

Natural Gas

Markets, Prices and Happenings

NGA Gas Operations – June 5, 2020

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Eversource

Manager Gas Supply

Overview

- **Back where it all began....**
 - **From Wellhead to Burner Tip**
 - **Local Distribution Company Supply Planning**
- **What's been happening?**
 - **Shale Gas, The Game-changer**
 - **Natural Gas Markets**
- **What's Next:**
 - **Pipeline Infrastructure Projects?**



Back where it all began.....



Its nothing new....



- In 1816, Baltimore, Maryland used manufactured natural gas from coal to become the first city to light street lights



- In 1836, the City of Philadelphia created the first municipally owned natural gas distribution company and is now PGW



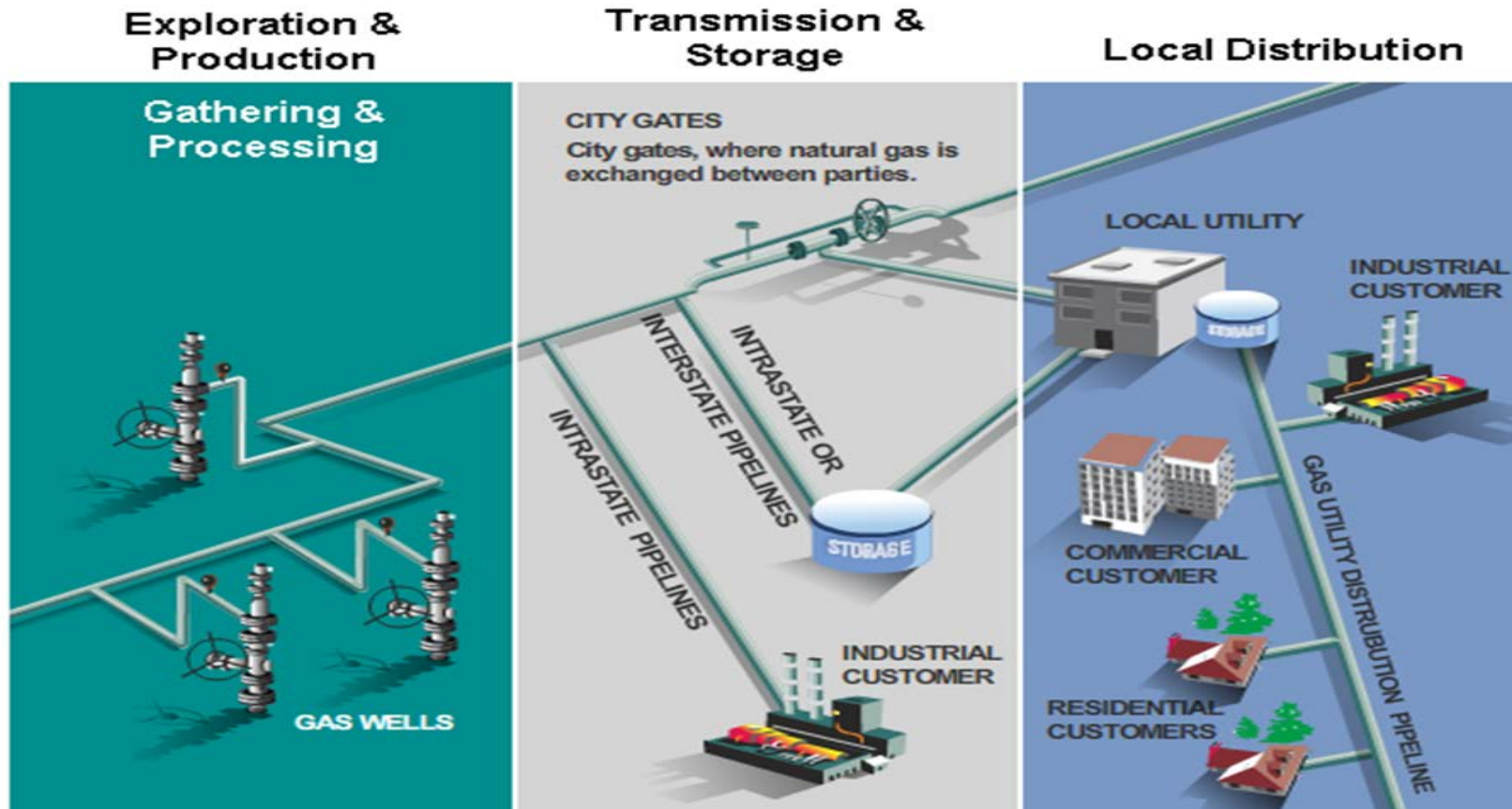
- In 1859, the first well was dug

- In 1885, Bunsen burner was invented changing its uses



But it got complicated....

- From Wellhead -----> Burner Tip



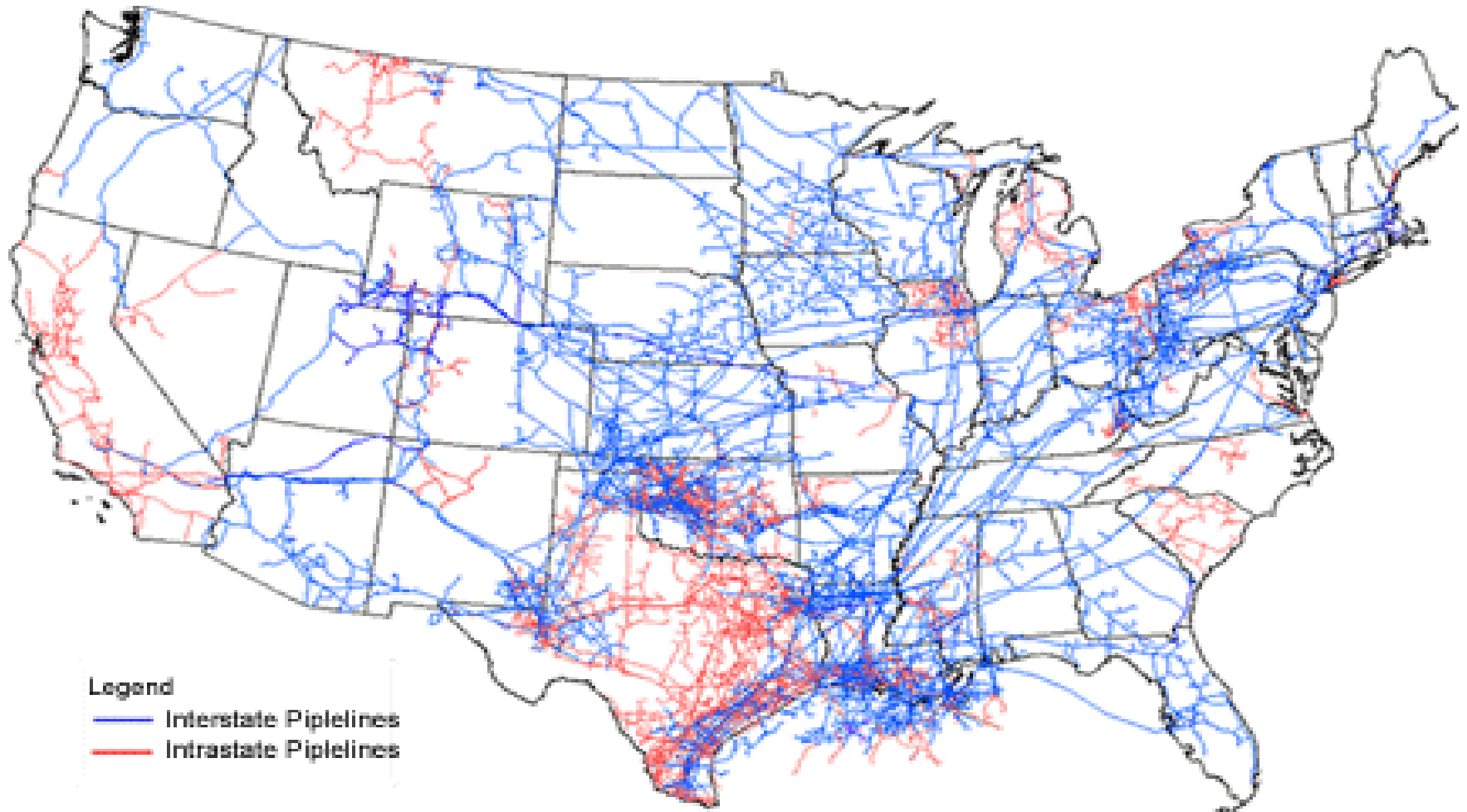
Non-Regulated

FERC/State Regulated

State Regulated



How does it move?

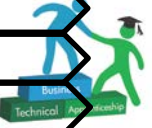
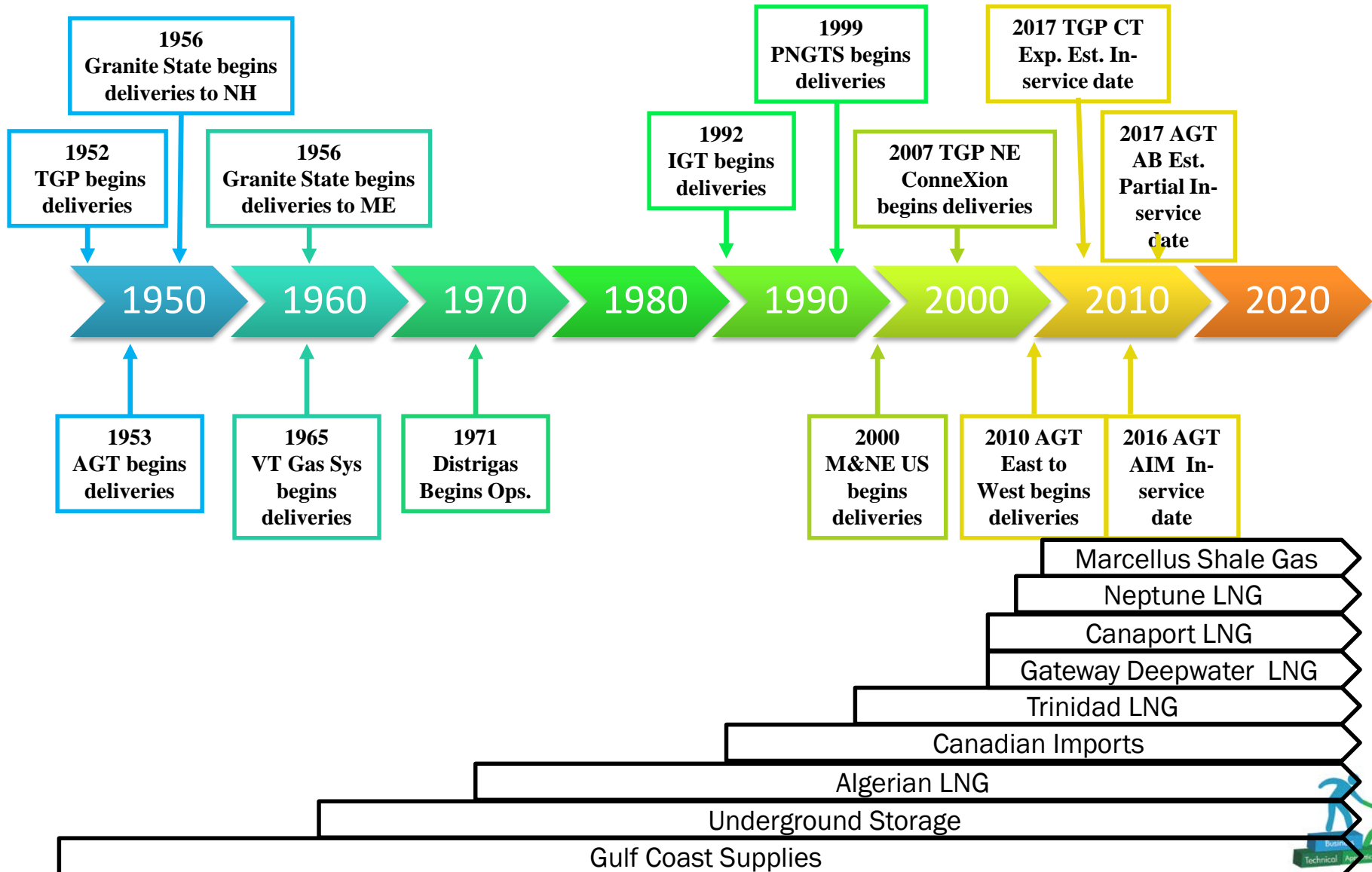


Legend

- Interstate Pipelines
- Intrastate Pipelines



Timeline of New England Infrastructure & Supply Access Developments



Now its everywhere.....

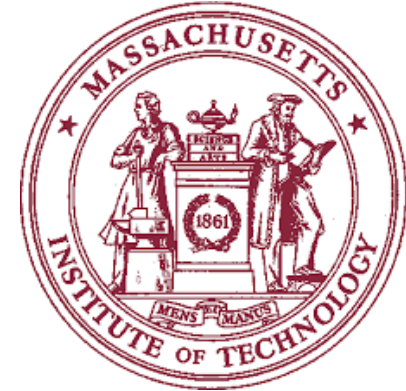
- Homes



- Military



- Schools



- Businesses



- Hospitals



- Power Plants



Gas Supply Planning



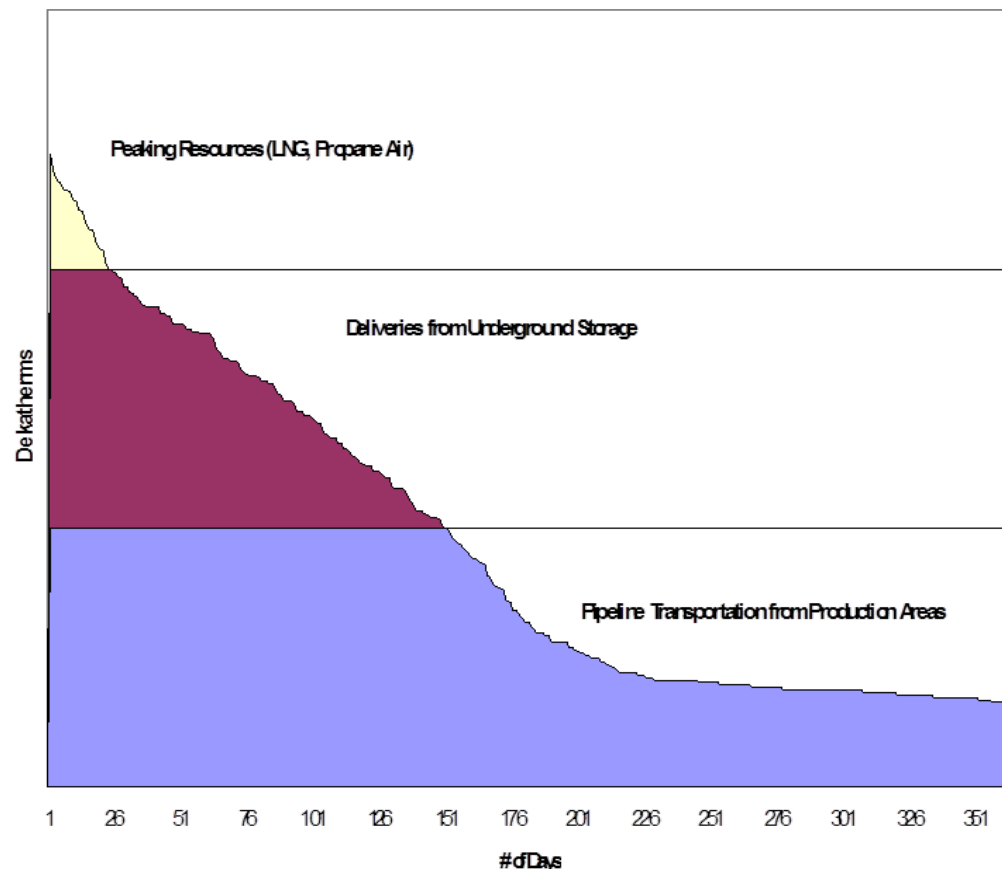
Gas Supply Obligations/Responsibilities

- **Provide for a safe, reliable service to all firm customers on its distribution system at a reasonable costs to consumers**
- New England's gas requirements are highly weather sensitive
 - Loads rapidly changes throughout the day in peak/shoulder periods
- Reliability is critical – restoration complex and lengthy
- Capacity planning long lead time
- Design Demand Scenario
 - New England is design day driven
 - Must secure firm supply to accommodate expected demand on a design day, winter, and year.
 - Take into account Distribution System

How an LDC Meets Its Customer Load Requirements

- Temperature sensitive load requires a mixture of resources to ensure a balance between reliability and cost
- Three physical delivery resources are available
- Resources are dispatched based on least cost dispatch principles
 - Baseload pipeline transportation
 - Deliveries from underground storage
 - Peaking supplies (e.g. LNG)

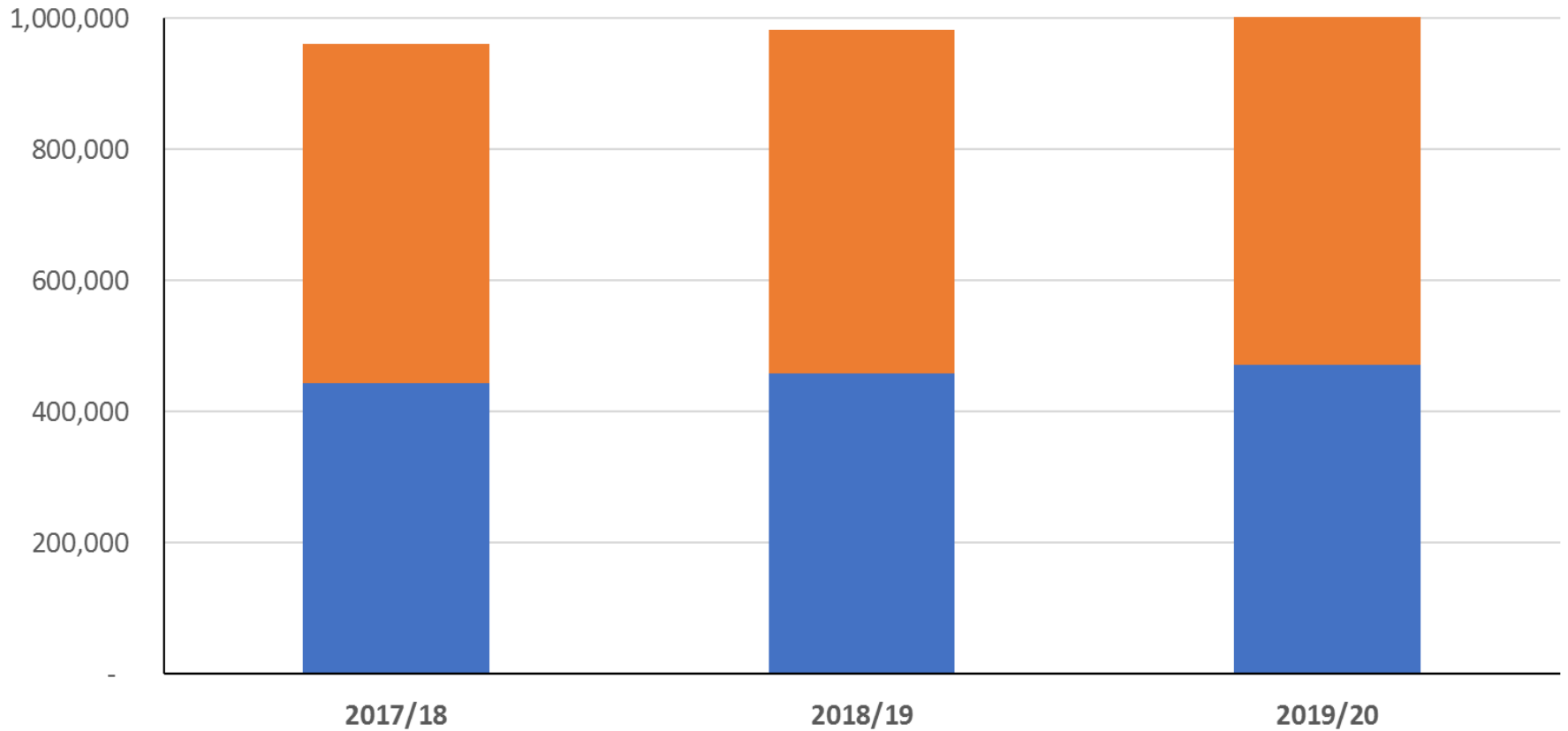
Illustrative Load Duration Curve



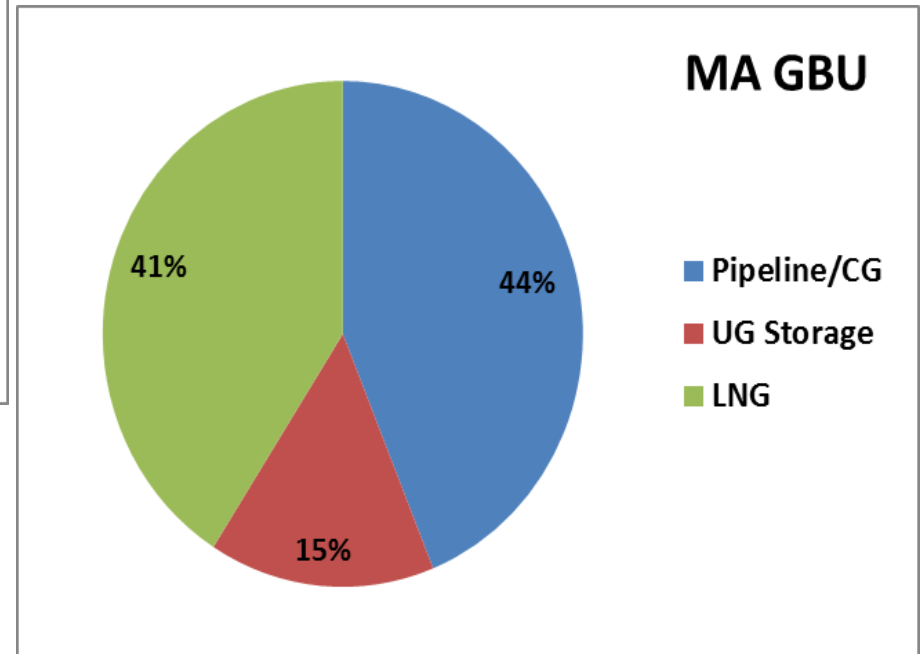
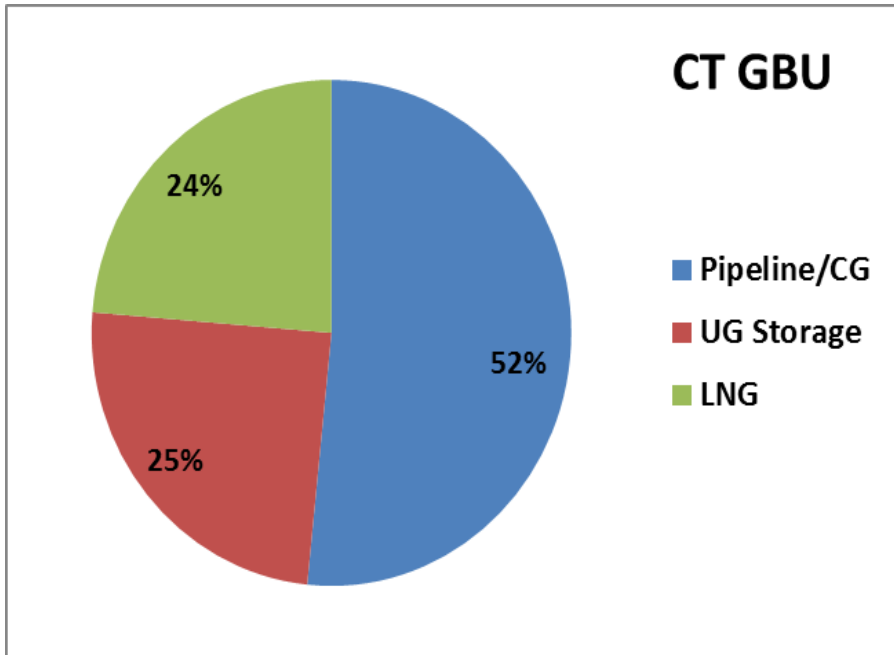
LDC load projections continue to grow

Eversource Gas LDC Design Day Projections (MMBtu/day)

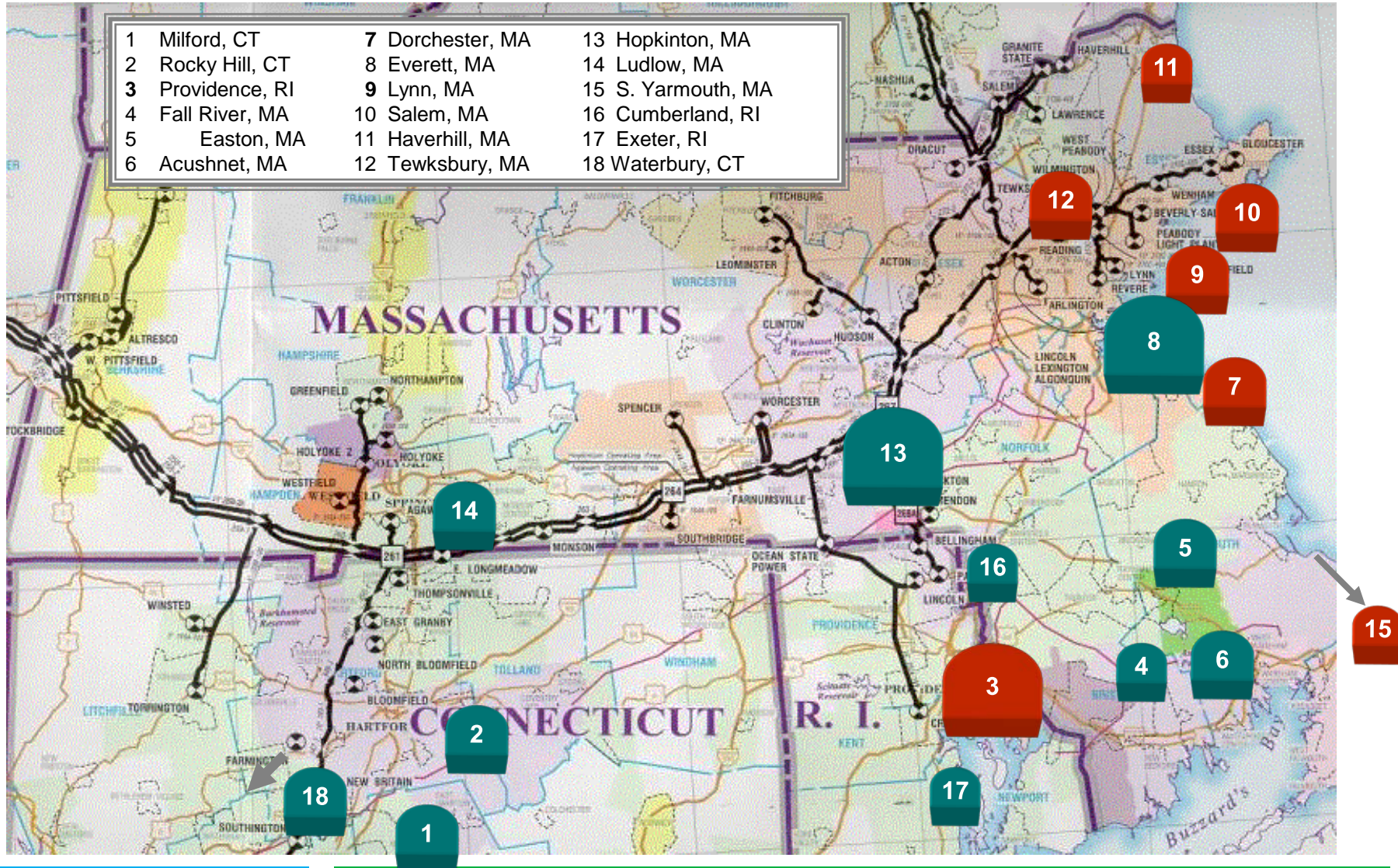
■ Yankee ■ NSTAR



Design Day Supply Portfolio



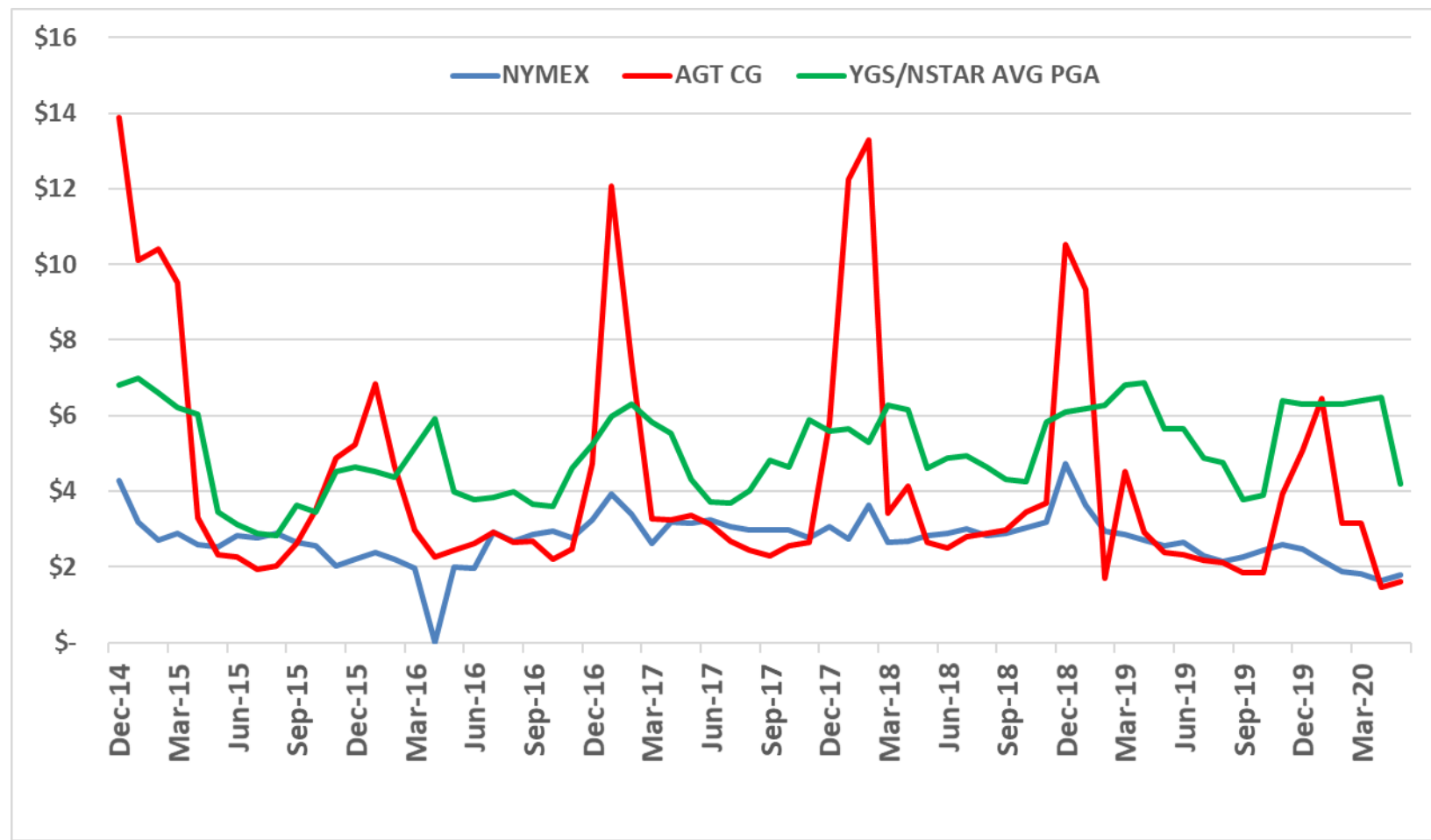
Majority of LNG Facilities owned by LDCs





LDC Customer Winter Prices Stable with Capacity vs. Secondary Market Prices with no Capacity

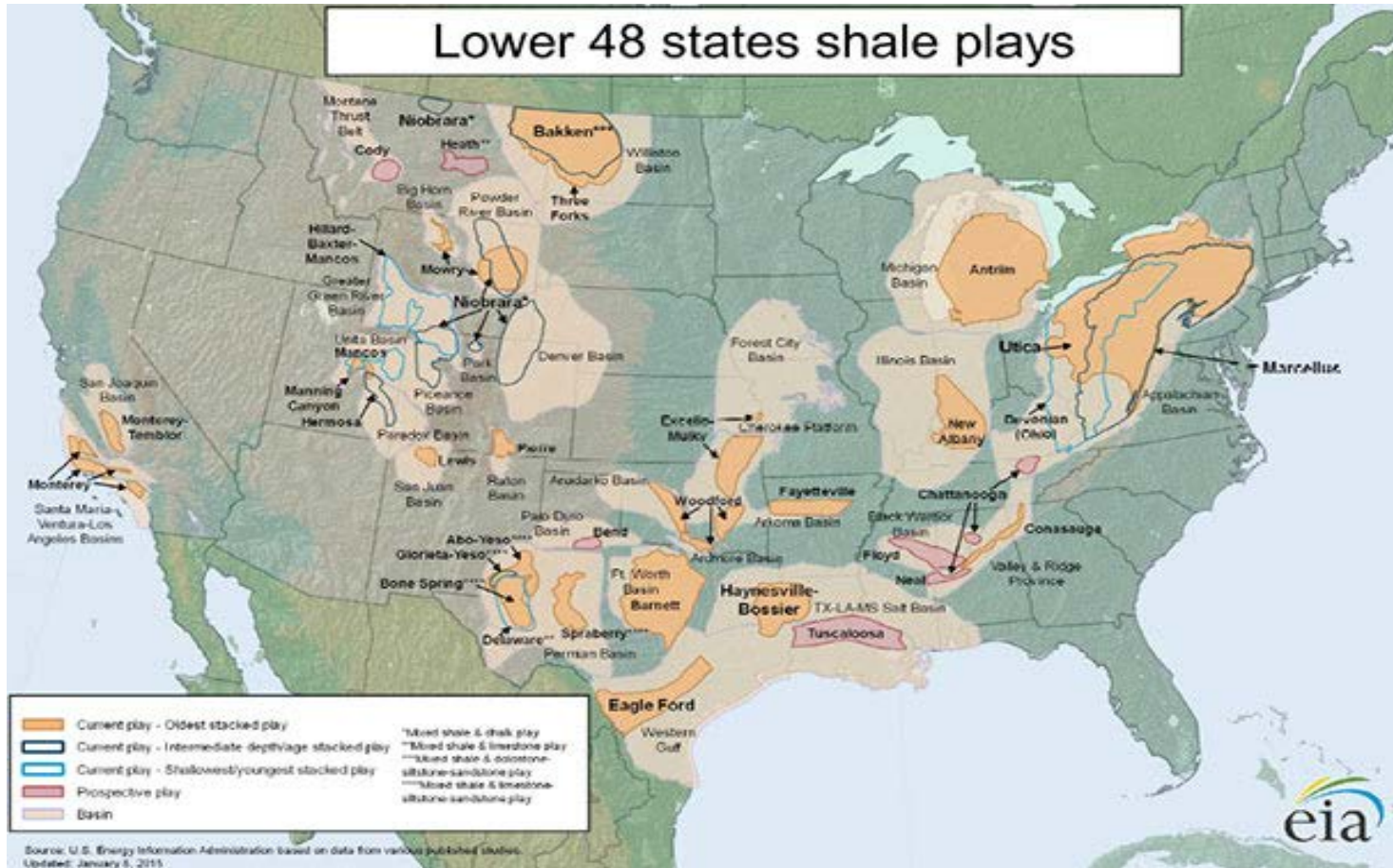
NE LDC CGA vs. Henry Hub and AGT City Gate \$/MMBtu



Shale Gas
+
\$\$\$\$\$
+
Technology
=
Game Changer



Shale gas is not new – but new technology allows economic extraction





How did we get here?

Shale Gas has been around since the 1970's

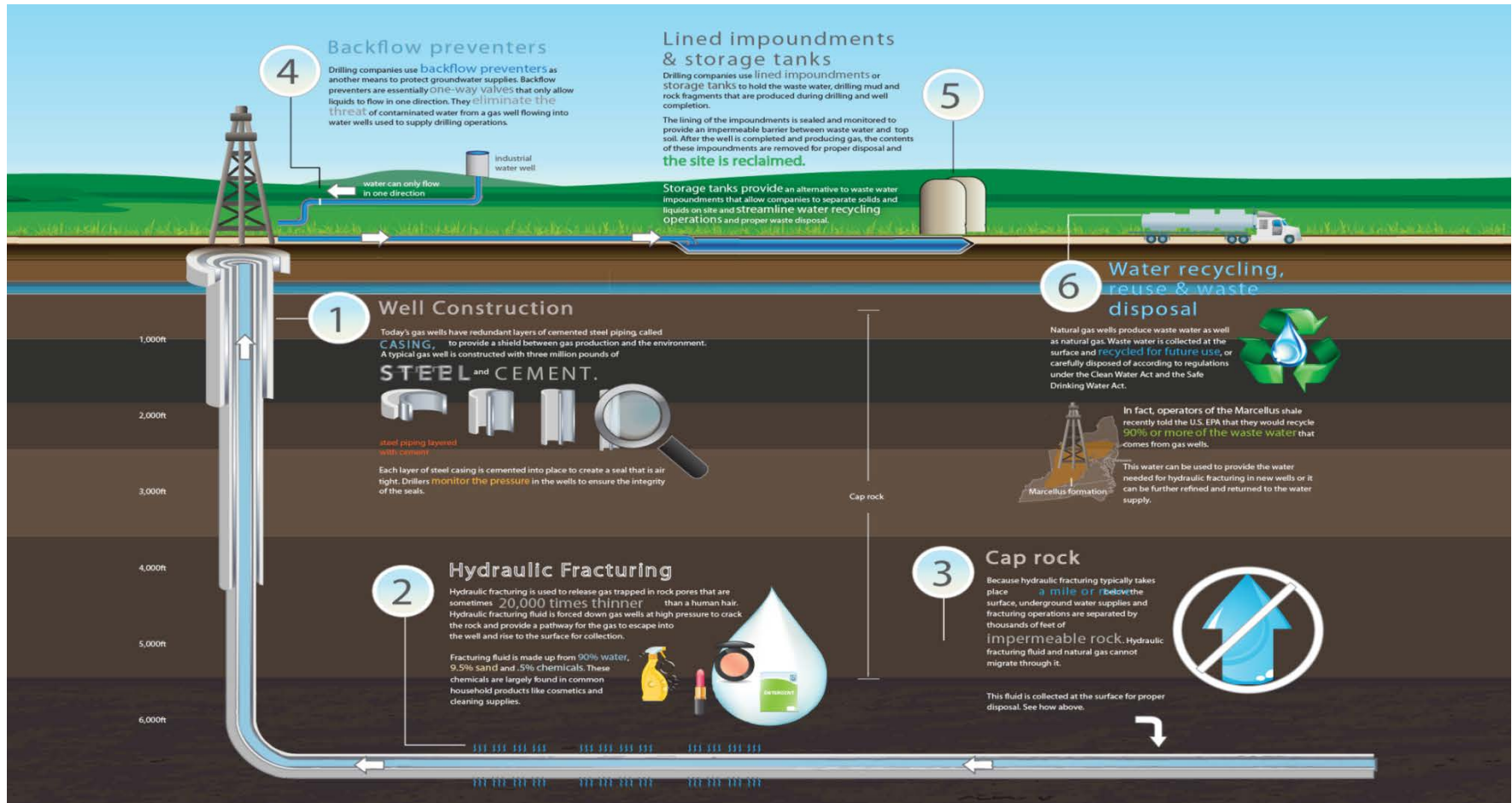
- Mitchell Energy (and Others)
 - Lead the way from Barnett Shale development
 - Borrowed technique from Union Pacific
 - Combined with Imaging & Mapping technology
 - Merged with Devon Energy who brought Horizontal Drilling technique
 - Utilized various federal & academic publications and expertise of other firms to further develop drilling/well completion techniques
- Did not really take off until late 2007/8

Main reasons for the boom:

- U.S. Policies & Programs
 - Private land ownership rights (ability to lease land and mineral rights)
 - Deregulated gas markets allowed prices to incentivize capital deployment
 - Gov't and industry sponsored R&D
 - 3-D Seismic Imaging & Micro-seismic Fracturing Mapping
 - FERC Open-access Policy for Interstate pipeline
- High Natural Gas Prices of the 2000's
 - Firms improve economics through efficiency gains in established techniques
- Liquid and Large U.S. Capital Markets:
 - Allowed both small and large firms to acquire large capital outlays to further their land acquisitions and development of technology

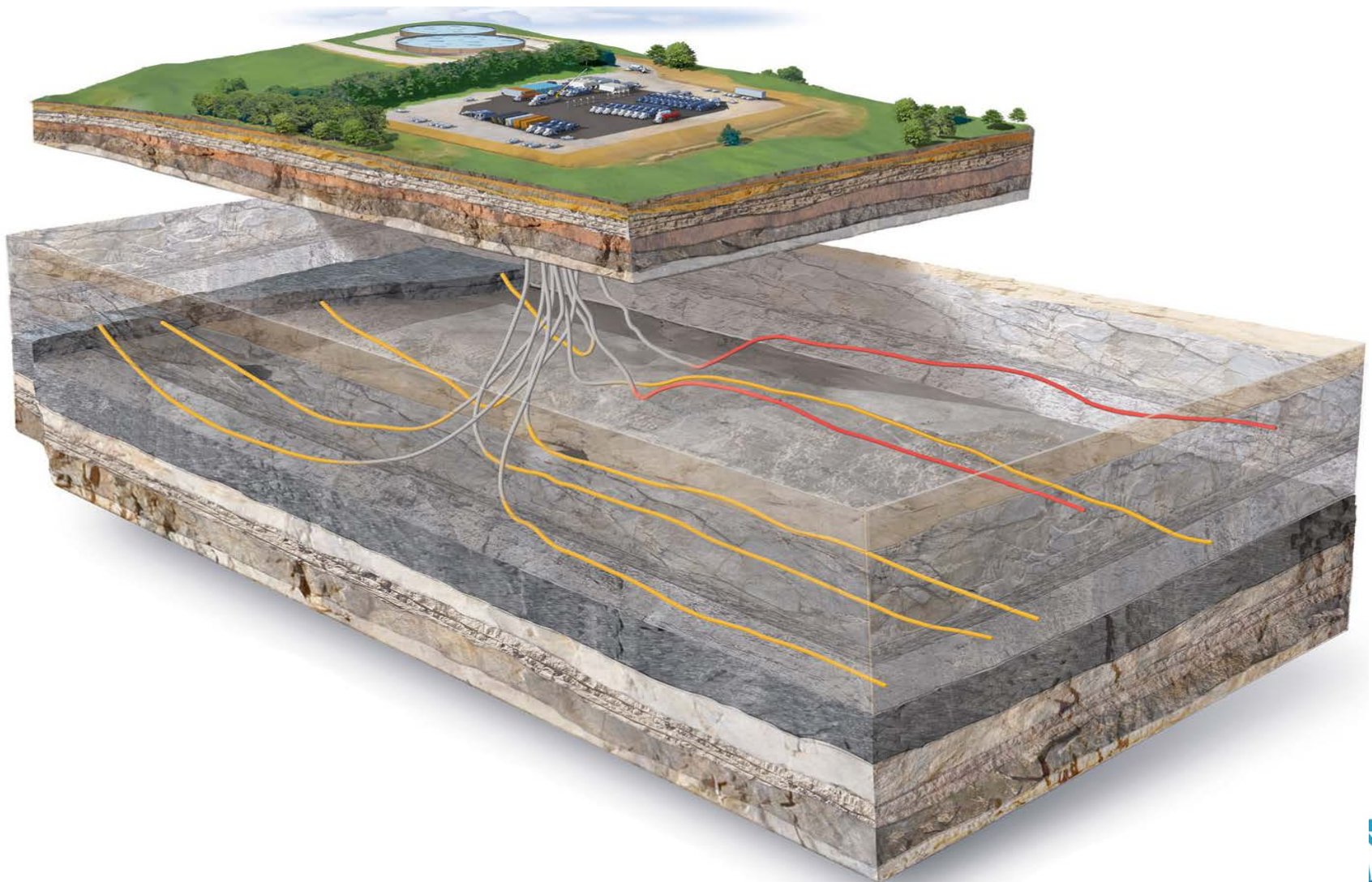


Technology has changed the game.....





Multiple wells from one pad.....



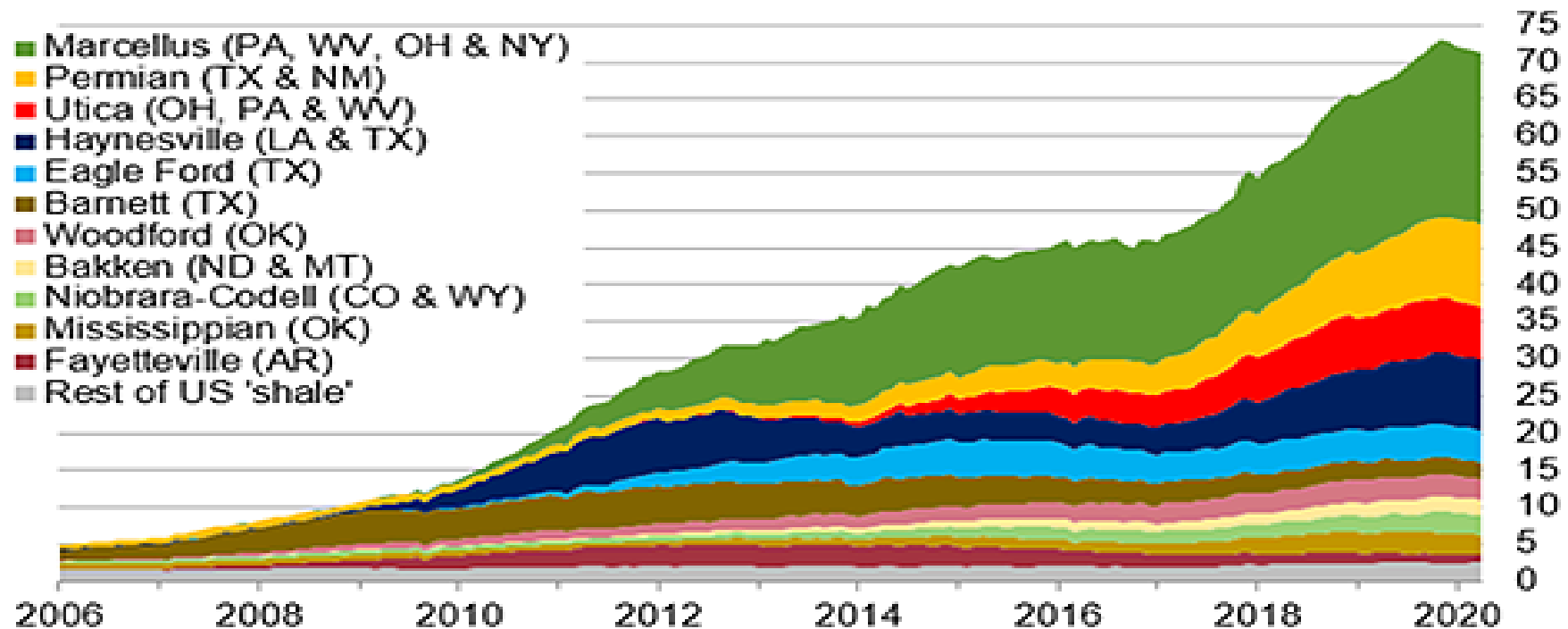
Hydraulic Fracturing and Horizontal Drilling Process

<https://www.cabotog.com/outreach-videos/the-drilling-process/>



Shale Gas Production Growth

Monthly dry shale gas production billion cubic feet per day



Sources: EIA derived from state administrative data collected by Enverus Drillinginfo Inc. Data are through April 2020 and represent EIA's official tight gas estimates, but are not survey data. State abbreviations indicate primary state(s)

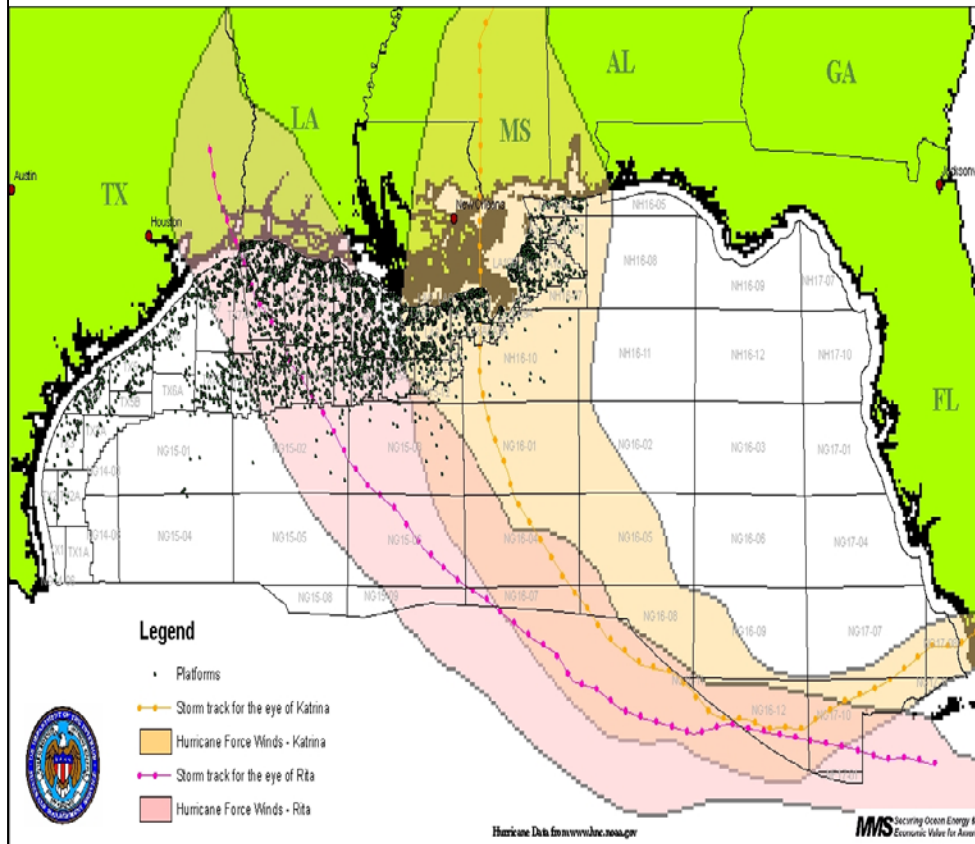


Gross production of natural gas in the United States has generally been increasing for more than a decade and in recent months has been more than 10% higher compared with the same months in 2017. This growth has been driven by production in the Appalachian Basin in the Northeast, the Permian Basin in western Texas and New Mexico, and the Haynesville Shale in Texas and Louisiana. These three regions collectively accounted for less than 15% of total U.S. natural gas production as recently as in 2007, but now they account for nearly 50% of total production

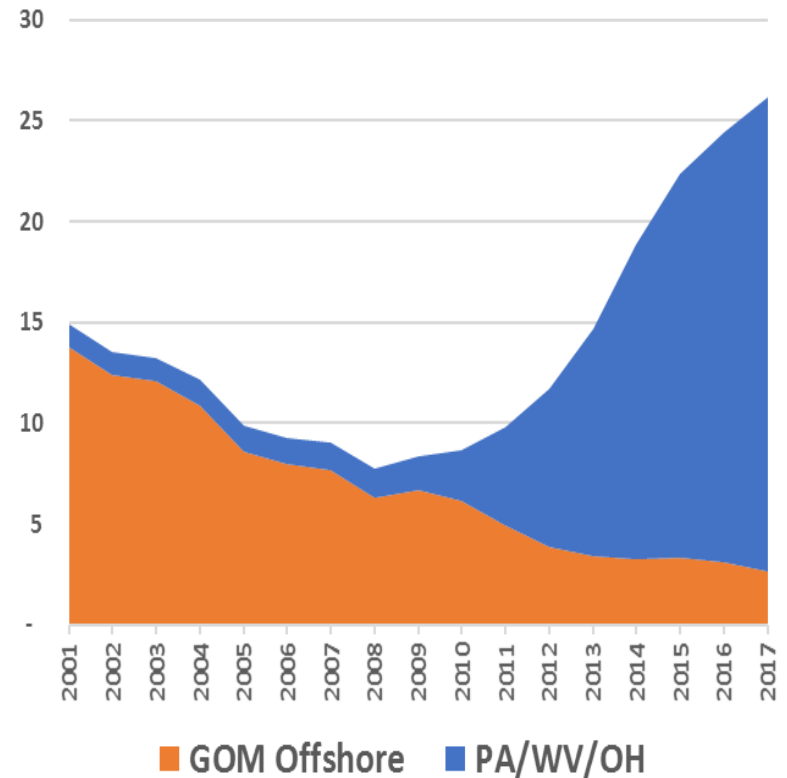


Shale has also lowered hurricane risk to U.S. natural gas production and prices for “Longhaul” LDC Shippers

Hurricanes Rita and Katrina, August - September 2005



Daily Average Gas Production (BCFD)



Environmental Considerations

- On-going studies/research programs to ensure the safe and most environmentally conscious drilling practices are utilized
- States have individual regulations and permits (min. must be equal to Federal)
 - VT & NY banned all fracking, CT banned storage/transport of fracking waste
- Federal Government Laws & Regulations (to name a few)
 - Commerce Clause – largely left to states, Resource Conservation and Recovery Act, Safe Drinking Water Act, Clean Water Act, Clean Air Act, National Environmental Policy Act
- Most recently:
 - FracFocus - the nationwide system for disclosing chemicals used in the hydraulic fracturing process. (Ground Water Protection Council and the Interstate Oil and Gas Compact Commission)
 - EPA Final Report on impact of hydraulic fracturing activities and drinking water resources.
 - It is the culmination of a multi-year study requested by Congress. The report provides states and others the scientific foundation to better protect drinking water resources in areas where hydraulic fracturing is occurring or being considered.
 - “Responsible Natural Gas” & “Renewable Natural Gas”

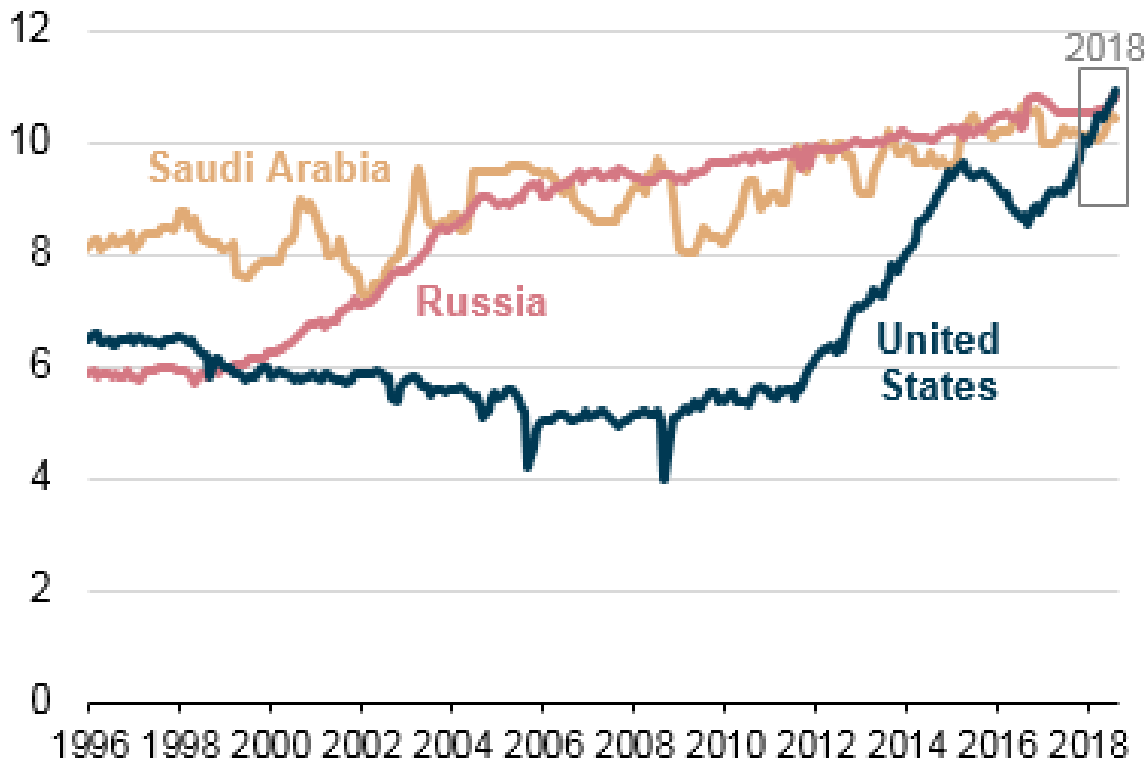


Natural Gas Markets

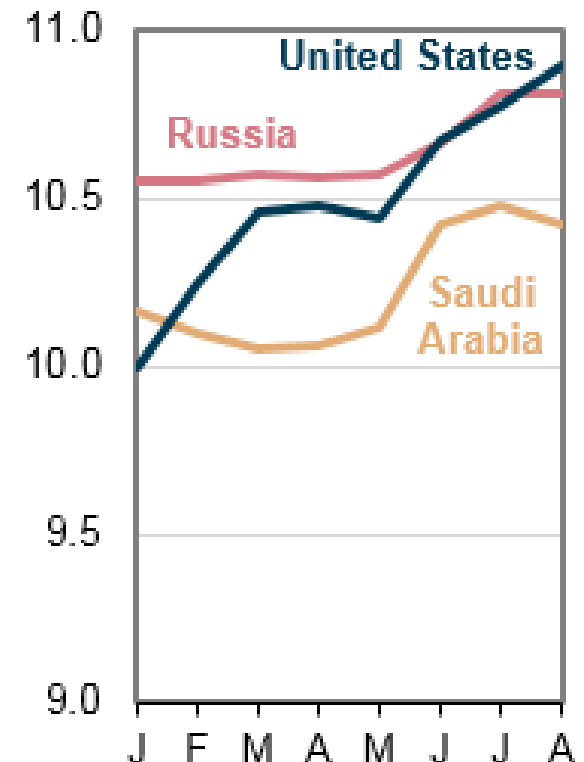


The United States is now the largest global crude oil producer

Monthly crude oil production (Jan 1994-Aug 2018)
million barrels per day



million barrels per day eia



Saudi Arabia's crude oil and other liquids production data are EIA internal estimates.
Russian data mainly come from the Russian Ministry of Oil, which publishes crude oil and condensate numbers

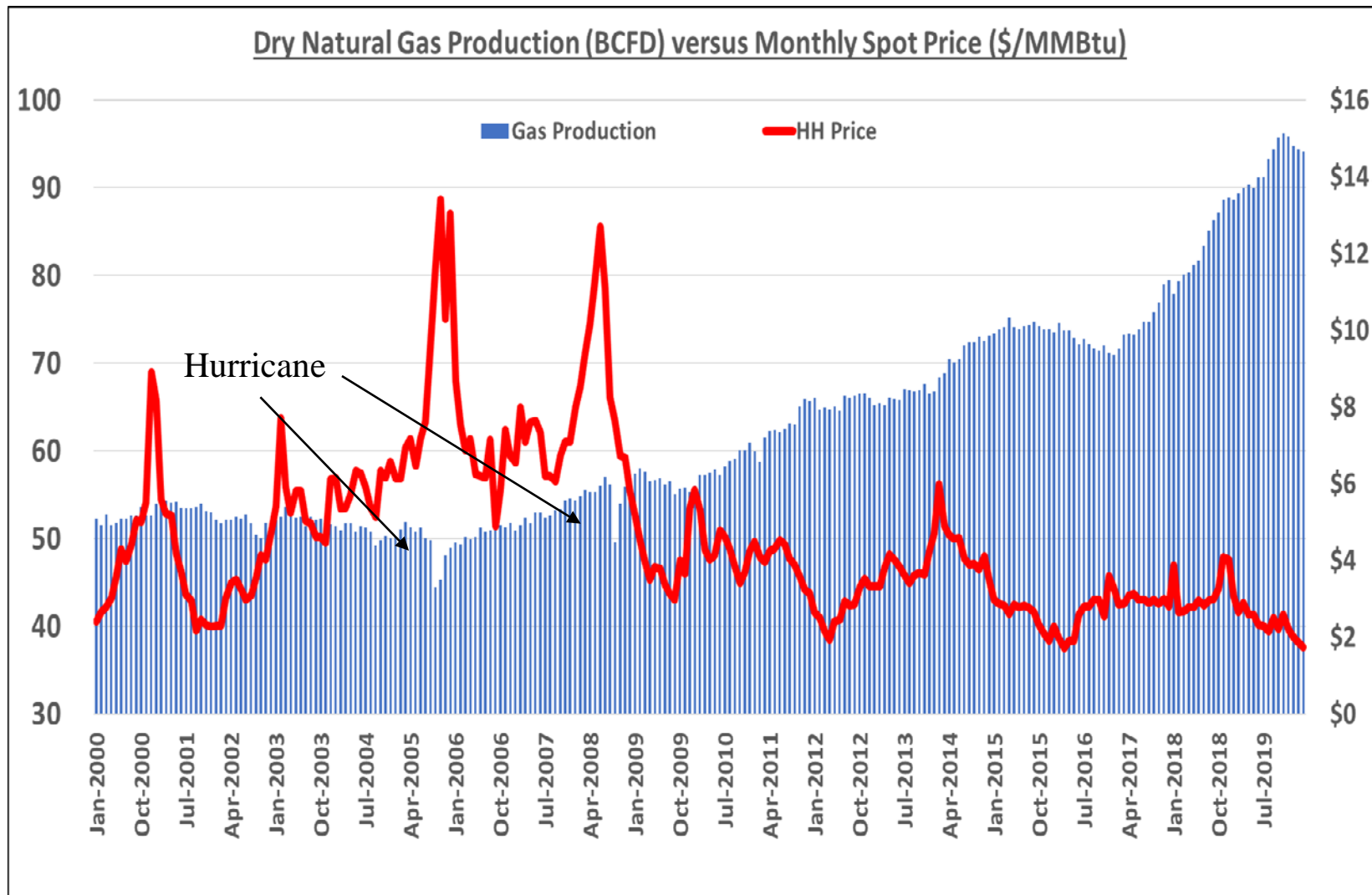


U.S. has become large exporter of LNG but impacts of COVID 19 have interrupted its sustained increases over last 5 years

Daily U.S. natural gas deliveries to LNG export facilities, Feb 2016 – May 2020
billion cubic feet per day

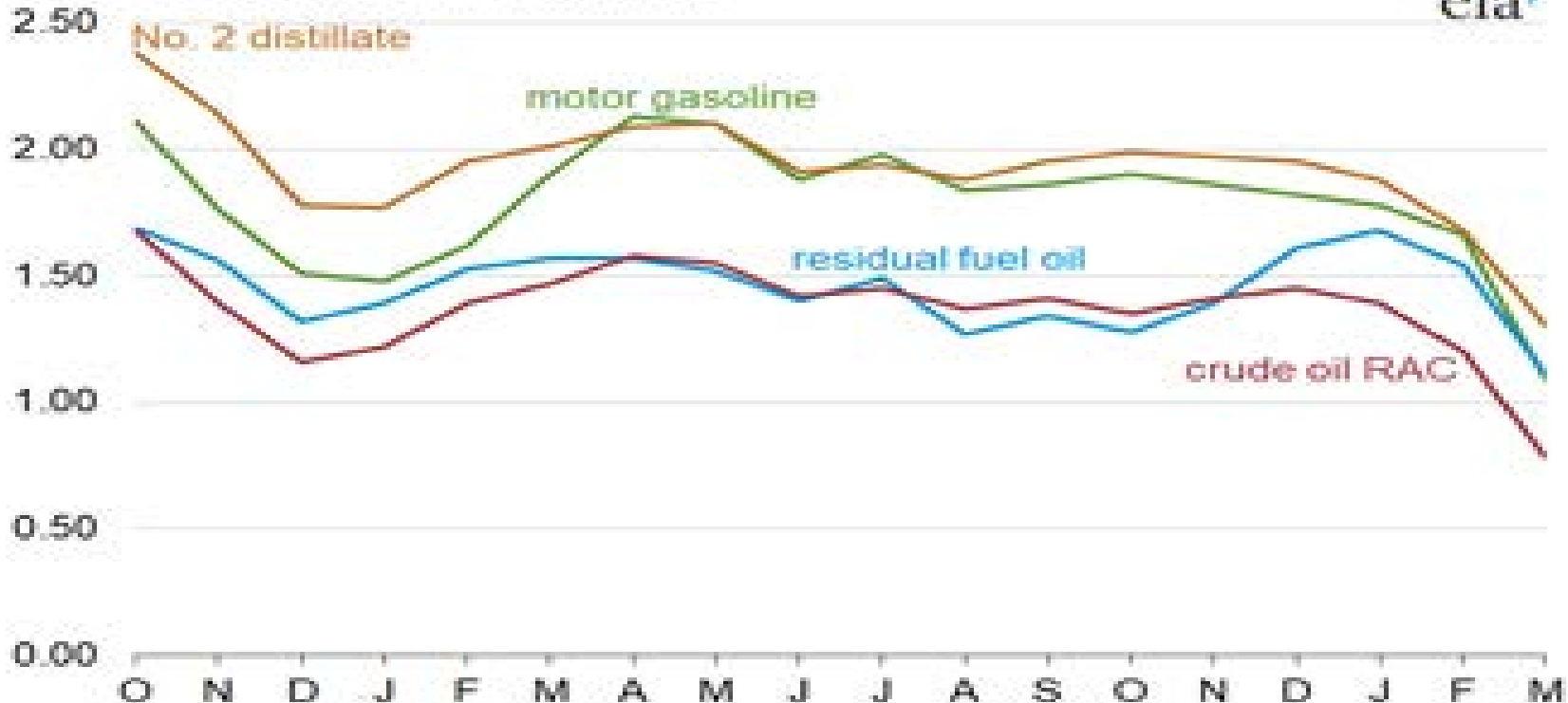


Natural gas prices are a function of market supply and demand as demand, prices and supply fall



COVID-19 has oil product prices at lowest levels in over a decade

dollars per gallon excluding taxes



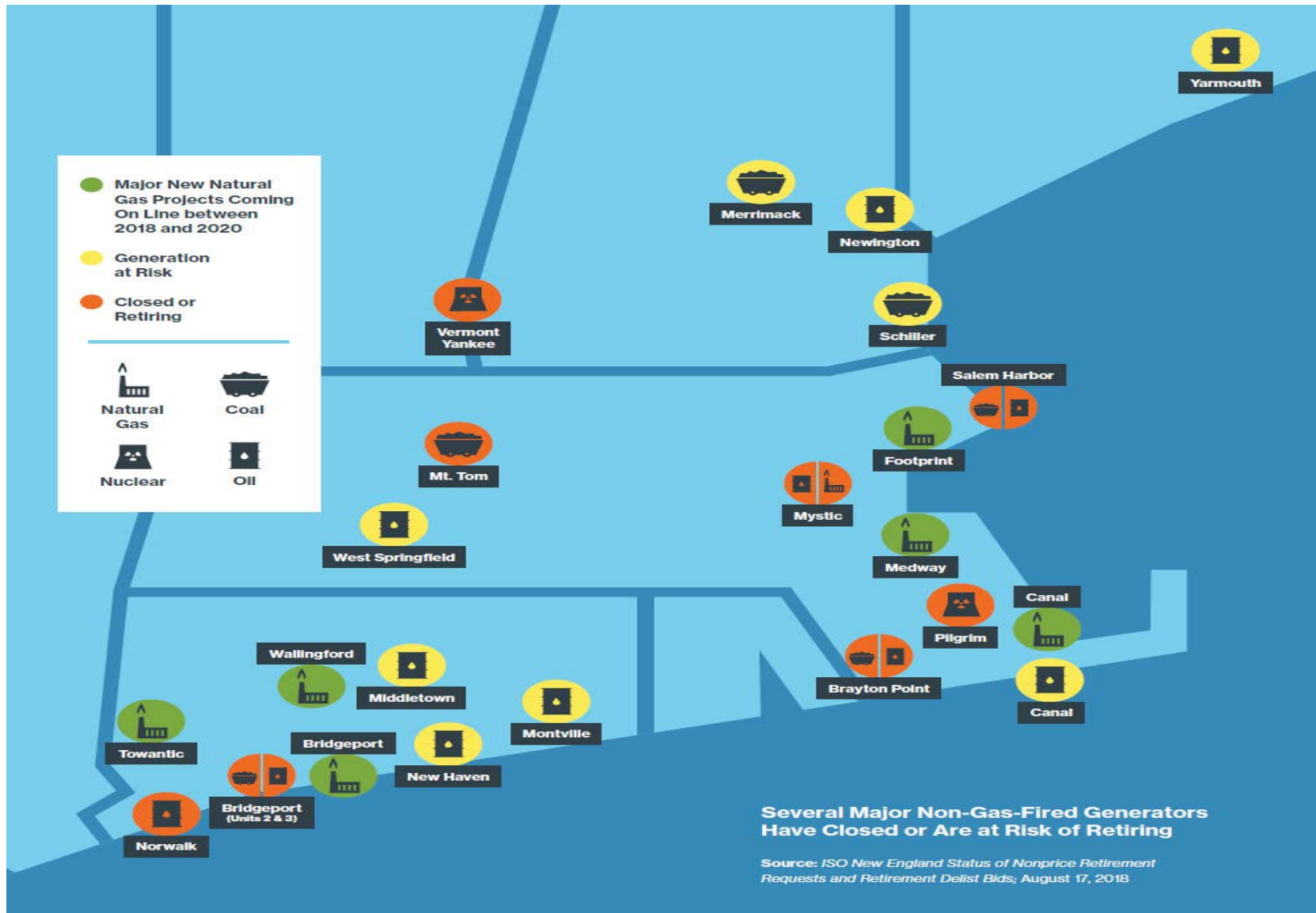
October 2018 - March 2020

Sources: U.S. Energy Information Administration, Crude oil refiner acquisition cost: Form EIA-14, "Refiners' Monthly Cost Report"; petroleum product prices: Form EIA-782A, "Refiners'/Gas Plant Operators' Monthly Petroleum Product Sales Reports."

Note: RAC stands for refiner acquisition cost.



As fleet ages, gas is filling in.....



Shift to gas has dramatically reduced emissions in the last 25 years

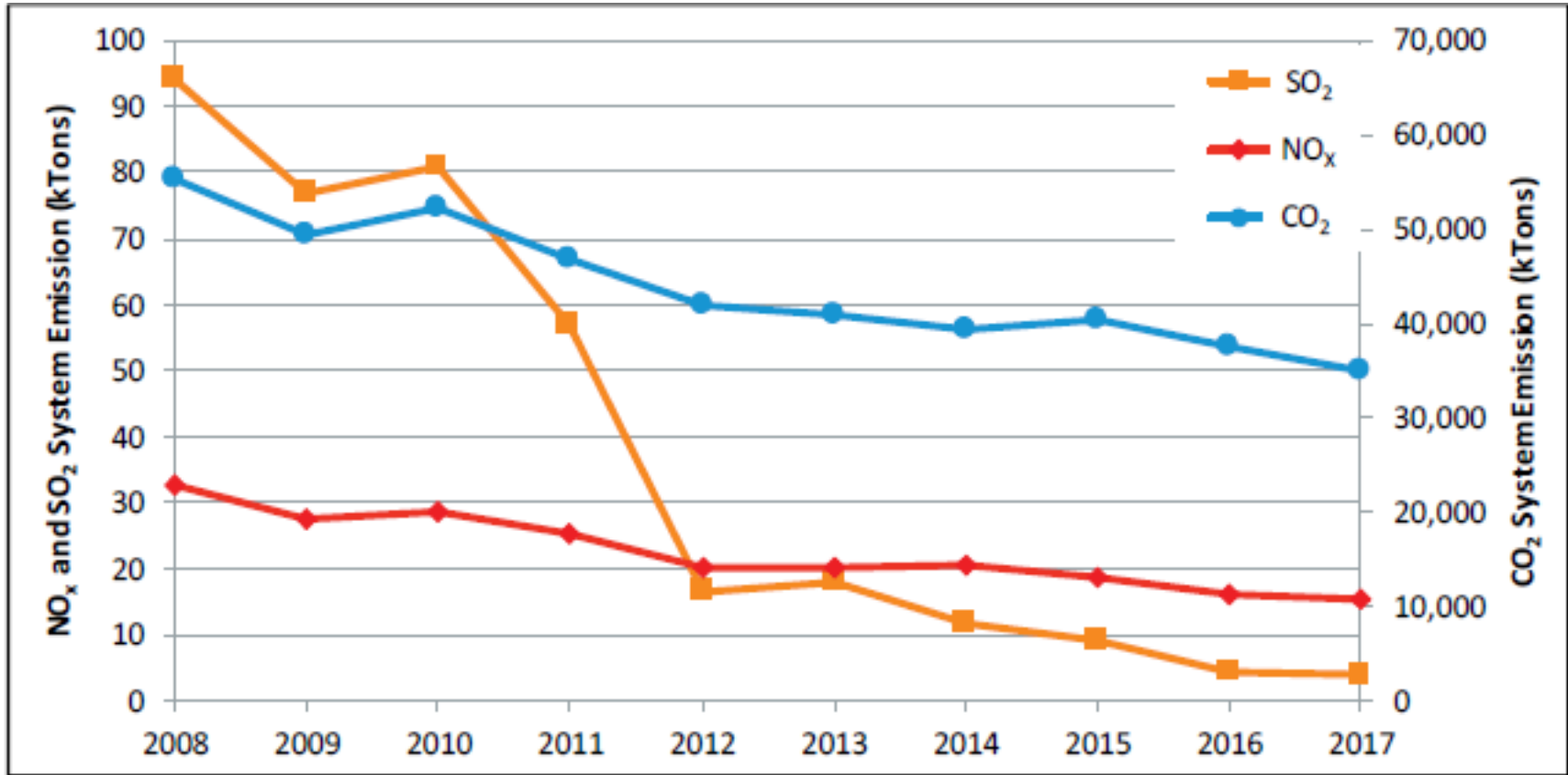


Figure 5-2: ISO New England system annual generator emissions, 2008 to 2017 (ktons).

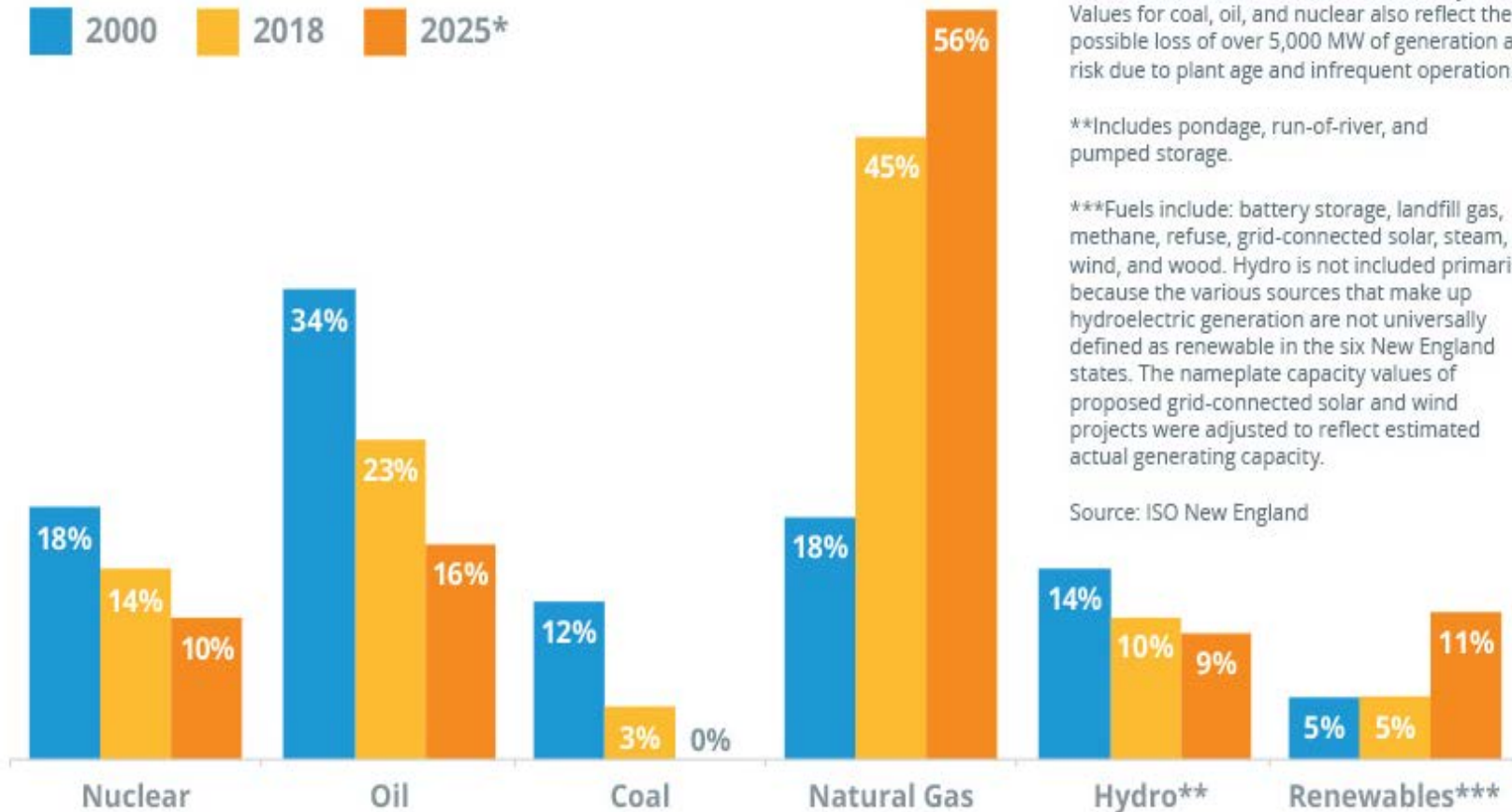
**From ISO-NE Report: Since 2008, NO_x emissions have dropped by 53% and SO₂ by 96%, while CO₂ has decreased by about 37%.*



ISO-NE increasingly reliant on natural gas to generate power

Percent of Total System Capacity by Fuel Type

2000 2018 2025*



*2025 values are hypothetical and assume new resources proposed in the ISO Interconnection Queue and non-price retirement requests for coal, oil, and nuclear resources as of early 2018. Values for coal, oil, and nuclear also reflect the possible loss of over 5,000 MW of generation at risk due to plant age and infrequent operation.

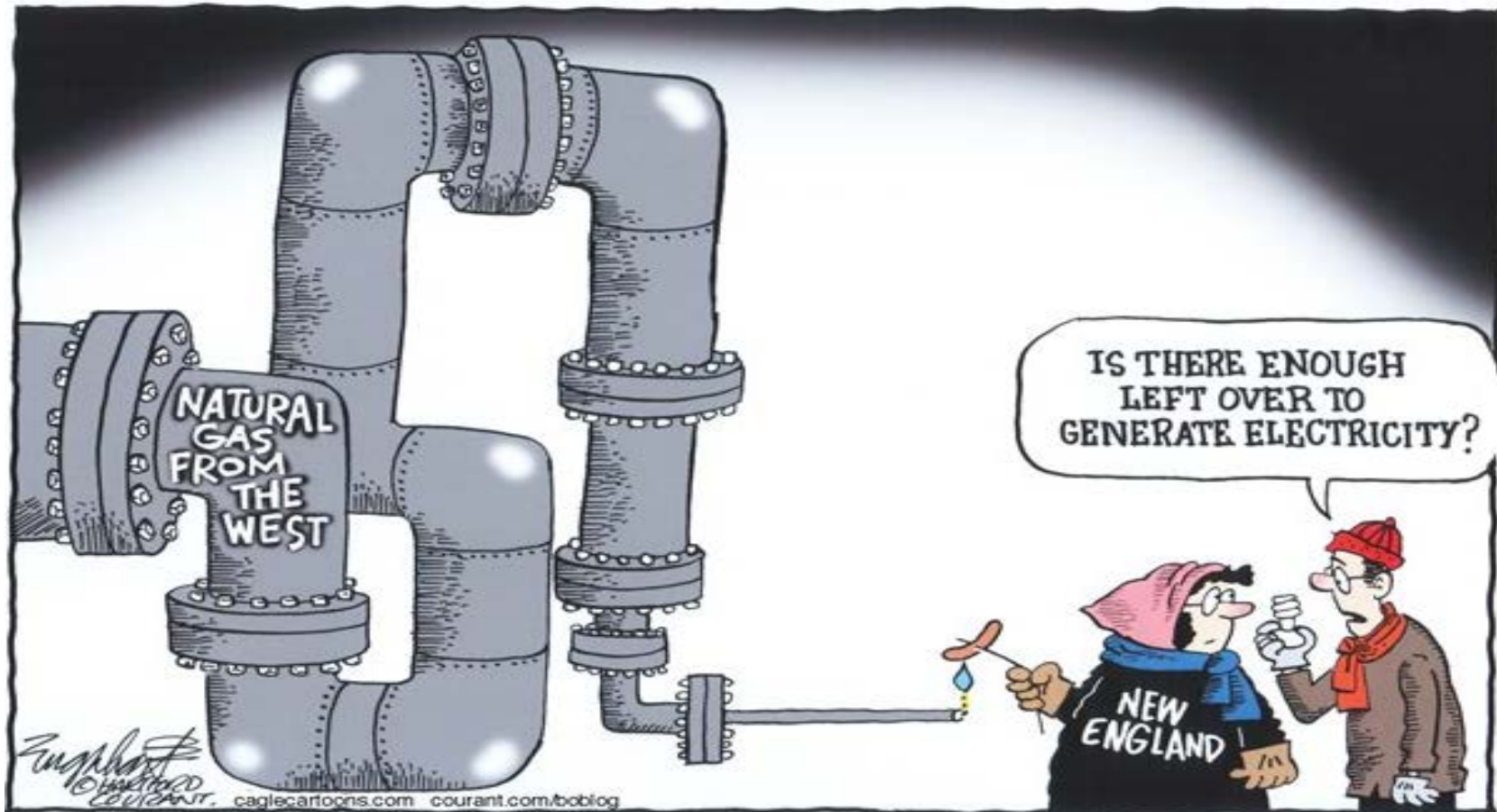
**Includes pondage, run-of-river, and pumped storage.

***Fuels include: battery storage, landfill gas, methane, refuse, grid-connected 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. The nameplate capacity values of proposed grid-connected solar and wind projects were adjusted to reflect estimated actual generating capacity.

Source: ISO New England

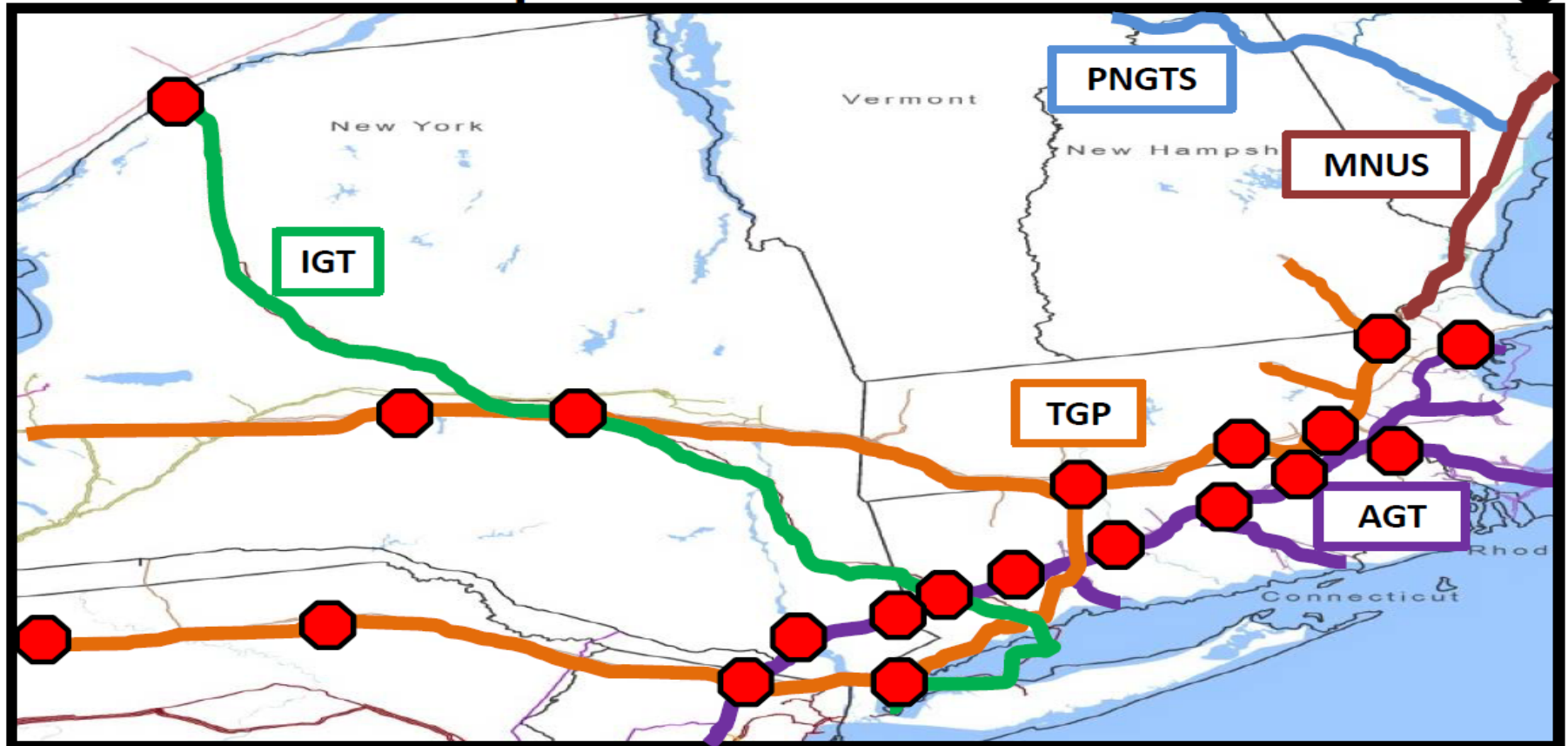


But New England Lacks Pipeline Infrastructure



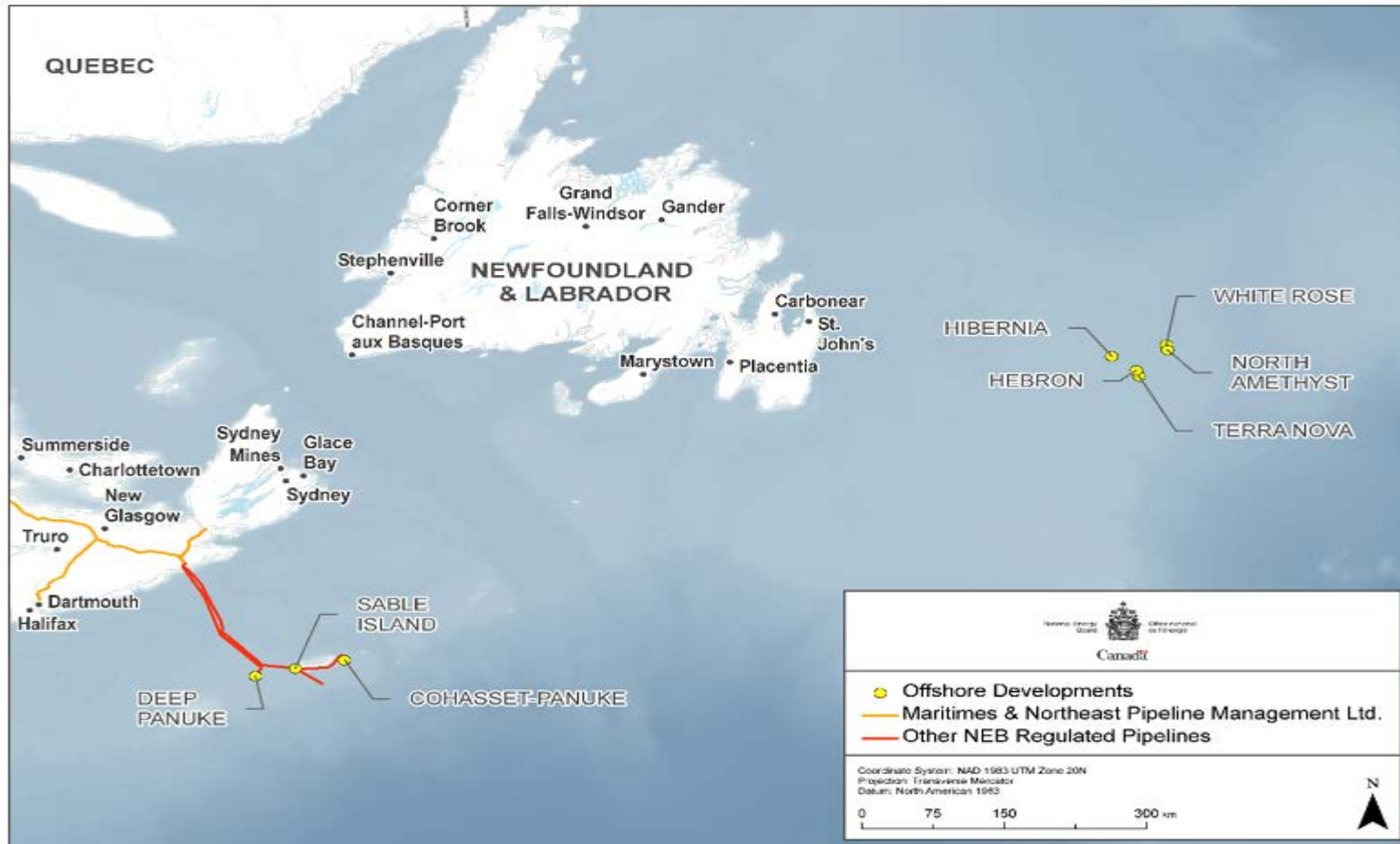
Constrained Gas Infrastructure in New England

Current NE Gas Pipeline Bottlenecks and Constraints



*There are both bottlenecks/constraints prior to the New York – New England border which impact the entire region and then also subsequently within the New England states that impact gas availability
 **This map does not represent all restrictions or bottlenecks as there are meter/lateral specific restrictions

Canadian Offshore Production was projected as answer but it was not.....

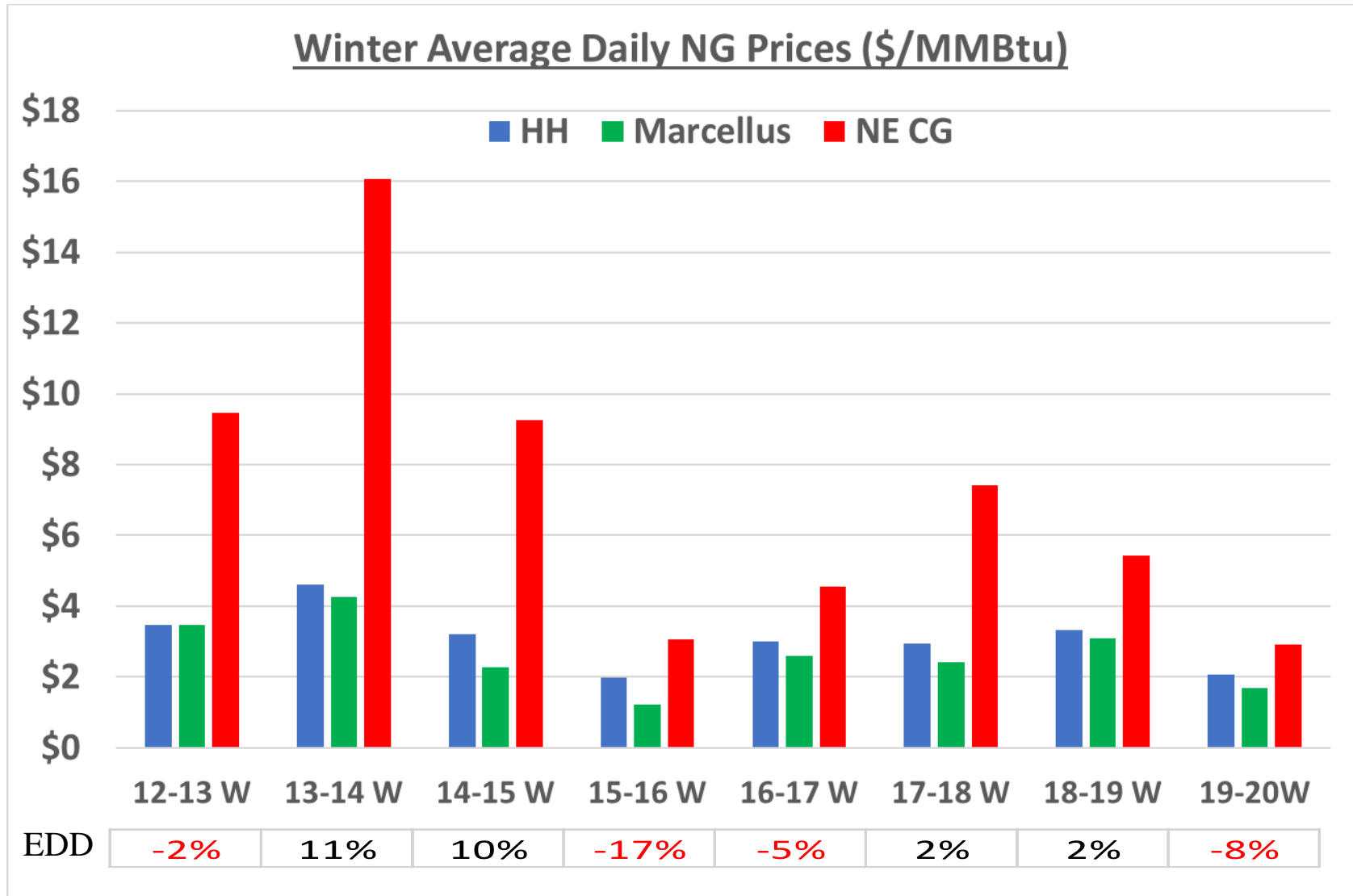


Region Depends on Imported LNG....

- Distrigas Facility (GDF) - Boston, MA - 1971
- Canaport Facility (Repsol/Irving) - N.B. Canada - 2008
- Northeast Gateway (Excelerate) - Boston Offshore bouy - 2008
- Neptune (GDF) – Gloucester Offshore bouy - 2010 (Decomissioned)

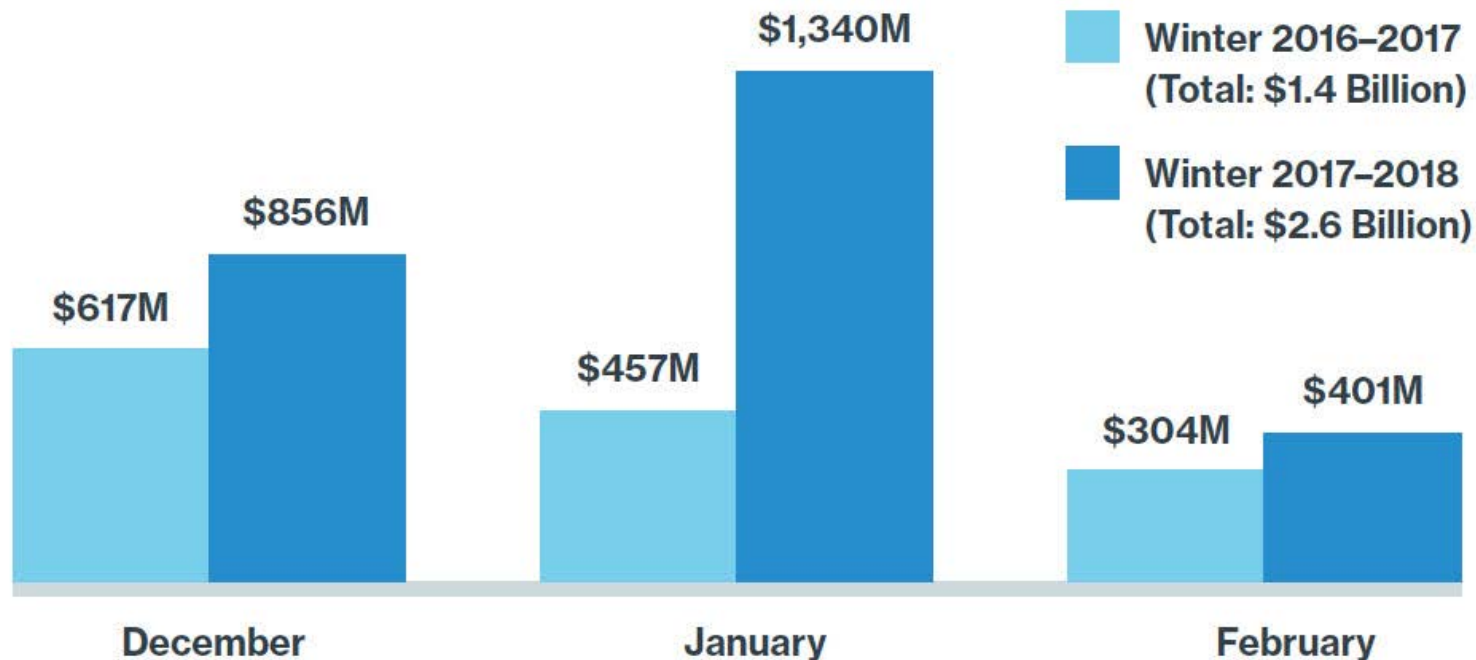


Region still subject to price volatility



Leads to large increases Energy Costs

Wholesale Energy Costs during Winter 2017–2018 Compared to Winter 2016–2017 (in millions)*



*Includes Day-Ahead and Real-Time Energy Markets

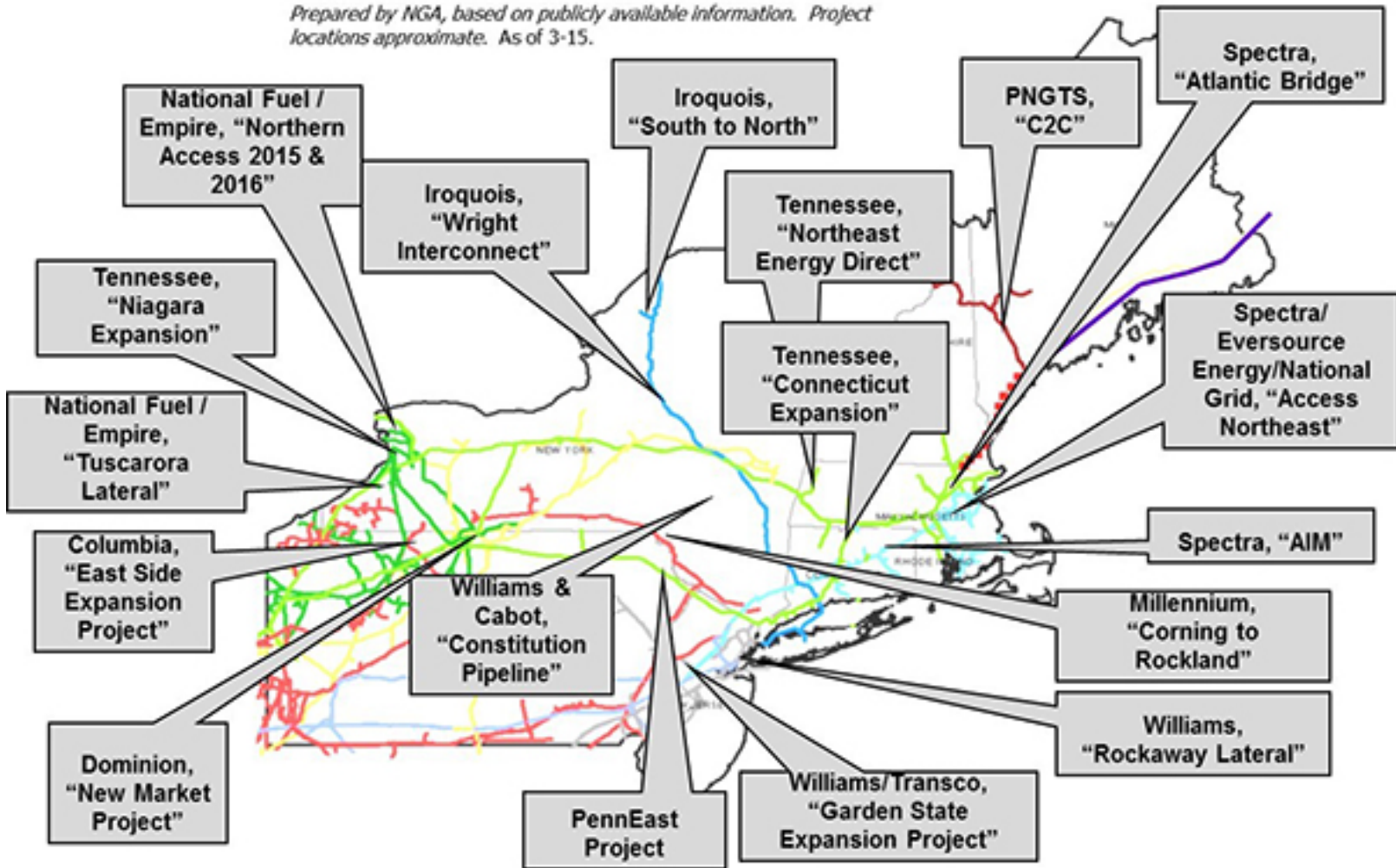
^Source: ISONE

Pipeline Infrastructure Projects



Northeast Region Pipeline Projects

Prepared by NGA, based on publicly available information. Project locations approximate. As of 3-15.



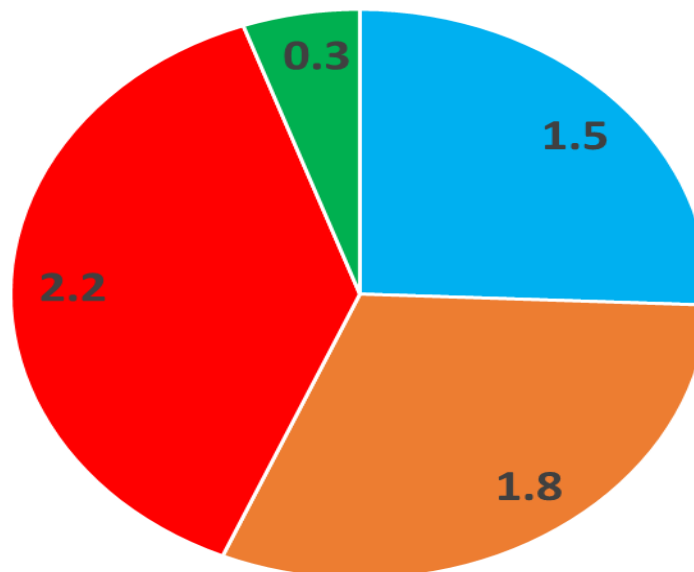
Source: Northeast Gas Association



Northeast Pipeline Infrastructure – Sample Projects

Survey of approximately pipeline projects into the New England/New York region (greenfield and expansions) in last 3 years reveals that ~40% of projects have been canceled

Additional Capacity (BCFD)



■ Announced/Applied ■ Approved/On Hold ■ Cancelled ■ Construction or Partial

.....Now What?



The FERC Application Process

- FERC approval for interstate pipeline facilities are petitioned through an Application for a Certificate of Public Convenience and Necessity (CPCN)
- Applications presented for FERC action must demonstrate the following key criteria:
 - Market need
 - New projects or expansions must be supported with firm market commitments for long-term (10+ year) transportation service agreements at tariff or negotiated rates
 - Just and reasonable rates
 - Demand charge based, fee-for-service structure with maximum rates set by FERC under traditional cost of service ratemaking methodology
 - Environmental impact mitigation
 - Comprehensive environmental impact analysis and mitigation measures
 - Compliance with pipeline safety standards
 - Built and operated in compliance with US Department of Transportation rules and procedures
- FERC will undertake a comprehensive review of an applicant's proposal and determine whether the action meets the standard of being in the interest of the public convenience and necessity and will issue an approval or denial of a project based on meeting this test



Future Capacity/Supply

- Pipelines continue to be maxed out
- LDC being pro active/taking long term view enable us to maintain reliability and growth
- Absent incremental pipeline capacity into NE only options involve existing capacity from the East and LNG imports
- A greenfield or large forward haul expansion to NE will take longer than anticipated/historical experience absent a policy shift or reliability issues
- Concern remains over growing gas generation reliance coupled with less marginal supplies available in market during peak periods
 - could impact regional reliability and will make pipeline operations tighter
 - ISO-NE Fuel Reliability Study to be released in 1Q18
 - Mystic RMR Agreement
 - FERC Grid Reliability/Resiliency Review
 - FERC Pipeline NOI
 - Impact of renewables on gas role in future
- Concerns regarding state vs Federal jurisdictional issues and level and tenor of protests

What is Eversource doing?

- Eversource is engaged with regulators and policy-makers throughout the region to be an effective environmental steward and partner to the region while providing a reliable energy supply to its customers at a reasonable cost
- On the Natural Gas side of the business it is evaluating the following measures to assist in these efforts:
 - **Energy Efficiency** – can robust existing programs be expanded or made more efficient?
 - **Demand Response** – setting up a pilot program to assess the viability and impact of actively shaving peak demand
 - **“Responsible Natural Gas”** - acquiring natural gas from entities who have utilized third party rating agencies to verify their gas extraction/production processes are meeting the highest standards to limit environmental impacts
 - **“Renewable Natural Gas”** – securing supply from various “renewable” natural gas sources such as dairy farms, wastewater treatment plants and landfills through the decomposition of organic matter – Biogas

QUESTIONS

