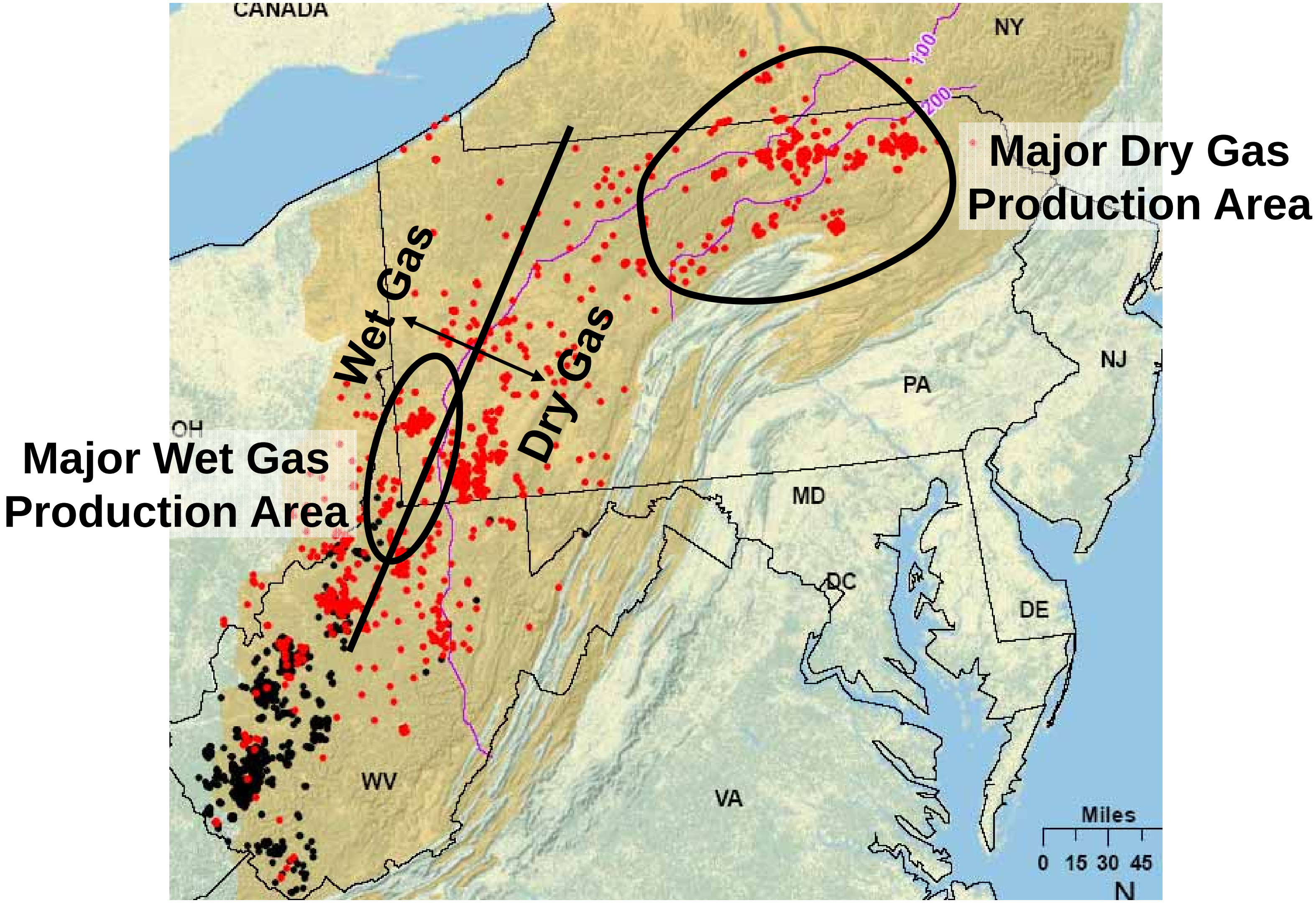
Marcellus production forecast



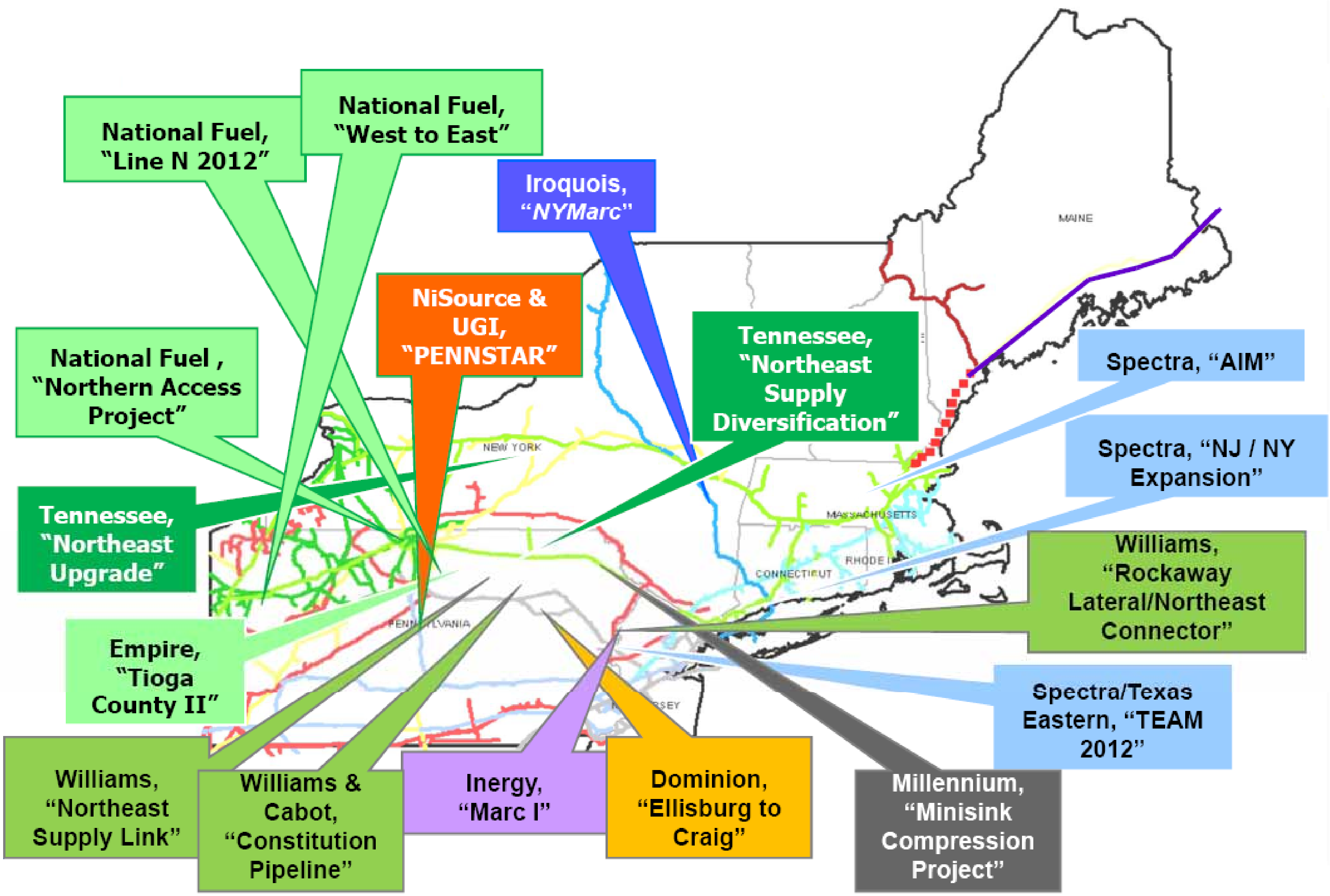
Source: Penn State University

Wet and dry shale gas production



Sources: EIA, Pennsylvania State University Marcellus Center, Dominion Resources, Pennsylvania Department of Conservation and Natural Resources

Marcellus-related planned projects

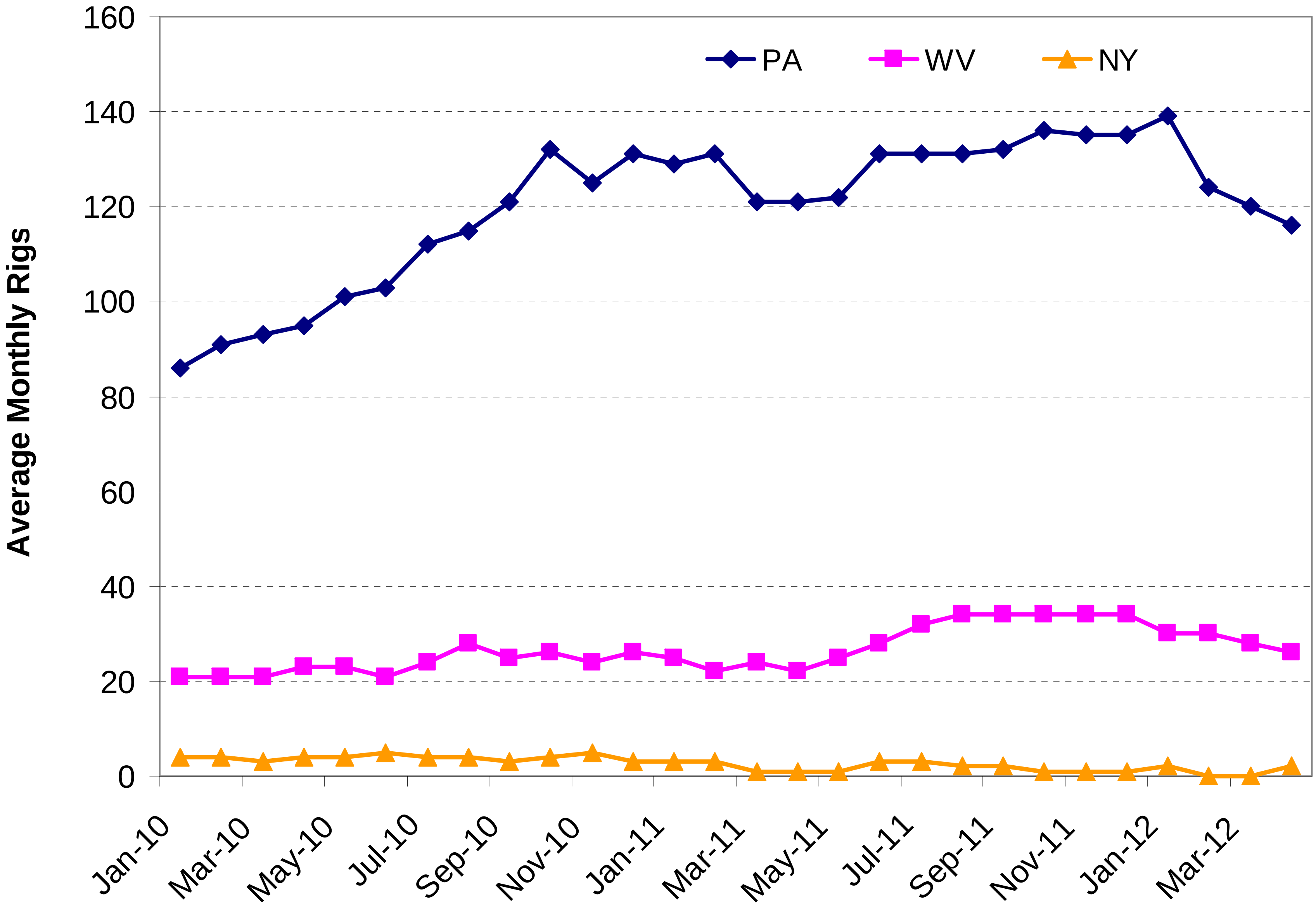


Source: NGA

New England remains at the "end of the line"

Source: EIA

Soft prices reduce dry gas rig count



Source: RigData

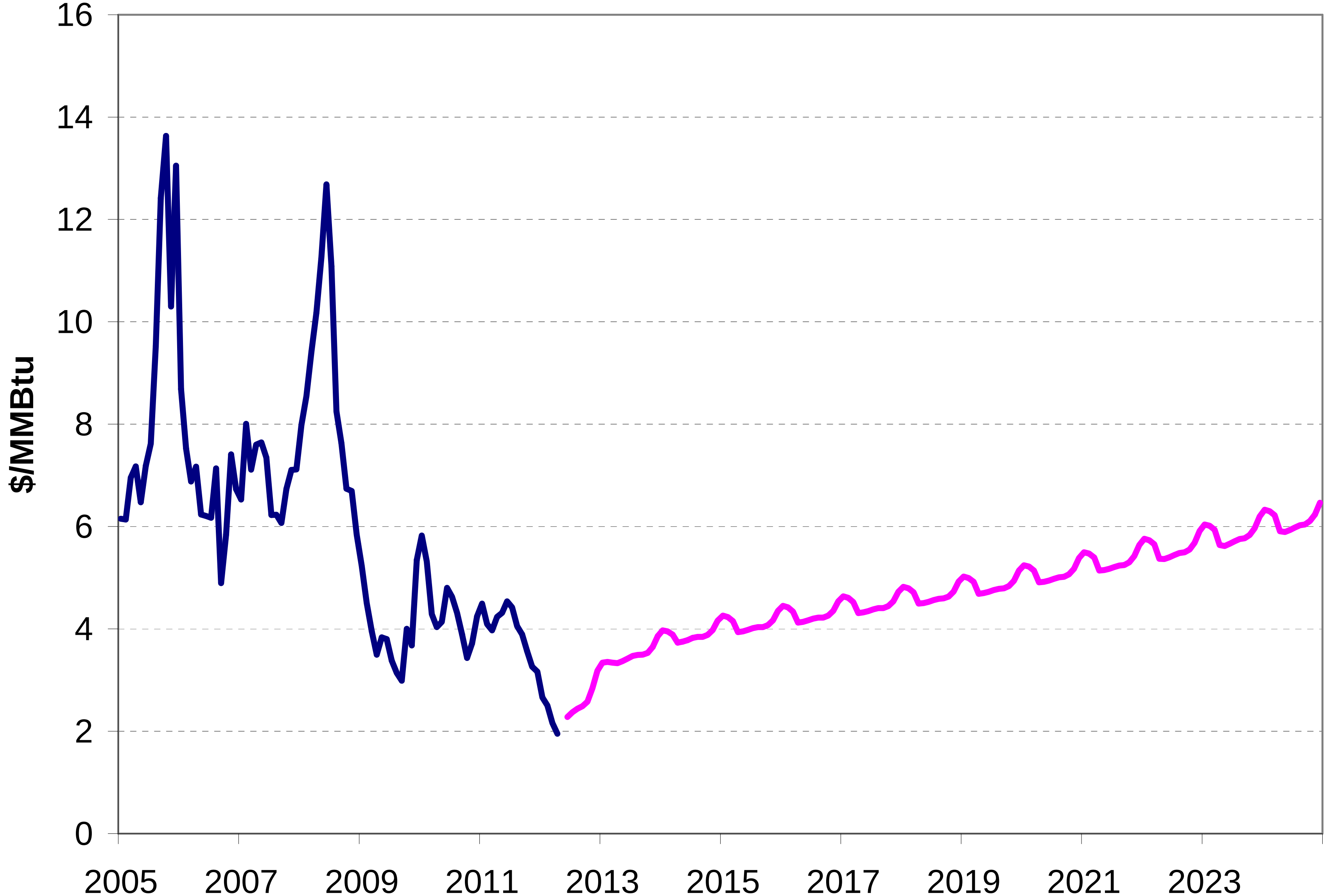
Marcellus production economics

$/mcf	Dry Gas	Wet Gas
Revenues		
Gas	2.60	2.61
Liquids	--	3.90
Total	2.60	6.51
Costs		
Unit Production	(3.36)	(3.36)
Liquids Processing	--	(0.32)
Net	(0.76)	2.83

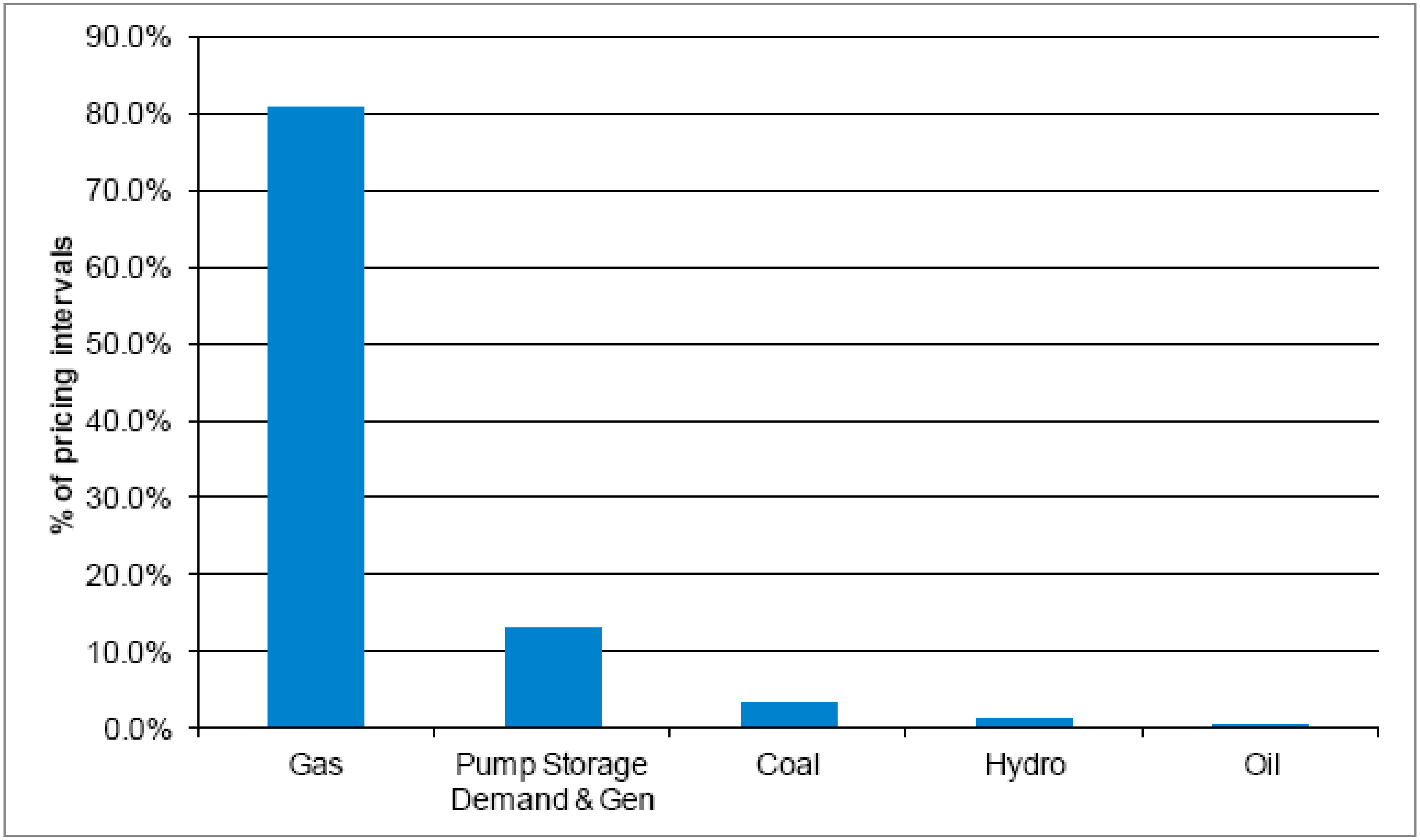
Assume: HH $2.50/MMBtu, WTI $100/Bbl, Dry Gas 1,040 Btu/scf, Wet Gas into Plant 1,266 Btu/scf, NGLs recovery 2.285 gals/mcf, NGLs priced at 52% of WTI, ethane left in processed gas stream

Sources: Range Resources, MarkWest Energy Partners

Inexpensive Gas is the New Conventional Wisdom, but…

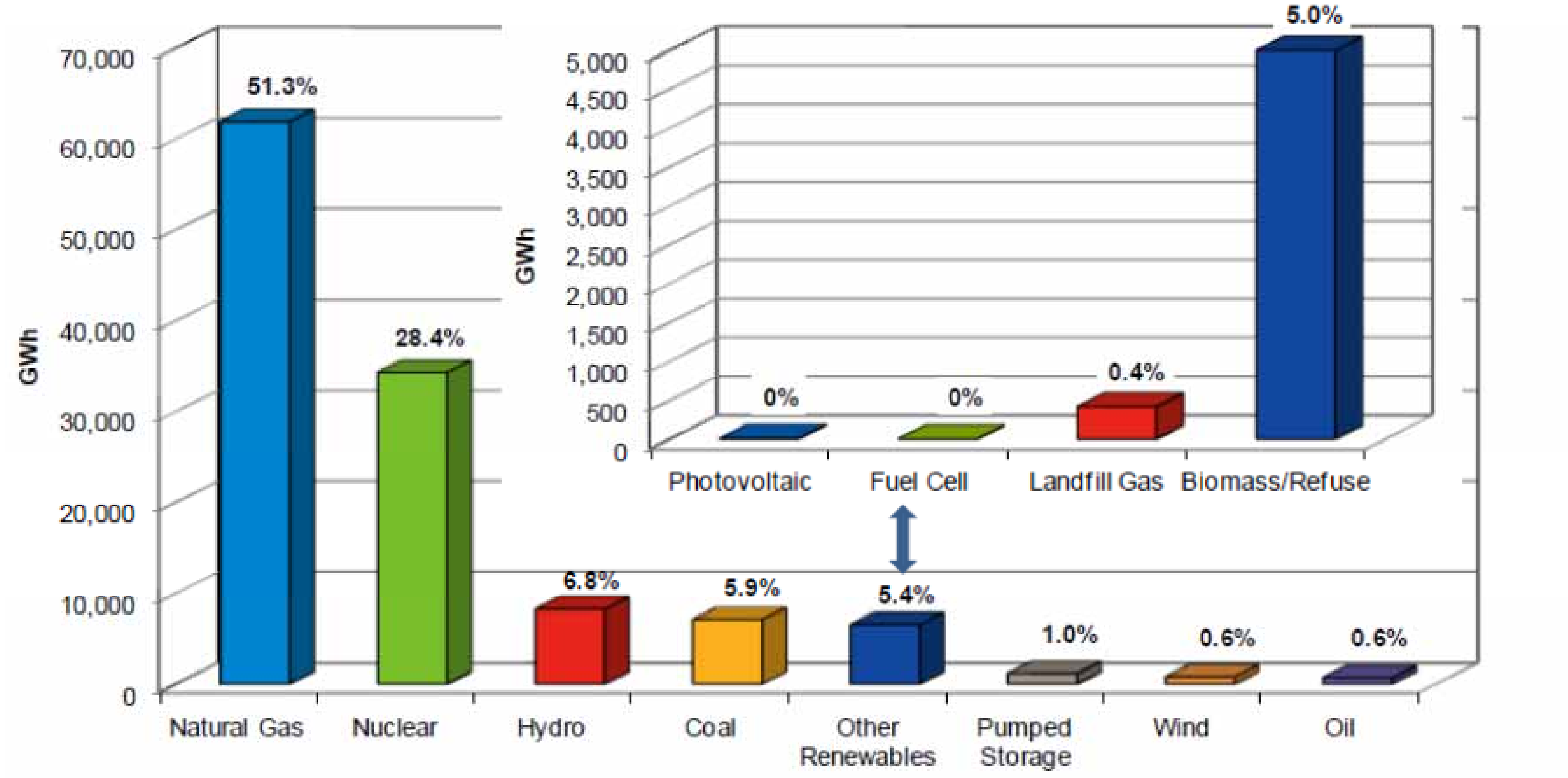


LMPs in New England Driven by Delivered Gas Costs



Source: ISO-NE

Generation by Fuel Type (2011)



Source: ISO-NE

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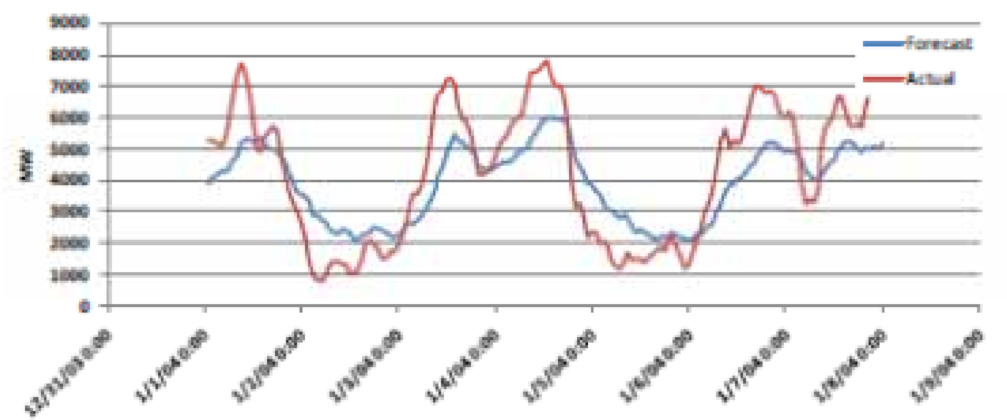
Increased Gas Market Share?

- Environmental Regulations
- Weakest Commodity prices in over a decade
- Vermont Yankee's anticipated retirement
  - ~4,500 GWh (2011)
- Expected decline in imports
  - 10,142 GWh (2011)
- Coal (dark spread) under seige
  - 7,080 GWh (2011)

Impacts on Line pack effects

- Wind forecast errors will result in unscheduled draws on linepack
- Forecast deviations often persist for significant fraction of day and can persist
- P/L additions can improve system tolerance to linepack variations



Source: ISO-NE

Issues & Concerns (Next 3-5 Years)

- PJM / NYISO / MISO are benefited by large new gas gathering and P/L additions → not so N.E.
- Slack deliverability during non-heating season, but increased demand may strain infrastructure in N.E.
- Anticipated retirement of many RFO / dual fuel steamers
- Gas basis benefits will be indirect and are unlikely to materialize during peak heating season
- Growth of intermittent resources requires quick-start resources → line pack part of the solution

Who pays?