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Presentation to the Energy & Technology Committee

Informational Forum on Adequacy of Energy Supplies Including Nuclear Power in the State

Katie Dykes

Deputy Commissioner for Energy
CT DEEP



Connecticut Department of Energy and Environmental Protection

2014 Integrated Resources Plan for CT

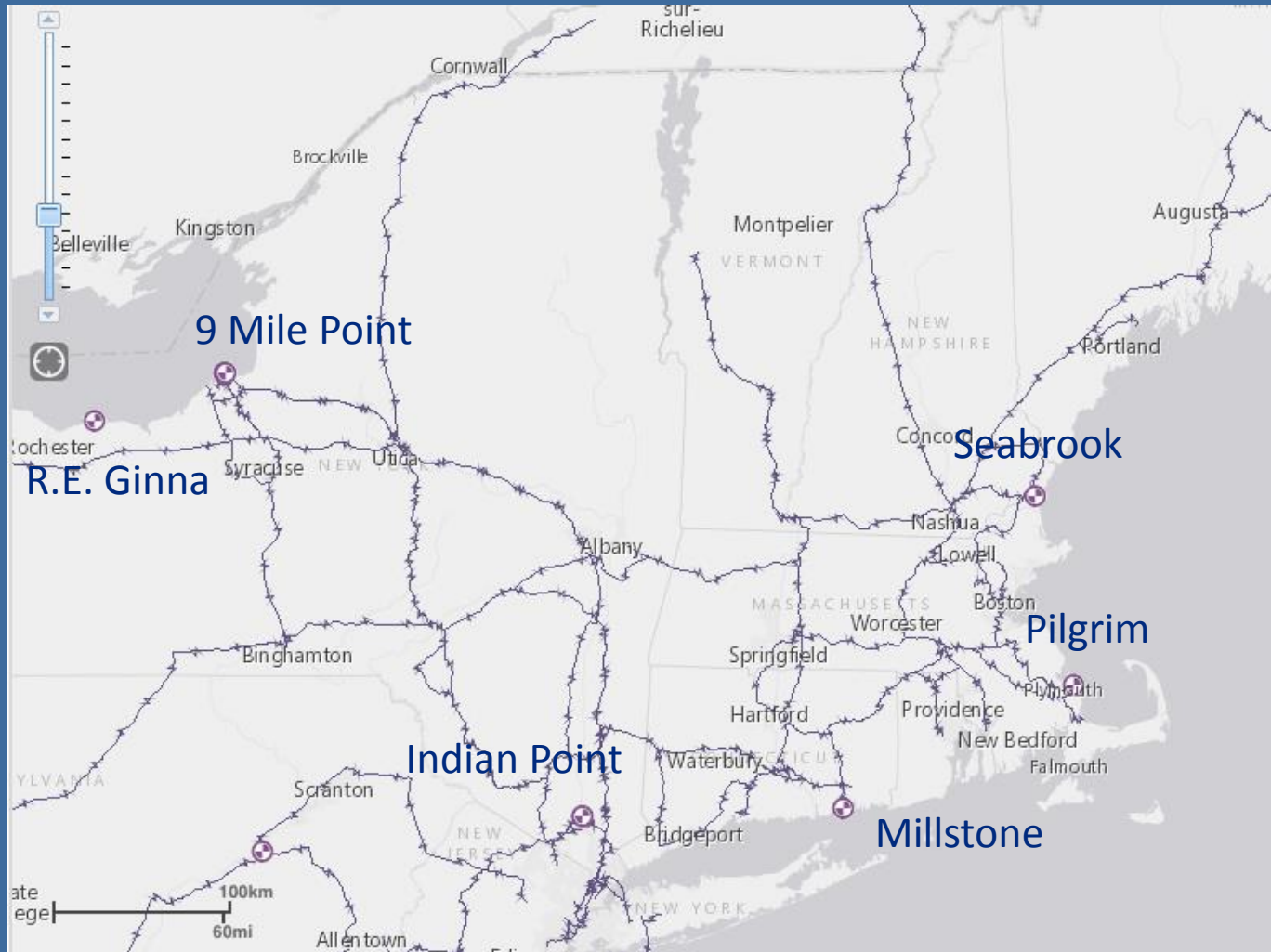
“Although the 2014 IRP projects that Connecticut will have sufficient generating resources to meet the Local Source Requirement, it is important to highlight **critical risks** that could adversely affect resource adequacy in the state. Only one plant in Connecticut is large enough to potentially leave Connecticut impaired if one or all its units were to retire: the approximately 2,100 MW Millstone nuclear plant.”

“**There is no indication that the Millstone units will retire within the 2014 IRP study horizon** [before 2024] and, in fact, both units have been relicensed to operate until 2035 and 2045, respectively. However, . . . **it is worth assessing the risk in case any unexpected factors caused it to shut down.**”

“[E]nough resources are already required in Connecticut to cover the temporary loss of either of those [Millstone] units. However, **a permanent loss of supply of this magnitude could raise resource adequacy concerns** for the Connecticut sub-area.”



Northeast Nuclear Fleet

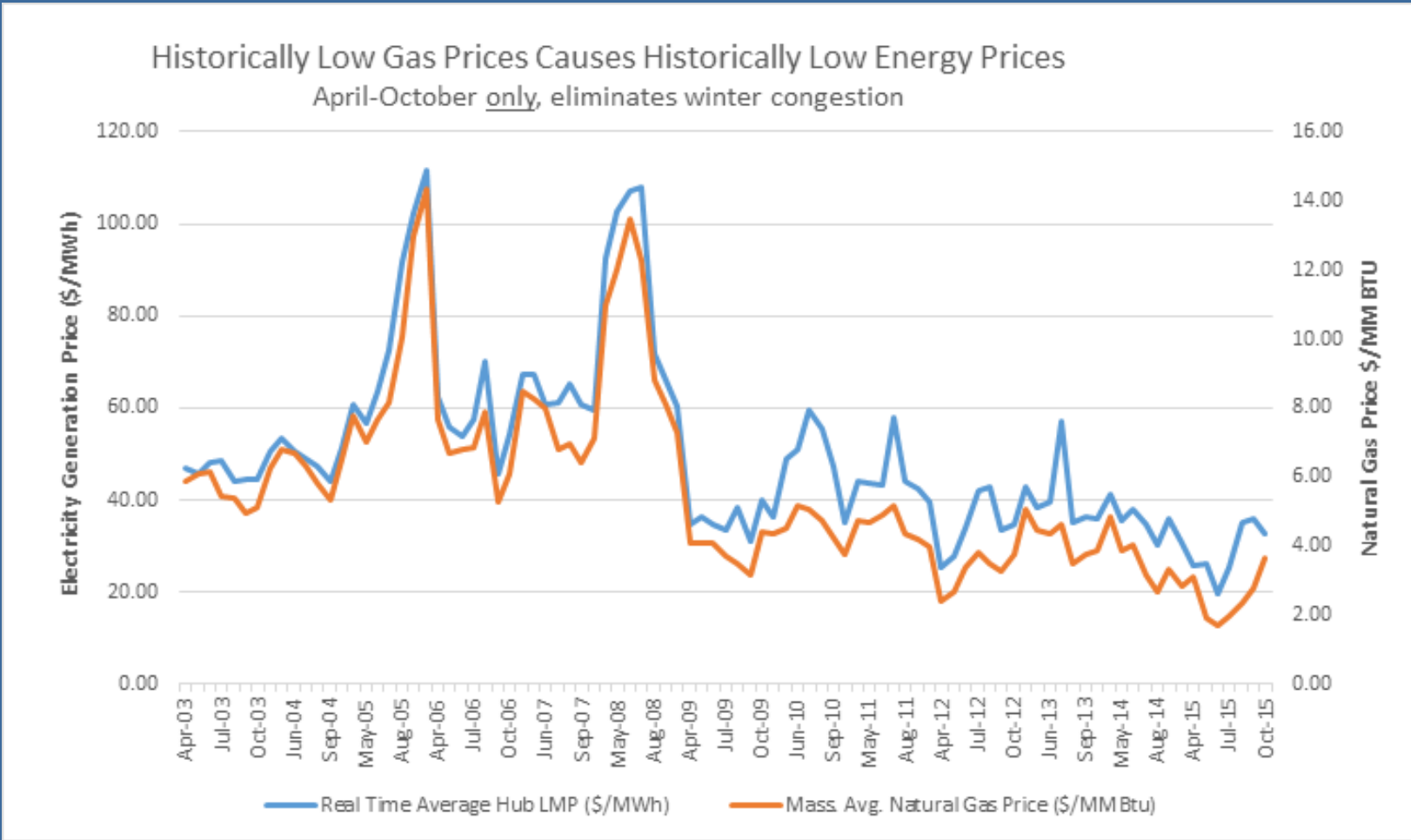


Market Outlook for New England Nuclear

- Nuclear plants characterized by high fixed costs and relatively low fuel and other variable costs
- Increase in natural gas generation capacity since 2000, fueled by low cost natural gas, resulting in reduction in wholesale energy prices (see graph on next slide)
- Negative pricing: Nuclear units are sometimes paying to generate during off-peak periods because they cannot ramp down.
- Capacity prices:
 - Capacity prices have increased over the past few years from \$ 3.60 kW/month in 2011/12 to \$ 9.55/kW/month in 2018/19 (2015 auction).
 - Capacity prices declined in the 2019/20 (2016 auction) to \$7.03 kW/month (25% lower than the previous year, and 35% below pre-auction estimates of the expected clearing price)
 - Capacity prices expected to remain at these levels or increase further in the next few years.
- Gas infrastructure constraints:
 - Mild winter in 2015/16 compared to 2013/14, 2014/15
 - New England states expected to resolve gas infrastructure constraints that have caused energy market price spikes in cold winters
- Anticipated entry of new clean energy supply expected to displace higher cost generation



Natural Gas Causing Lower Energy Market Prices



New England Nuclear Power Plants

Plant (Owner)	Capacity (MW) / Relicense Date	Status
Vermont Yankee (Entergy)	620MW (2032)	Entergy announced intention to retire plant in August 2013. Plant closed in December 2014
Seabrook (NextEra)	1246 MW (2030)	
Pilgrim (Entergy)	677MW (2034)	Entergy announced in October 2015 retirement planned for June 2019
Millstone (Dominion)	Unit 2: 870 MW (2035) Unit 3: 1,210 MW (2045)	



Millstone Power Station

New London, CT

Source: Dominion



Potential Impacts of Retirement

Wholesale Market Costs

- Millstone accounts for roughly one-quarter of CT local sourcing requirement (LSR), the amount of generation capacity that ISO-NE requires in the state for reliability.
- Region would need to secure new generation capacity to replace Millstone units, resulting in higher capacity costs.
- In the event of Millstone retirement, ISO-NE could potentially put in place a **Reliability Must Run (RMR)** payment to keep Millstone online until replacement generation can be built. RMR payments are allocated to the benefited ratepayers in the affected zone/area of ISO-NE
- Energy market prices could increase, unless Millstone replaced with similar “zero bid” resources

Fuel Diversity

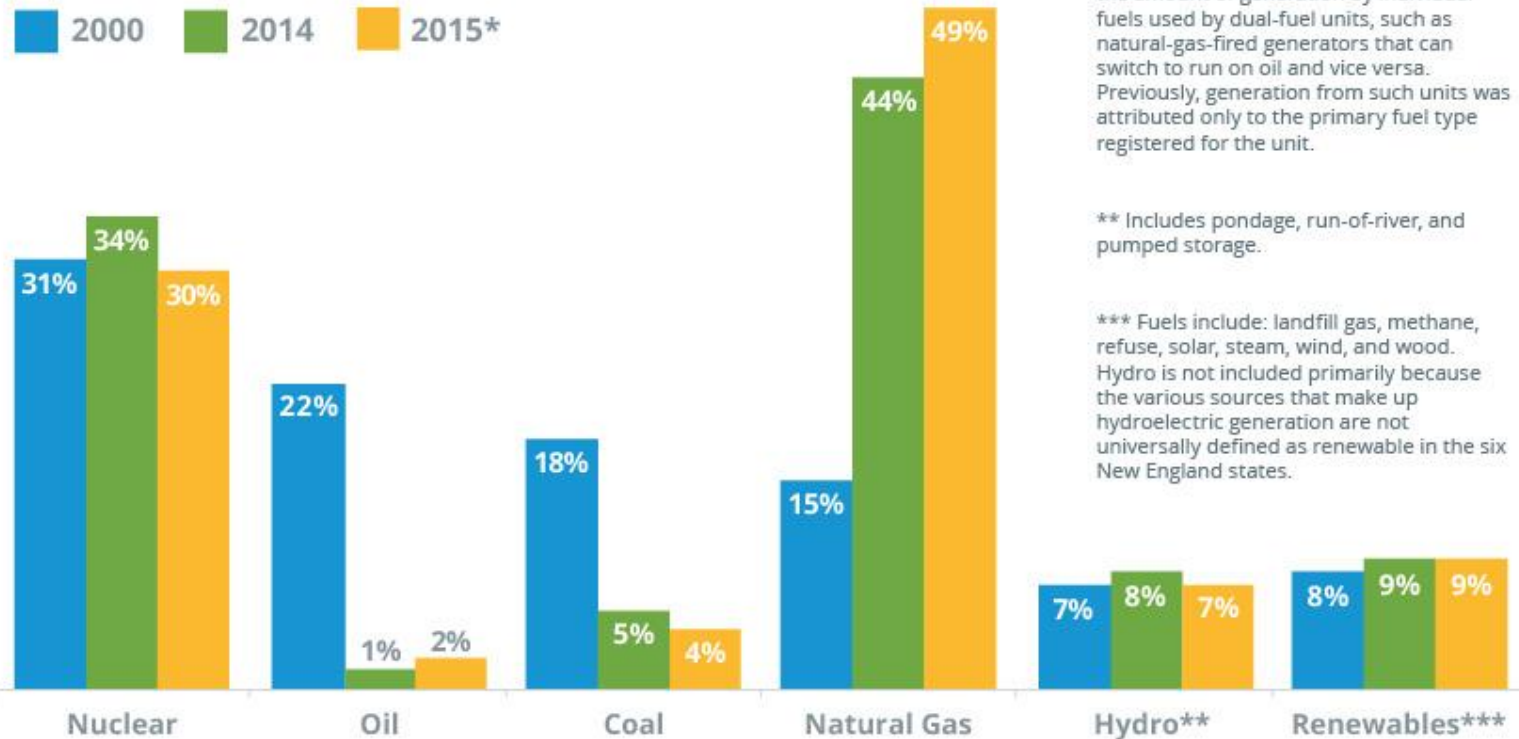
- If Millstone’s capacity were to be replaced with natural gas generation
 - Regional reliance on natural gas would increase, increasing market sensitivity to fluctuations natural gas prices
 - Additional gas pipeline capacity would be needed to avoid infrastructure constraints.



Potential Impacts of Retirement

Percent of Total Electric Energy Production by Fuel Type

2000 2014 2015*



* The figures are preliminary, based on pre-90-day resettlement data. Starting with 2015, data more closely approximate the amount of generation by individual fuels used by dual-fuel units, such as natural-gas-fired generators that can switch to run on oil and vice versa. Previously, generation from such units was attributed only to the primary fuel type registered for the unit.

** Includes pondage, run-of-river, and pumped storage.

*** Fuels include: landfill gas, methane, refuse, solar, steam, wind, and wood. Hydro is not included primarily because the various sources that make up hydroelectric generation are not universally defined as renewable in the six New England states.



Source: ISO-NE

Potential Impacts of Retirement

Air Emissions / Carbon Pollution

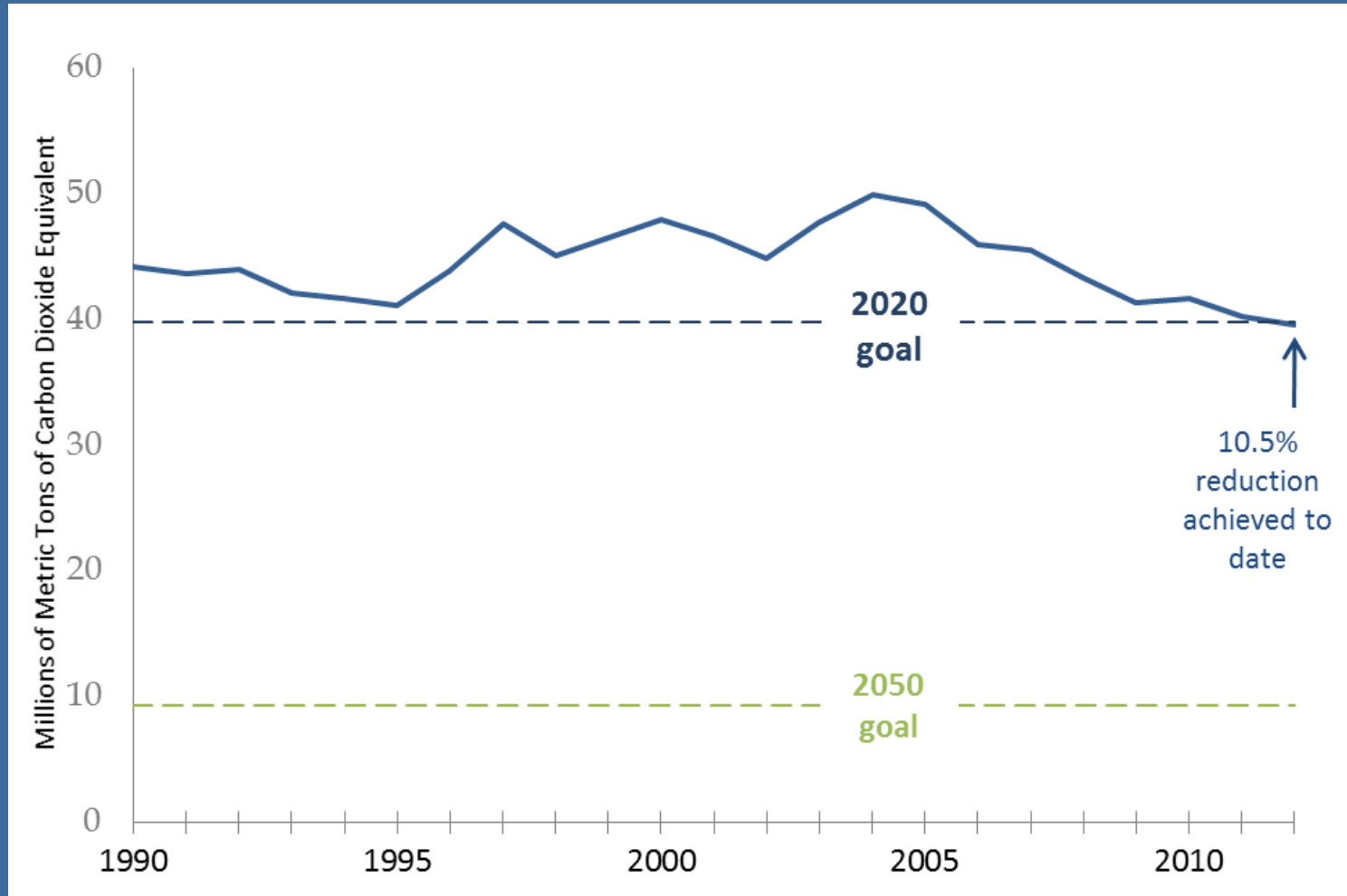
- If Millstone nuclear generation were to be replaced with natural gas generation:
 - New England electricity sector emissions could increase by 8 million tons per year, or ~27% increase in annual emissions
 - Compliance with Connecticut's Global Warming Solutions Act (GWSA) carbon reduction mandates would become more challenging

New England Electric Sector Emissions

Year	CO ₂ (Million tons/yr)
2012	32.2
2013	30.7
2014	28.2
2015	29.6



Potential Impacts of Retirement



Connecticut Department of Energy and Environmental Protection