The Natural Gas "Crisis:" Dispelling the Myths

Shanna Cleveland
Senior Attorney
Conservation Law Foundation

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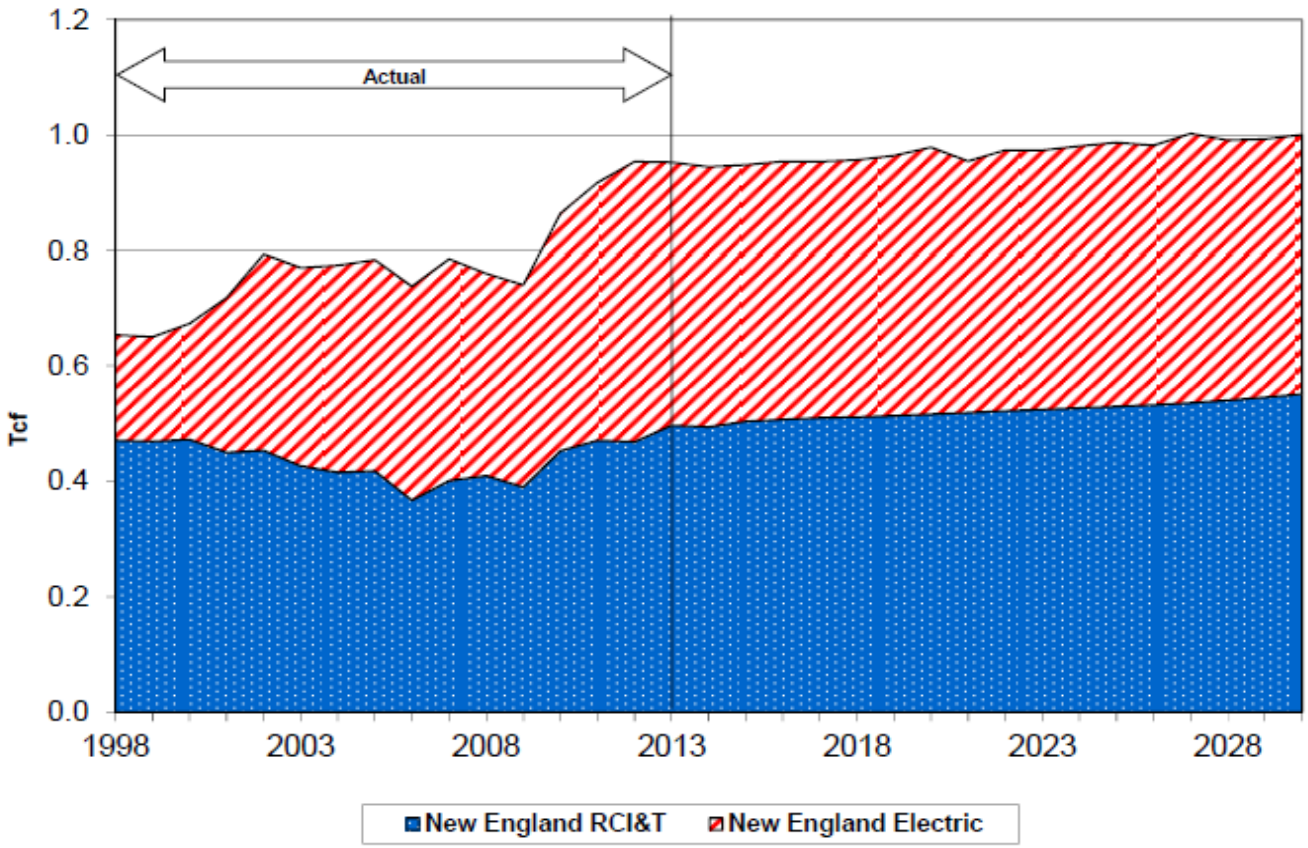
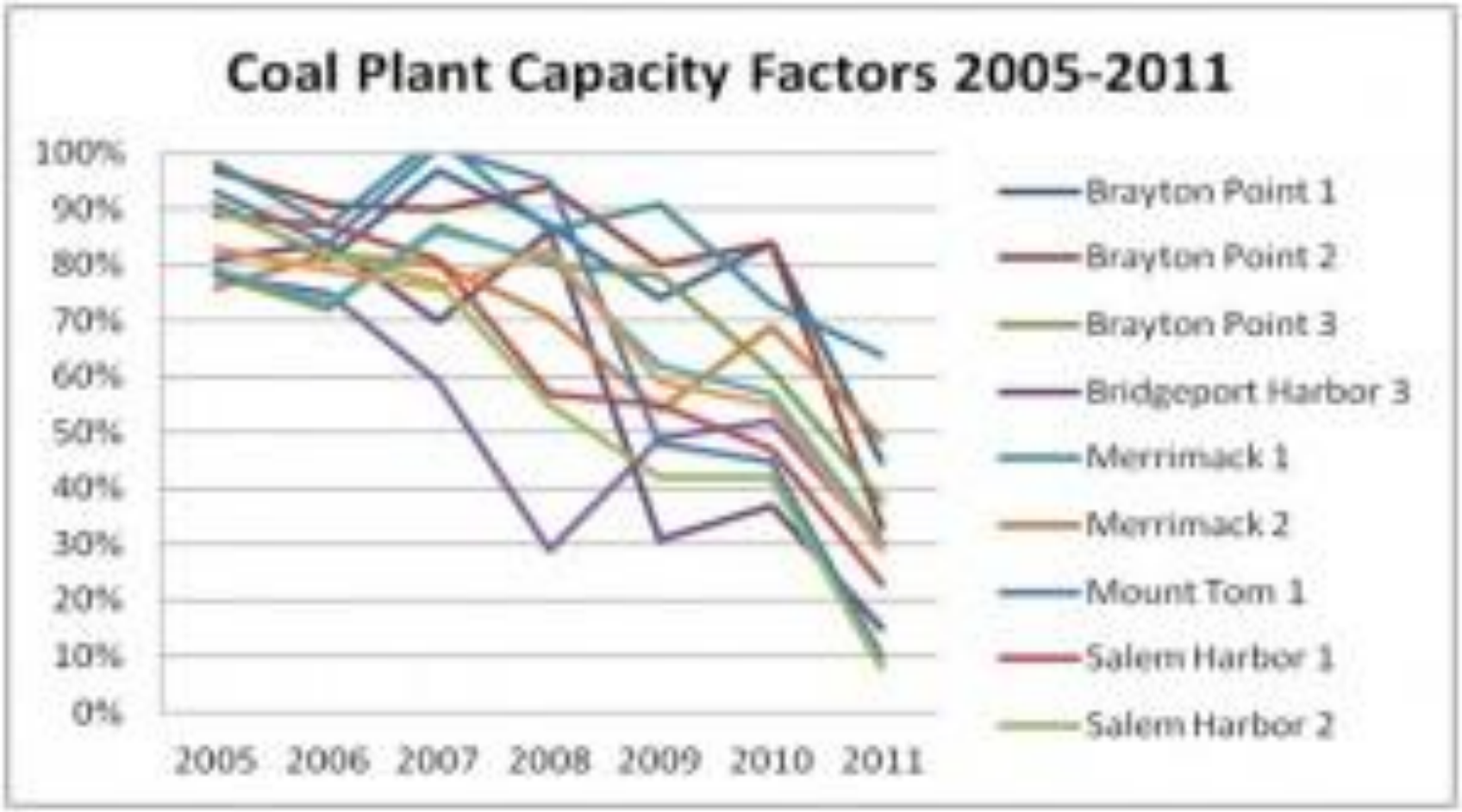
Dramatic increase in gas use for electric generation in New England embodies national trend

Exhibit 2-1. Annual Gas Use (Tcf) in New England, Actual and AEO 2013 Reference Case projection (Tcf)



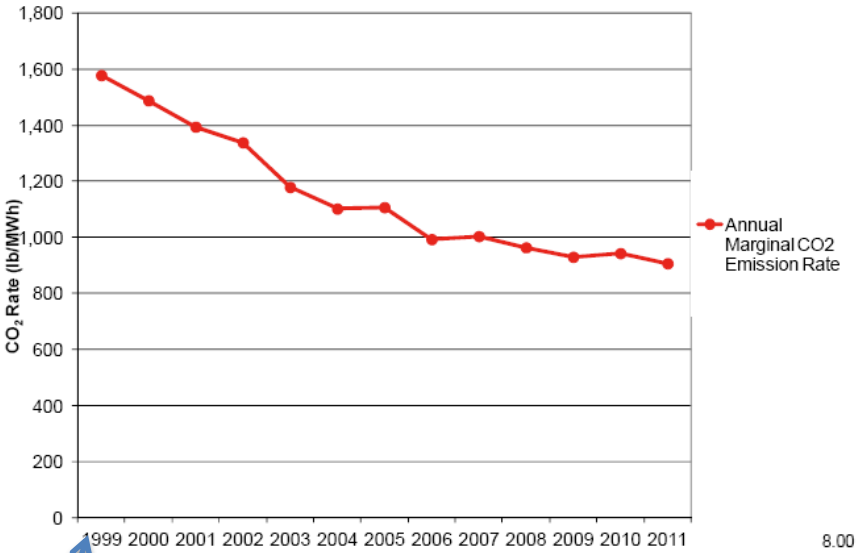
Source: EIA data; Natural Gas Consumption by End Use. See: http://www.eia.gov/dnav/ng/ng_cons_sum_dcu_nus_a.htm. Accessed July 10, 2013.

Part of that Story Has Been Coal Displacement



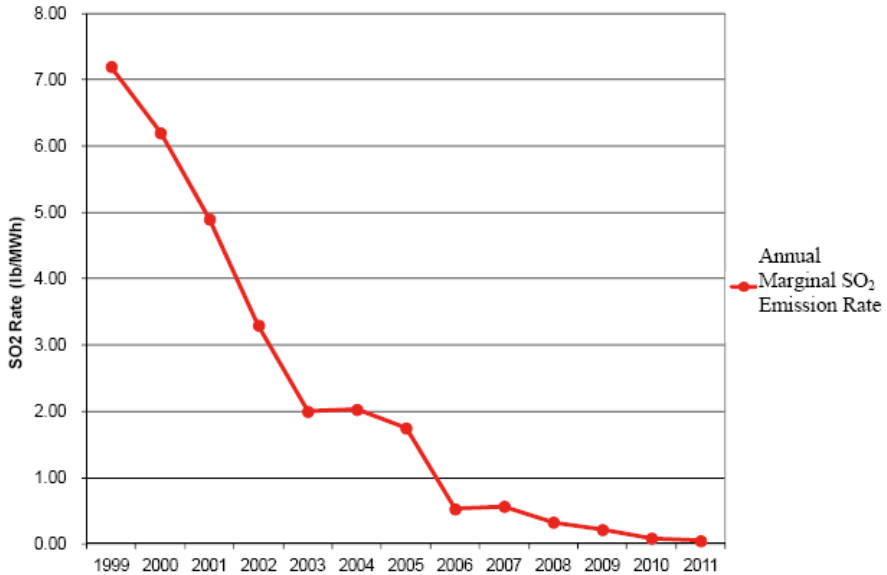
Yes, The Rise of Gas Has Had Benefits for Public Health, but Less So for Climate

Figure 5.4: Historically Calculated New England CO_2 Marginal Emission Rates



In New England, and increasingly elsewhere, Emissions threatening the Public Health, like SO_2, have been slashed very close to zero

Figure 5.3: Historically Calculated New England SO_2 Marginal Emission Rates



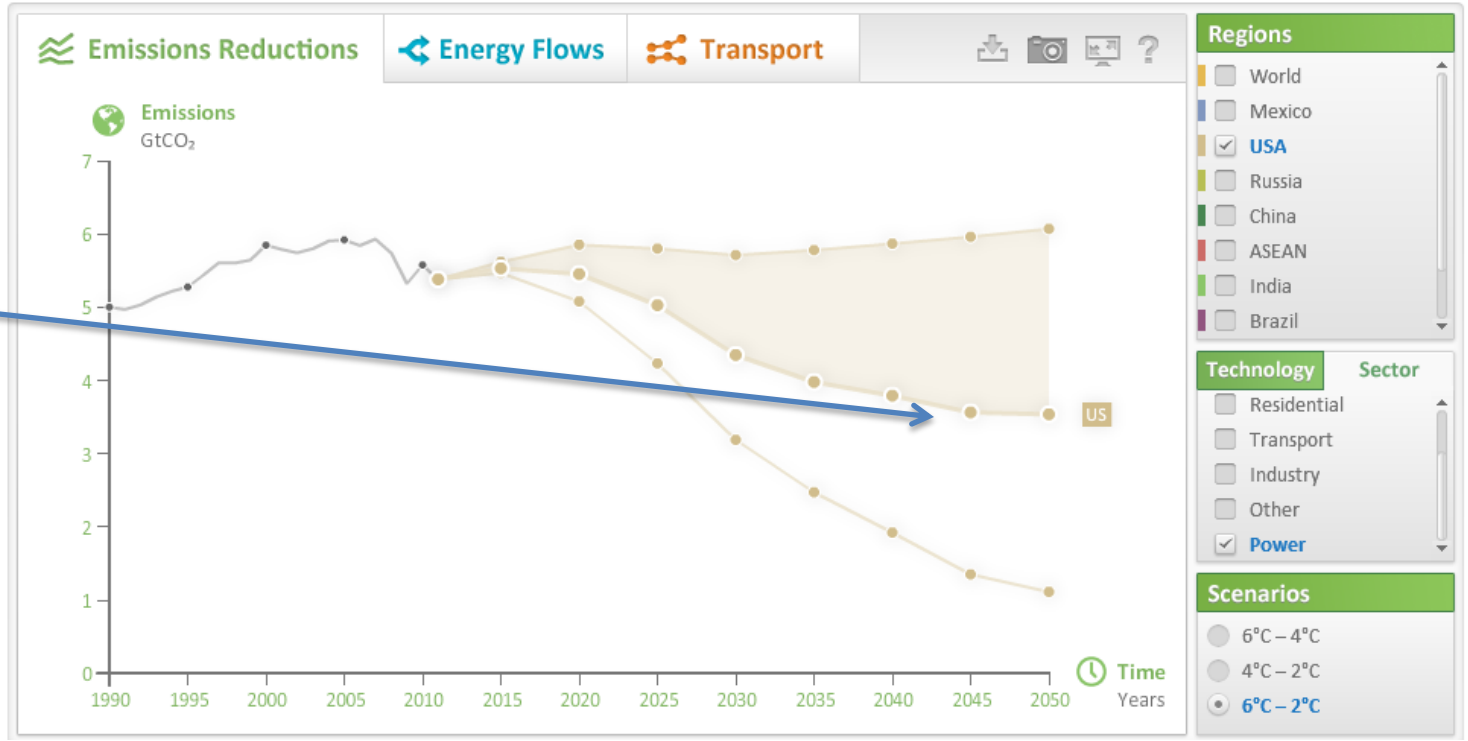
. . . However CO_2 has been reduced to level of an efficient gas plants so more gas coming into the system won't reduce emissions . . .

Doesn't account for fugitive emissions

Gas, While Important, Can Not Rise Indefinitely

- "Substitution of gas for coal as an energy source results in increased rather than decreased global warming for many decades." National Center for Atmospheric Research (2013)
- International Energy Agency sees 650 PPM of CO2 in atmosphere under "Golden Age of Gas" scenario, effects would be catastrophic

To have 50% chance of avoiding total disaster emissions from power sector must be cut 50% - 100% (depends on other sectors)



Given the massive transition in progress all regulatory structures & market rules will remain in flux to some degree. Live with it .

Concerned about gas supply? One tempting option:

PANIC **Ignoring climate, the future etc . . .**

Are there alternatives that balance full range of concerns? Yes, but they are not simple . . .

Getting Gas Right Means Identifying the Real Problems and Creating Tailored Solutions

Perception

- Pipes are fully utilized
- Capacity release/renomination opportunities are sufficient
- Basis problem = need for more capacity
- 75% utilization threshold = basis spikes
- Needle peaks cannot be resolved without new pipelines
- New greenfield pipes will resolve the basis problems

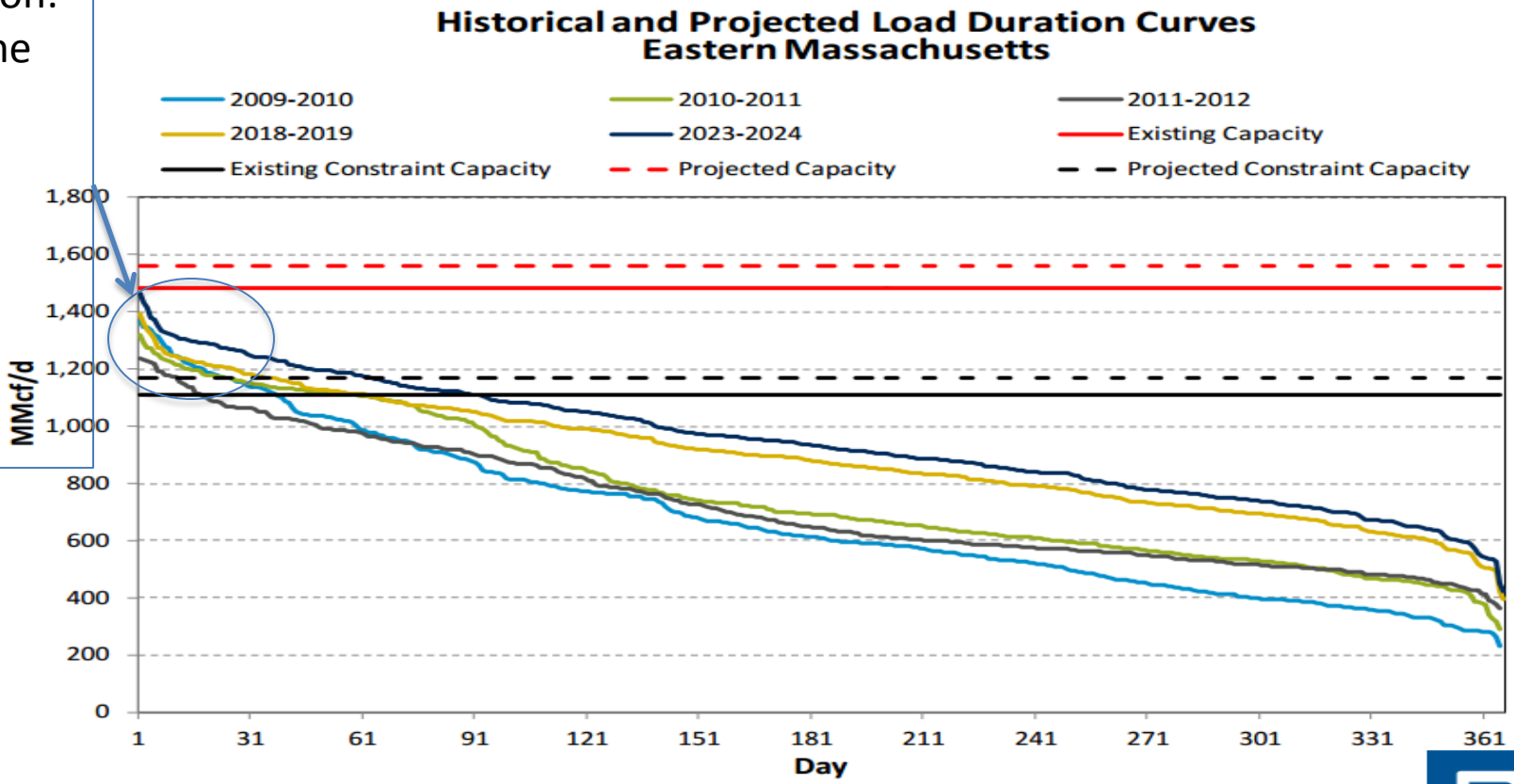
Reality

- Subscribed but not fully utilized
- More opportunities for intra-day and short term releases
- Greater intraday liquidity/transparency
- Market refinements/new services raise to 85%
- On site storage (e.g., LNG), and market based services provide solutions
- Incremental expansion of existing pipelines is more cost effective, faster, and can be climate compatible

Big Opportunities in both Short and Longer Term From Simply Maximizing Use of Existing Infrastructure

Current situation: Pipeline truly "full" only a small part of the year

Eastern Massachusetts Load Duration Curve



Source: Black & Veatch Analysis, Electronic Pipeline Bulletin Board

Important Takeaways from Black & Veatch

- "The consumer consequences of New England's increasing dependence on natural gas as an electric fuel source are difficult to quantify precisely and predict accurately." Internal NESCOE Memo

- "In the Low Demand Scenario, infrastructure solutions are **not needed or justified.** The Low Demand Scenario is predicated largely on substantial, ongoing gains in natural gas and energy efficiency, and other demand-side management programs, distributed resources and RPS, which result in retreat from natural gas across all sectors." Phase III, 9

- Black & Veatch only examined 3 long-term solutions: Cross-Regional Pipeline, "Economic Canadian Imports" and "Firm contract Canadian Imports"

Each of the B&V Alternatives Resulted in Economic Losses for First 6 Years Because:

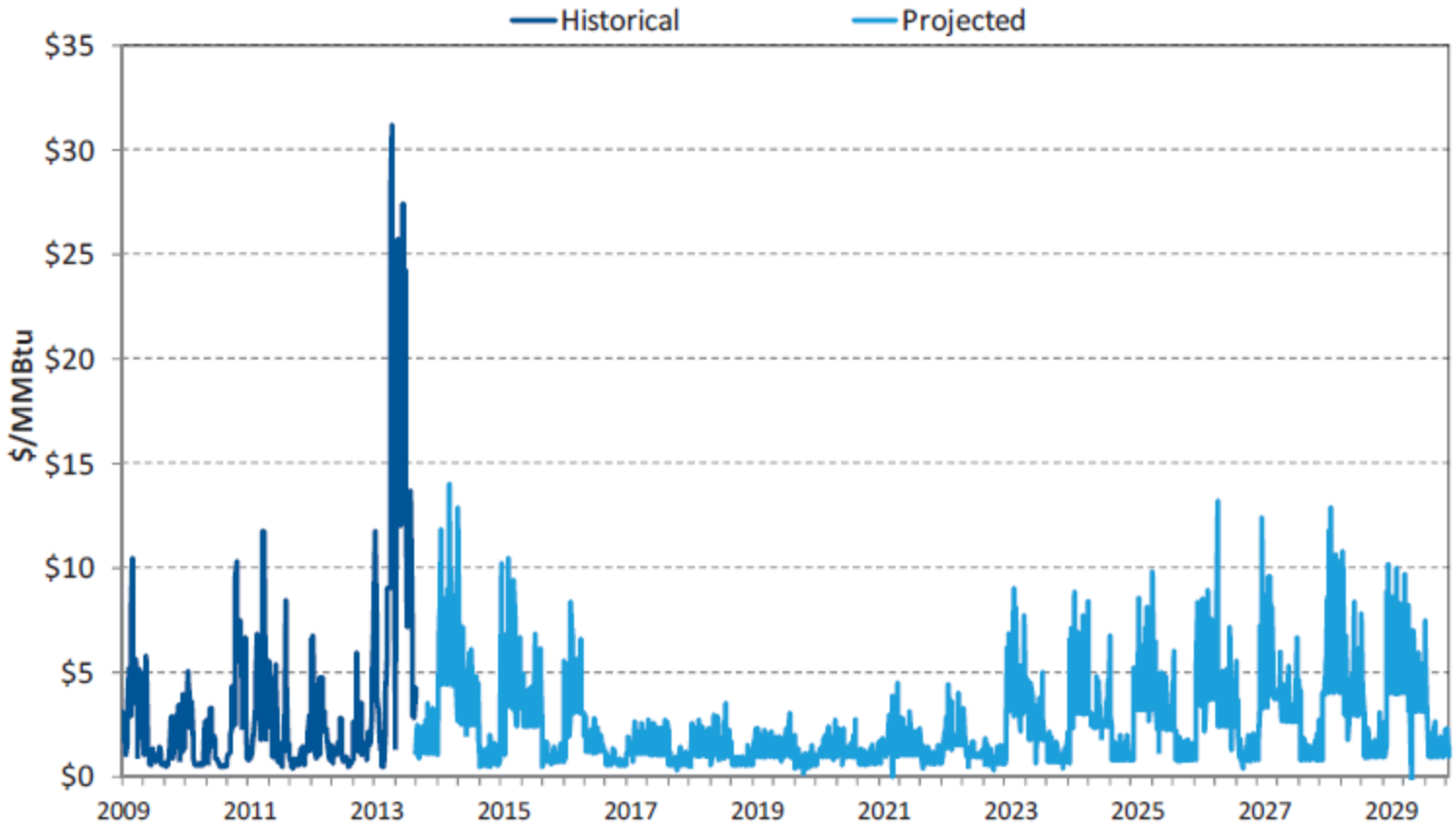


Figure 18 Daily Algonquin City-Gates Basis to Henry Hub: Base Case Forecast

Source: *Platts historical data, Black & Veatch projection*

Where are We Now?

Lower Prices

- October 2014 natural gas prices **28.5% lower** than October 2013
- October 2014 natural gas prices **16.8% lower** than September 2014
- Avg LMPs **15.2%** lower than September 2014

NEPOOL Participants Committee Report, Nov 2014 available at
www.iso-ne.com/static-assets/documents/2014/11/november-2014-coo-report.pdf

Where are we Now

- Massachusetts withdrew from NESCOE Tariff Proposal
- "Low Demand Analysis" is Underway
- Winter Reliability Program **Will** Include LNG this year
- NAESB has proposed 3 additional nomination periods for natural gas. Comments to FERC due Nov. 27
- Maine PUC Staff concluded contract with pipeline not likely to be cost effective BUT Commissioners overruled

Current Pipeline Proposals

Total more than 4.5 Billion cubic feet a day

AIM 342,000 MMcf/d projected Nov. 2016

Constitution Pipeline 650 MMcf/d projected Nov. 2015 or 2016

Atlantic Bridge 100-600 MMcf/d projected Nov. 2017

Northeast Direct 600 MMcf to 2 Bcf/d projected Nov. 2018

Access Northeast 200 MMcf to 1 Bcf/d projected Nov. 2018

Battle Over the Vision for New England's Energy Future: 9,000 MW Retiring BUT

[1] ISO-NE's At-risk Units & VT Yankee Utilized Capacity and Capacity Factors, 2010-June 2014

Year	Theoretical Capacity MW)	Used Capacity (MW)	Capacity Factor
2010	8892	2,114	24%
2011	8892	1,417	16%
2012	8892	1,079	12%
2013	8892	1,407	16%
2014 Jan-June	8892	1,763	20%
Avg used capacity 2010-June 2014		1,728	

Theoretical Capacity calculated from ISO-NE retirement risk table plus 620 MW for VT Yankee from the EIA Used Capacity (MW) calculated from gross load (MWh) numbers reported quarterly by the coal & oil plant operators to EPA's Clean Air Markets Division plus VT Yankee gross load (MWh) reported to the EIA [2010 most recent year reported, same figure repeated for remaining years].

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Battle Over Vision for New England's Energy Future: What Will It Look Like in 2050

[3] Generation mix in the ISO-NE Interconnection Queue, Sept. 2014

Fuel & Technology	Totals	Wind	Solar PV	Natural Gas Combined Cycle	Natural Gas Combustion Turbine	Natural Gas Steam Turbine	Hydro	Biomass
Net MW in Interconnection Queue	9269.76	3681.03	6.00	4173.00	1297.55	7.50	34.98	69.70
Max potential (MWh)	81,203,098	32,245,823	52,560	36,555,480	11,366,538	65,700	306,425	610,372
avg cap factor for type		32%	19%	47%	4%	11%	38%	51%
likely (MW) generation capacity	3233.32	1188.97	1.16	1940.45	53.20	0.80	13.33	35.41
likely MWh annual generation	28,323,872	10,415,401	10,197	16,998,298	466,028	7,030	116,748	310,171

ISO-NE Interconnection Queue data as of 9/1/2014.
Average capacity factor by technology from EIA Electric Power Monthly, July 2014, at 146-47 Tables 6.7.A & B
As described above, "likely" capacity and generation figures were calculated using the EIA average capacity factors.

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