
National Grid propaganda that they are disseminating to the business and community leaders. Their data is flawed. Their goal is to expand the national gas system for power generation (and the resulting expansion of LDC's). It is a political document for the purposes of creating momentum for their market expansion.
Sean
10-23-2019

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# 2019 Providence Resolution: Net Zero Carbon Pathway

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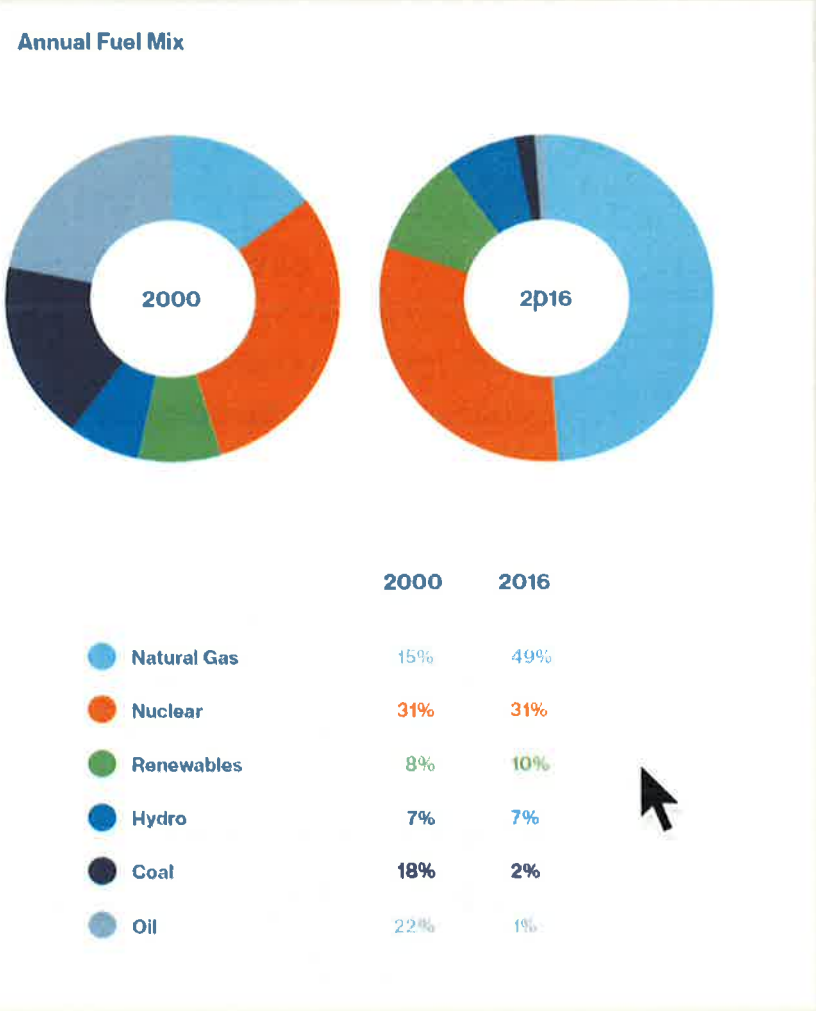
# REDUCING CO2 80% BY 2050: NOT A STRAIGHT LINE

# Goals are great until overtaken by events

- ERDA 1976, consensus forecast – 700 GW of nuclear by 2000
  - Nuclear peak – 101 GW
- Carter Administration – 1978 Fuel Use Act *bans* natural gas from power plant use
  - 2016 - Natural gas about 50% of NE generation, 1/3 of US
- Carter Administration – Solar/renewables to account for 20% of energy by 2000
  - 15% in 2016 -- solar 0.9%, hydro 6.5%, wind 5.6% -- but growth accelerating
  - 72% installed in 2016 utility-scale

- Analysis Group, 11/05
  - … a relatively urgent need for additional gas supply and infrastructure
  - … New England Governors' Conference projects winter peak gas demand will exceed supply within 5 years.
- Analysis Group, 11/15
  - Increased gas capacity not needed
  - No regional reliability issues through 2030
- Bloomberg, 12/27/17
  - …spot prices tripled and "turned the region into the world's priciest market."
- Fuel Security Report, 01/18
  - – rolling blackouts by 2024/25 winter possible




NEGA -- No new pipeline capacity for generation since 2004


Source: ISO New England 2019 Regional Electricity Outlook (March 2019)

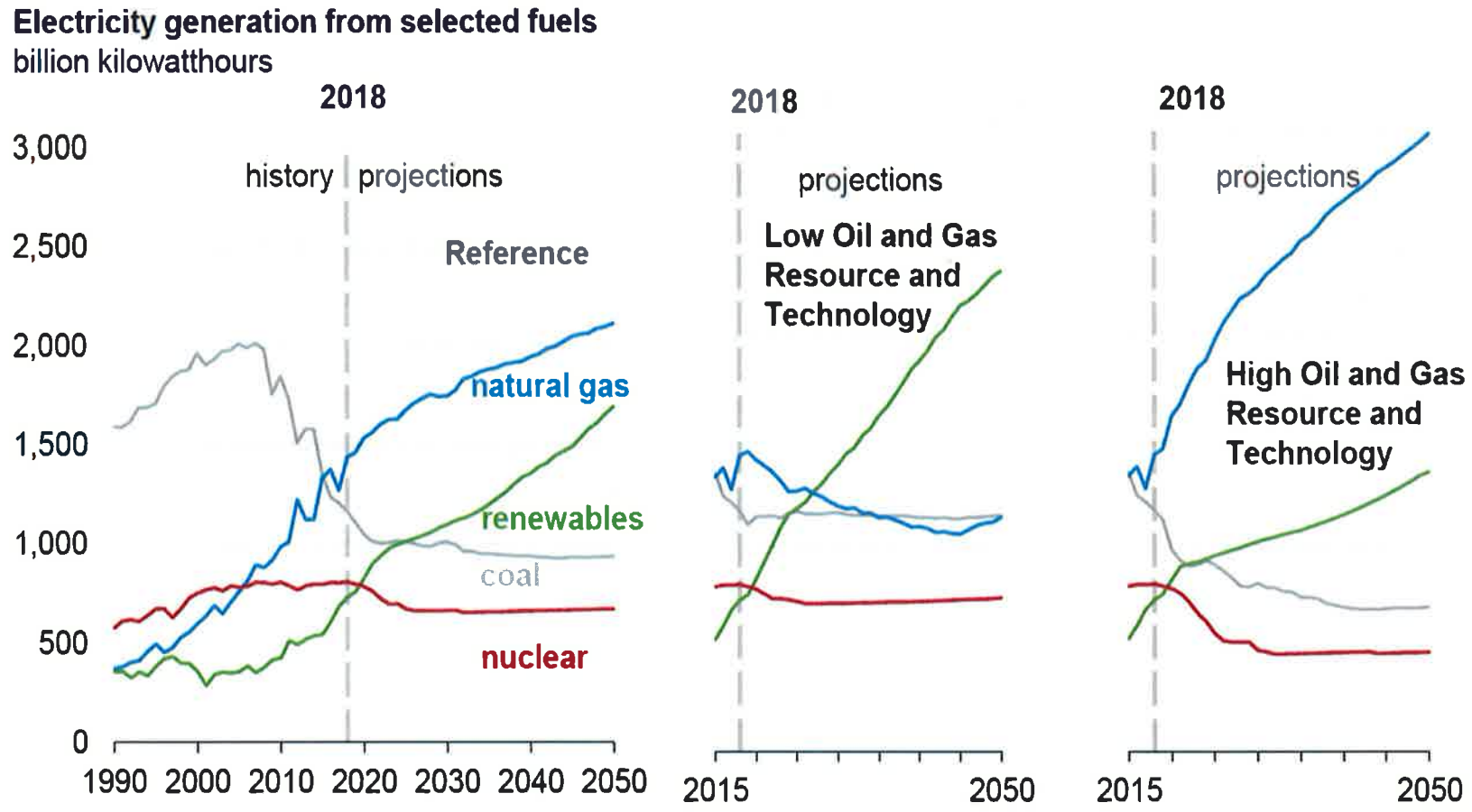
# Since 2013, More Than 5,200 MW of Generation Have Retired or Announced Plans for Retirement in the Coming Years

- Include predominantly coal, oil, and nuclear resources
- Another **5,000 MW** of remaining coal and oil are at risk of retirement
- These resources have played an **important** role in recent winters when natural gas supplies are constrained in New England

# Is there a path to consensus on natural gas for power generation and end-use consumers?

- Probably not for the foreseeable future
  - ISO Regional plan 8/19:
    - Sufficient resources are projected for New England through 2028 to meet the resource adequacy planning criterion, ***assuming no major retirements and the successful completion and operation of all new resources***
      - *(Note earlier 4/19 slide from ISO:* ***5,200 MW retired since 2013, another 5,000 at risk of retirement****)*
    - …" watching the preliminary strategic electrification initiatives …. new electricity uses will be important considerations in the long-term outlook for annual electric energy use and peak demand in the years beyond the RSP19 forecast period.
- There is no apparent public policy or investor willingness
- Moratorium on hookups in MA – 14 communities, 225,000 customers and growing

# EIA 2019 Annual Energy Outlook
## Scenarios Highlight Uncertainty



# ISO New England Today: "Looking Ahead"

- Aggressive pursuit of energy efficiency and renewable energy reduces dependency on fossil fuels
- Power demand will remain flat or slowly decrease for at least five years
- However, shift to electric vehicles and buildings may gradually reverse trend
- Small surplus, but coordination of "exit and entry of resources may lead to *shortage conditions and price volatility*"
- Margin of error is small -- *during cold weather region vulnerable to large outages on the gas and electric systems.*

# And Then Columbia Gas explosions Sept 13, 2018

**'Armageddon' Anniversary: A look back at the Merrimack Valley Columbia Gas explosions**

**'I Want Justice': Family Of Teen Killed In Merrimack Valley Gas Explosions Talks Exclusively To I-Team**

# Employers care about markets and impacts

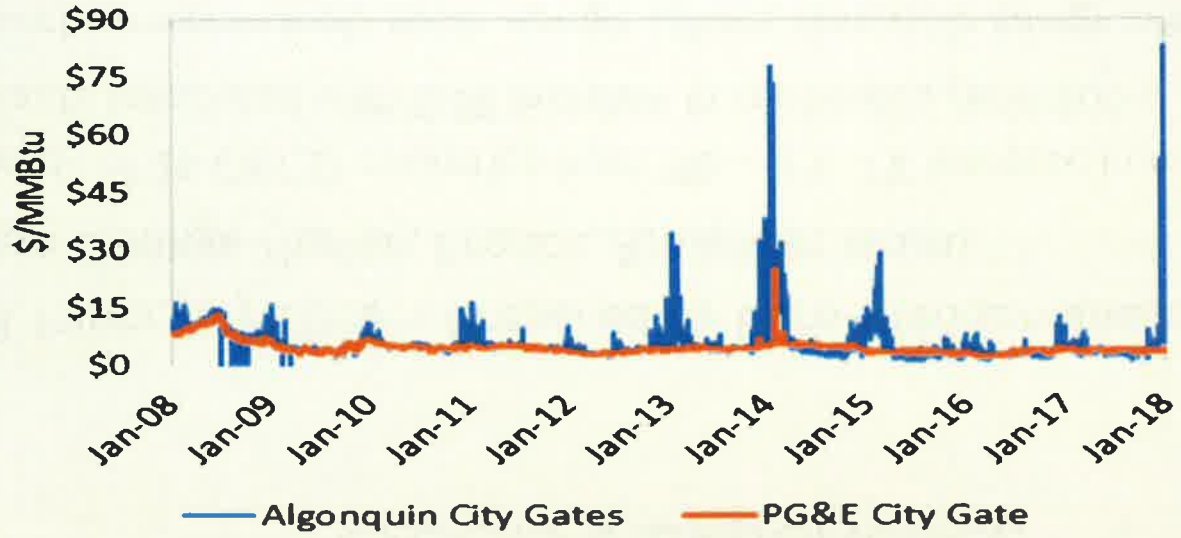
- "Electricity costs … concerns about future price volatility, along with the inability in this region to build new energy infrastructure … a distinct disadvantage as we look to expand." NH
- Electricity costs were one of the factors that led to the loss of $10.5 billion government contract … "that could cost as many as 1,000 jobs." ME
- A manufacturing facility warns that "addressing issues related to high costs and the lack of pipeline capacity is critical to our future success." CT
- "Making electricity more affordable" is a major factor effecting "a very, very competitive business" facing world-wide competition. MA
- New England is on the razor's edge regarding the reliability of its electrical grid …. Our elected officials, regulators, and thought-leaders need to embrace policies and projects that optimize all-of-the-above resources, including large energy infrastructure projects. BIA NH

Boston Globe Editorial, February 13, 2018

"Natural gas has shown itself to be an important bridge to a clean energy future," said Ernest J. Moniz, the former secretary of energy in the Obama administration. "For New England, expanding the pipeline capacity from the Marcellus" — the area of shale gas production in Pennsylvania — "makes the most sense."

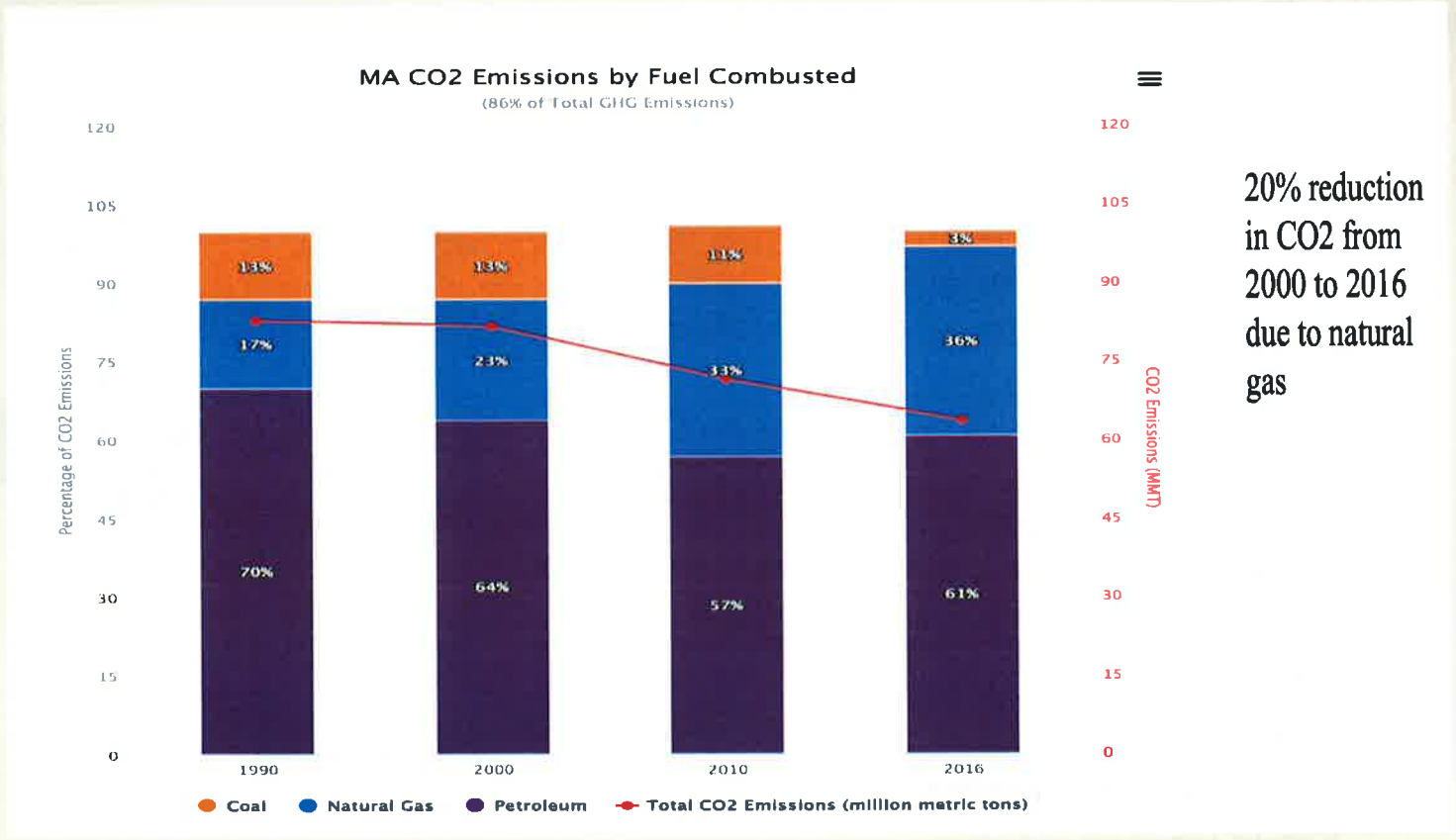
# California's Experience

In 2001, gas constraints cost CA $19.4 billion. Utilities were ordered to overbuild pipeline capacity. In 2009, the CA Energy Commission said this "insurance policy" helped shield the state from the "brunt of price volatility." The result is clear. *Major difference between CA and Northeast is a direct result of CA's "long-standing policies to maintain pipeline and storage capacity adequate to meet the growing future peak demand requirements."*



# OECD's Experience

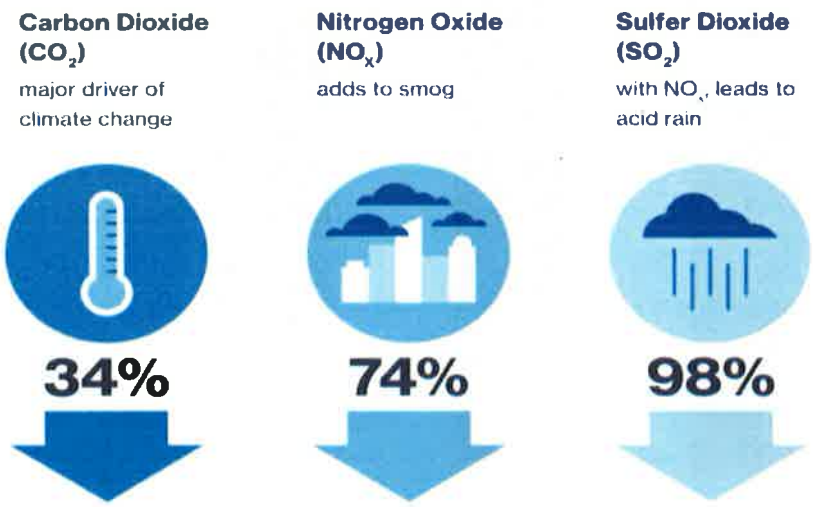
- NBER Paper, July 2016 – Prepared by Euro-Mediterranean Center on Climate Change (Italian, French, American team)
  - Study of 26 OECD countries from '90 – '13: 1% increase in natural gas-fired plants associated with 0.88 increase in renewable generation.
  - *"Lacking economically viable storage options, renewable energy integration has so far been possible due to the presence of fast-reacting … back-up capacity."*
  - *"…fast-reacting fossil technologies … should be jointly installed to meet the goals of cutting emissions and ensuring a stable supply."*
  - Nevertheless, when fast-responding battery storage is prevalent and reliance on natural gas will be less prevalent. Washington Post author interview 8/11/2016 on NBER report




20% reduction in CO2 from 2000 to 2016 due to natural gas

# Power Plant Emissions Have Declined with Changes in the Fuel Mix

## New England Generator Air Emissions 2000 vs. 2017

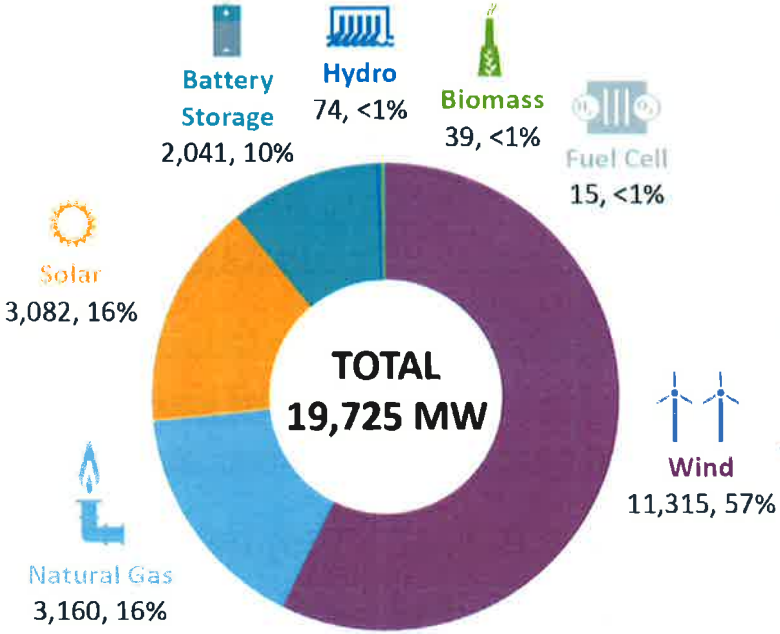



- The **70 million short tons** of carbon dioxide emissions avoided regionally between 2001 and 2017 is like taking more than **13.5 million passenger vehicles** off of the road for a year
- For comparison, in 2016, roughly **5.1 million** vehicles were registered in New England

Source: 2017 ISO New England Electric Generator Air Emissions Report (April 2019); ISO New England 2019 Regional Electricity Outlook (March 2019)

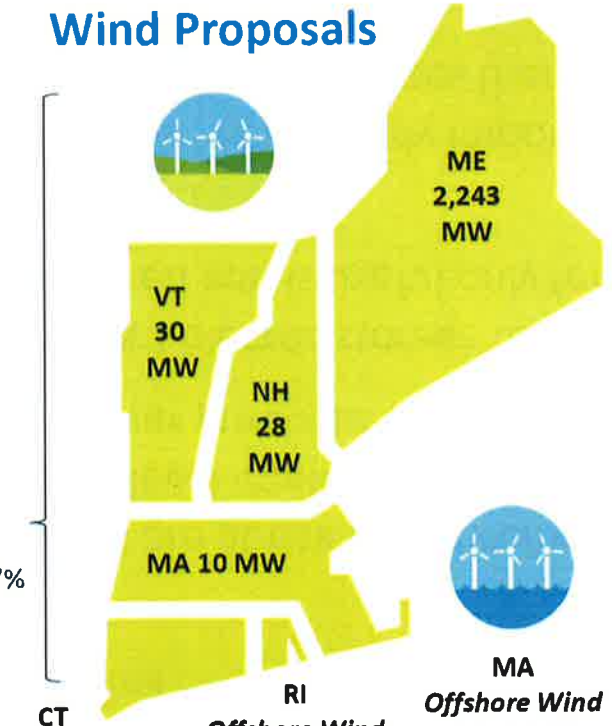
# Wind Power Comprises More Than Half of New Resource Proposals in the ISO Interconnection Queue

## All Proposed Resources




Source: ISO Generator Interconnection Queue (April 2019)
FERC and Non-FERC Jurisdictional Proposals; Nameplate Capacity Ratings
Note: Some natural gas proposals include dual-fuel units (with oil backup).
Some natural gas, wind, and solar proposals include battery storage.

## Wind Proposals



# The Emergence of an Energy Constrained System

*Retiring and emerging resources exhibit very different characteristics*

- Resources with **onsite fuel storage** are being replaced by resources that cannot always get fuel or are entirely dependent on the weather
- The remaining **nuclear power stations** are at risk for retirement, until policymakers price carbon at the level implied in renewable energy contracts, or provide them power purchase agreements
- **Energy storage** is important; but current electric storage technology is limited in the quantity of energy stored and is useful only for short-duration events (hours)
- Addressing "energy security" will become increasingly important as the New England power system shifts toward resources that face **constraints on energy production**

*REDUCING CO2 80% BY 2050*

# *Addressing risks to a clean energy future*

# FRAMEWORK

- Climate change is real -- MA/NE have aggressive goals to reduce CO2
  - MA - Generation sector '08-'18 reduced CO2 emissions 52% through energy efficiency, renewable resources, and retirement of carbon-intensive generators.
- Utilities are major players
  - Eversource – 4,000 MW of wind with Orsted, Ev's, Storage
  - National Grid – Northeast 80X50 Pathway, EV and Buildings initiatives
- Energy costs are high relative to other regions
- Achieving CO2 goals is not without risk and uncertainty
- Natural gas is a bridge to a clean energy future and the goal of 80% by 2050

# HISTORICAL PERSPECTIVE: GOALS OVERTAKEN BY EVENTS

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  - Nuclear peak – 101 GW
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# GENERATION MIX HAS CHANGED: RISK OF FUTURE RETIREMENTS


Source: ISO New England 2019 Regional Electricity Outlook (March 2019)

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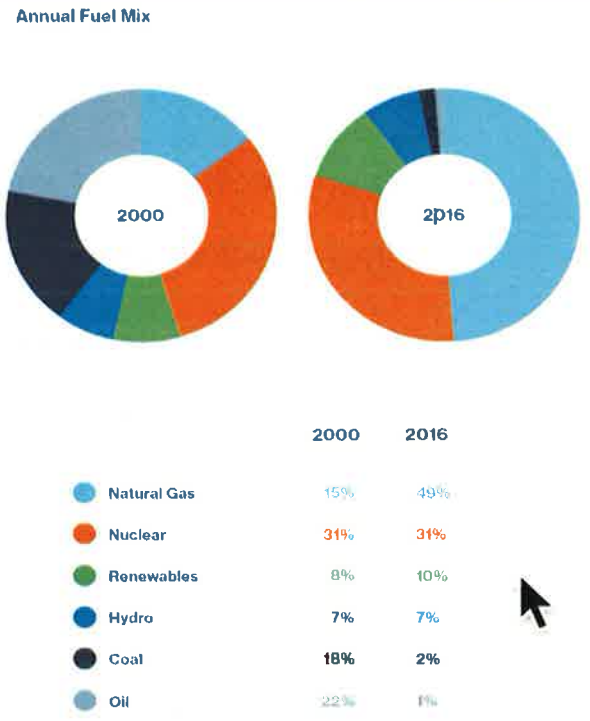


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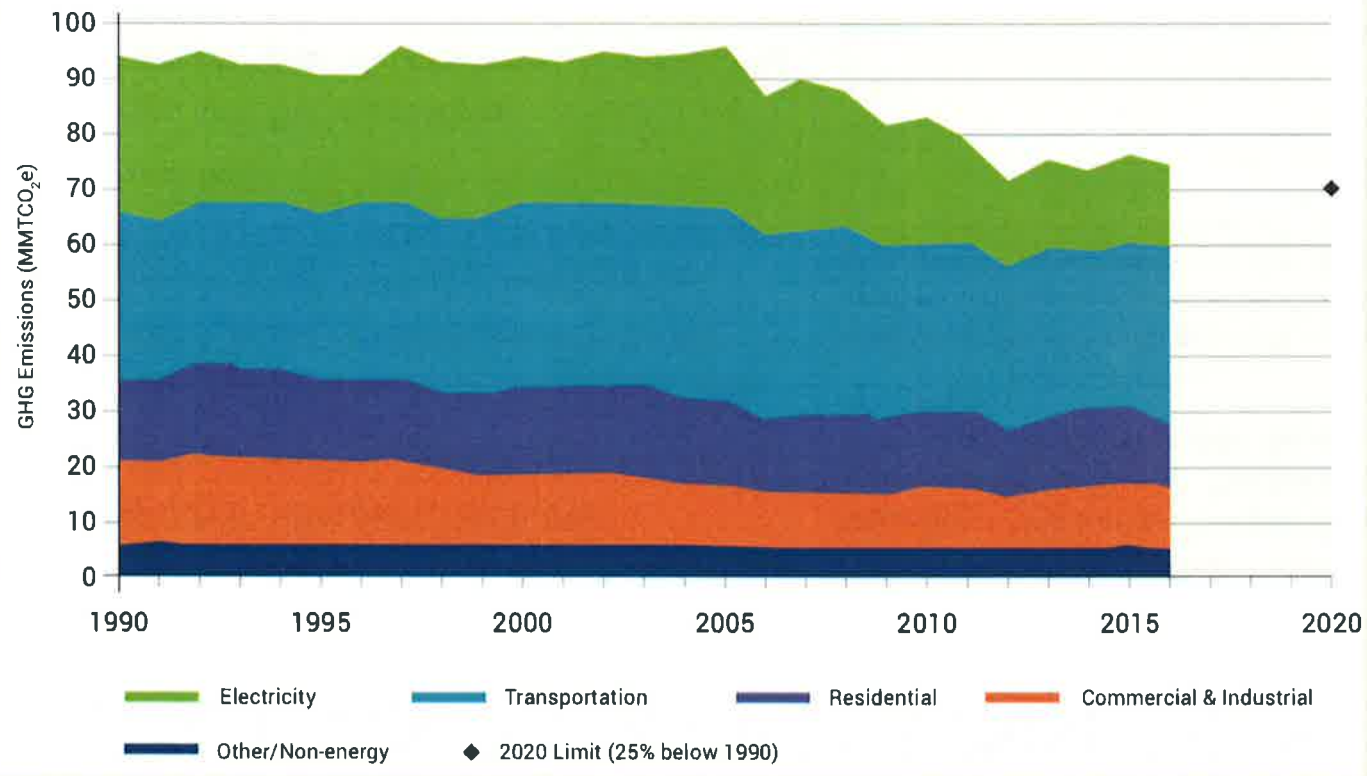
# PROGRESS TOWARD EMISSION REDUCTION GOALS

**FIGURE 2** | MASSACHUSETTS GHG EMISSIONS, 1990 – 2016



# OECD AND CA OFFER INSIGHTS

- NBER Paper, July 2016 – Prepared by Euro-Mediterranean Center on Climate Change
  - 26 OECD countries from '90 – '13: strong correlation between natural gas and renewable growth: *"Lacking economically viable storage options, renewable energy integration has so far been possible due to the presence of … back-up capacity."*
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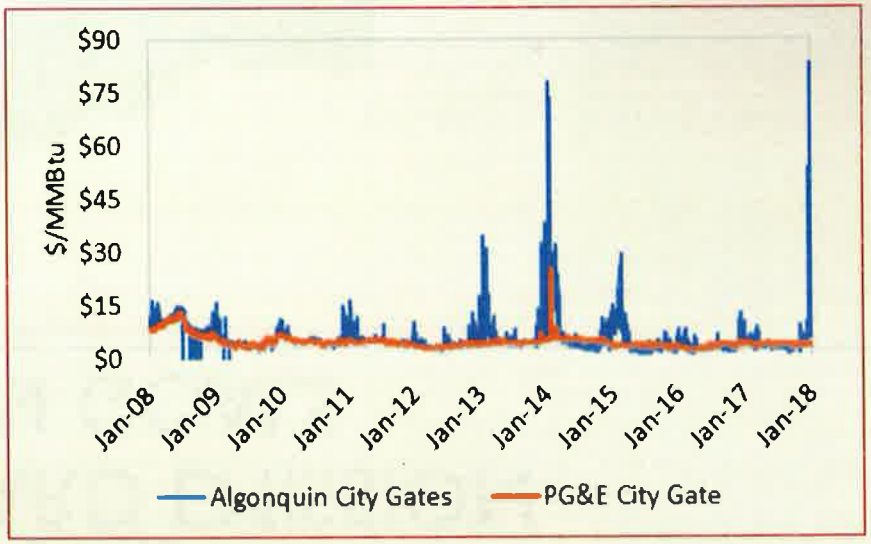
  - "Nevertheless, when fast-responding battery storage is prevalent and reliance on natural gas will be less prevalent." Washington Post 8/11/2016

**Germany -** "Renewables Threaten German Economy & Energy Supply," McKinsey Warns In New Report. Gas pipeline from Russia controversy

**Australia**, rich in natural gas, lacks network of pipelines – regulators in August sued four wind farm operators for contributing to a huge blackout in 2016.



# RELATED PERSPECTIVES

ISO New England – Energy Constrained System

- Risk: "just-in-time" gas-fired and renewable technologies may be unavailable simultaneously
- Energy storage important but limited in quantity and short-duration

Ernest Moniz - Boston Globe Editorial

- *"Natural gas has shown itself to be an important bridge to a clean energy future,"* said Ernest J. Moniz, the former secretary of energy in the Obama administration. "For New England, *expanding the pipeline capacity from the Marcellus makes the most sense." 2/18*

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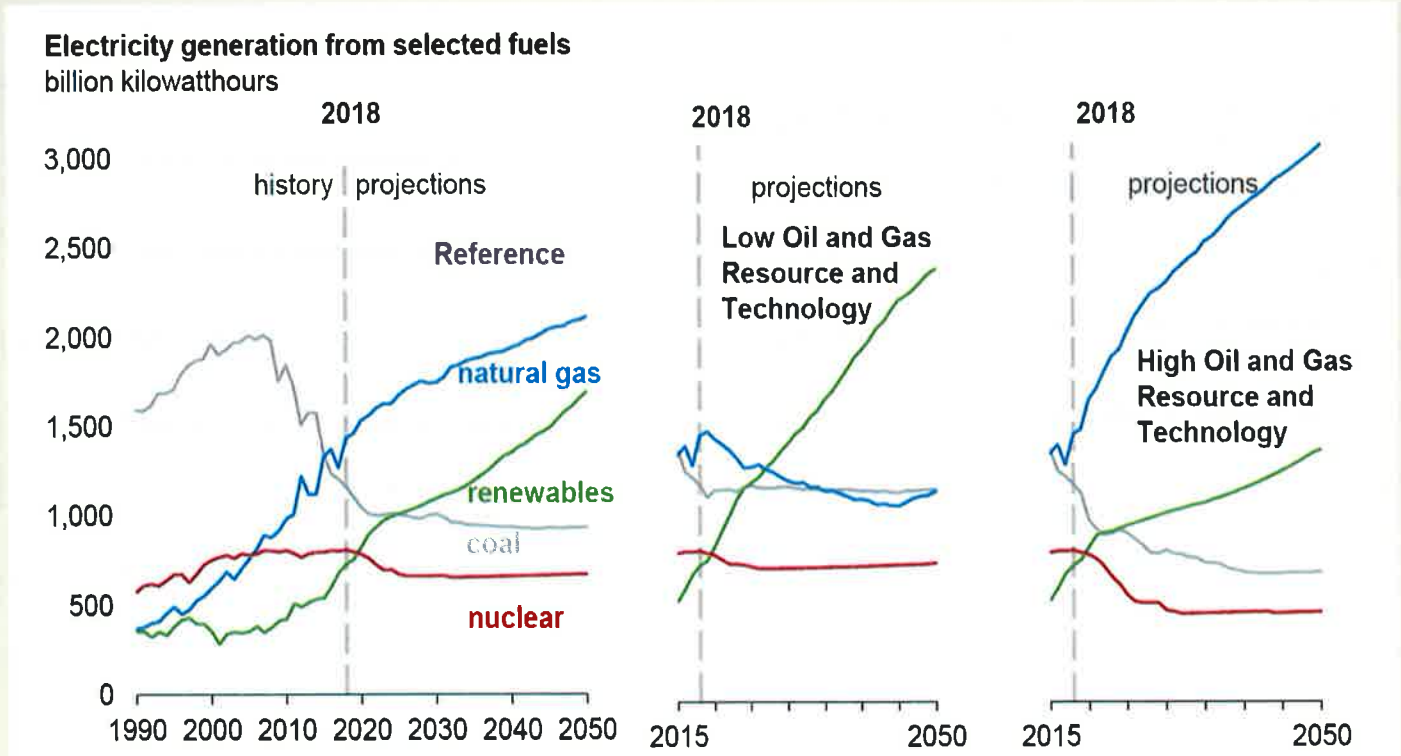

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- Margin of error is small -- *during cold weather region vulnerable to large outages on the gas and electric systems.*

# Is there a path today to consensus on natural gas?

- No apparent public policy or investor willingness: Public opposition to infrastructure – transmission and pipelines – remains strong
- Goals being achieved, ISO addressing fuel security issue
- Yet, experience and history suggest back-up generation is an important bridge to a successful transition for a clean energy future
- Your thoughts?