

2022 New Hampshire BIA Energy Symposium

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API Industry Outlook

Business & Industry Association of New Hampshire – Energy Conference

R. Dean Foreman, Ph.D. December 7, 2022



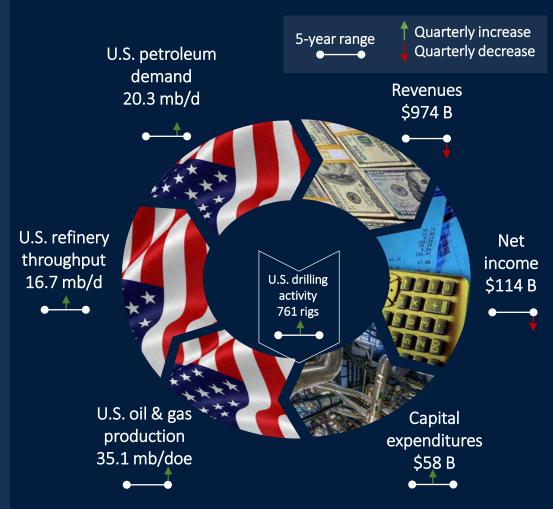
Key points

- Economy. IMF and Bloomberg consensus expectations have dropped but still imply likely higher demand for oil and natural gas in 2023 and 2024
 - Weakened and uneven consumer conditions have prompted concerns for a recession in 2023, led by the U.S. and Europe
 - Strong U.S. dollar appreciation has added stress to many emerging market economies
 - Global population milestone of 8.0 billion amplifies energy, food, environmental issues
- Oil. Strong global demand coupled with supply challenges has been assuaged by releases of government-controlled reserves, which are scheduled to end
 - Global oil demand expected to reach a record-high 101.0 mb/d in 2023 per EIA
 - Global oil drilling fell by 15.0% in Oct. 2022 compared with Oct. 2019 per Baker Hughes
 - U.S. oil-directed rig productivity fell by nearly 20% y/y in Oct. per EIA, while the historical production boost from drilled but uncompleted wells (DUCs) disappeared
 - U.S. oil production resilience requires greater participation by CO, NM, ND, and WY
 - With continued work force, supply chain, financial, and policy headwinds, <u>IEA</u>, the <u>KSA</u>, and <u>OPEC</u> have said that global oil investment and spare capacity could struggle to meet demand in 2023
- Natural gas. Resilient U.S. natural gas production could serve as a model for oil
 - Record U.S. natural gas production in Nov. 2022 with growth led by Louisiana and Texas
 - U.S. spot prices fell despite record-high natural gas exports

Third Quarter 2022 by the numbers

Benchmark price averages

Brent crude oil: \$99.07 per barrel WTI crude oil: \$91.63 per barrel NGL composite: \$10.89 per mmBtu Nat. gas Henry Hub: \$7.98 per mmBtu



 Financial compilation based on API 200 companies with shares listed on U.S. stock exchanges.
 sources: EIA; API Monthly Statistical Report; Bloomberg and company reports; Baker Hughes; API Team analysis



American Petroleum Institute

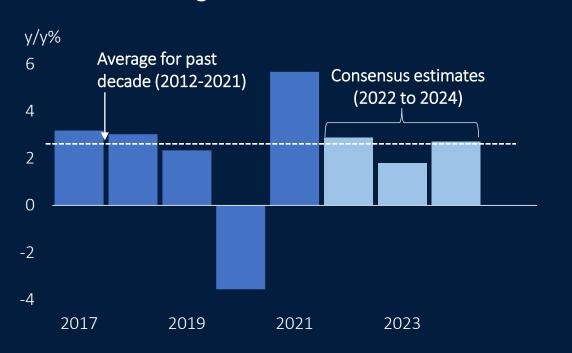


Despite solid industrial activities, the economic consensus global GDP growth to slow in 2023, largely due to interest rate increases to stem price inflation

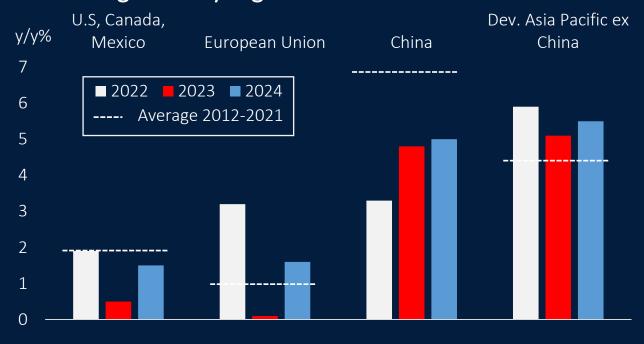


- Slobal GDP growth expectations have fallen to 1.8% y/y for 2023 but could rebound to its decade average rate in 2024
- Economic growth in China and emerging Asia economies is a key uncertainty

Global real GDP growth and consensus estimates*



Real GDP growth by region





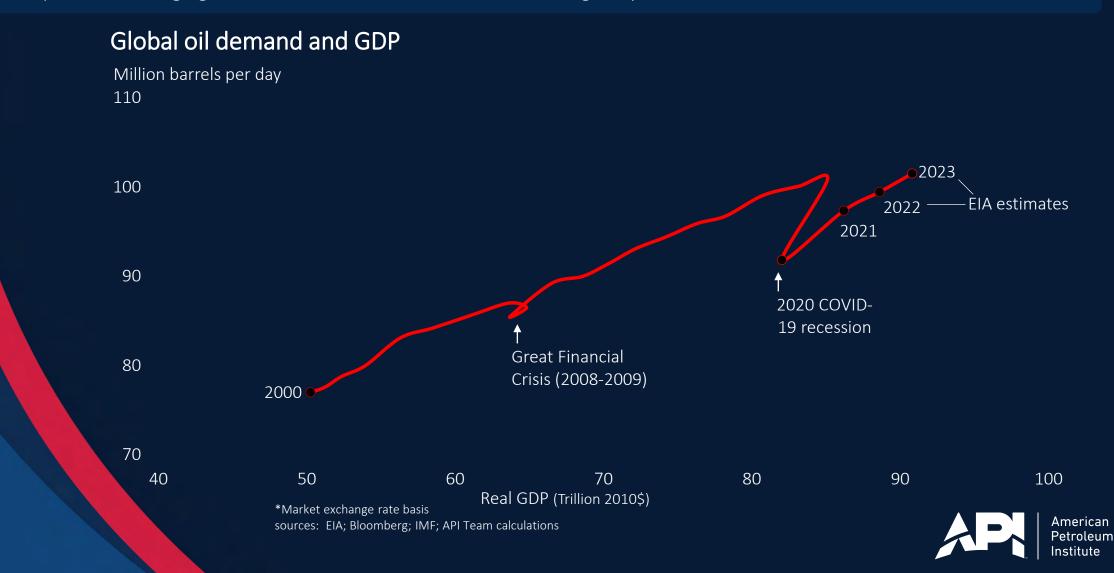
^{*} Market exchange rate basis aggregated for 204 countries, compiled Aug. 2022 sources: IMF; Bloomberg; API Team calculations



Global oil demand could achieve a record high in 2023 per EIA



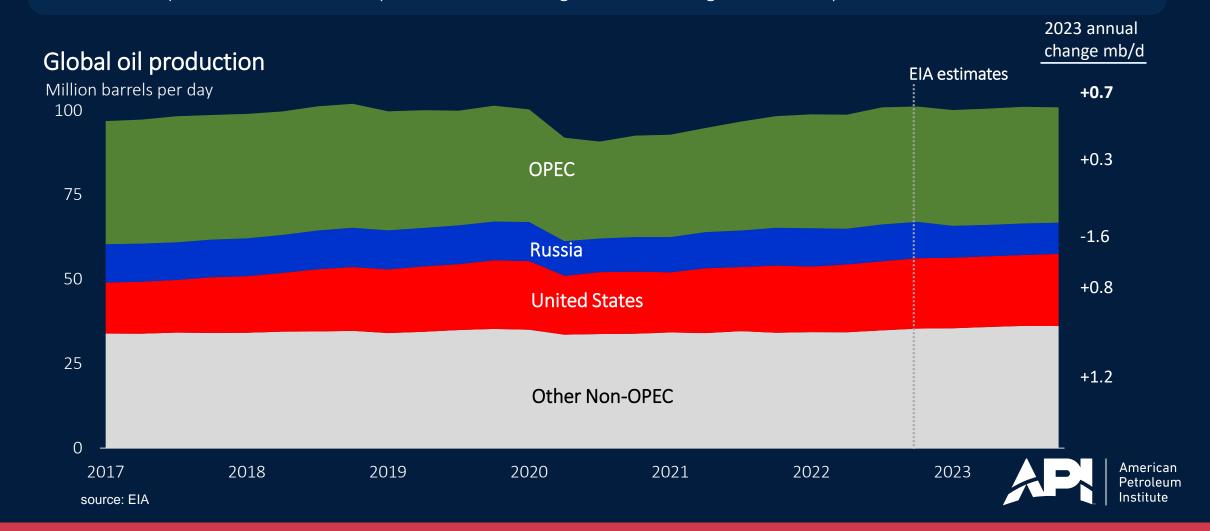
▶ EIA expects record-high global oil demand 101.0 mb/d in 2023, exiting the year at 102.3 mb/d in Dec. 2023



EIA projects that the U.S. and OPEC could need to raise production further this year and in 2023 to meet global demand growth



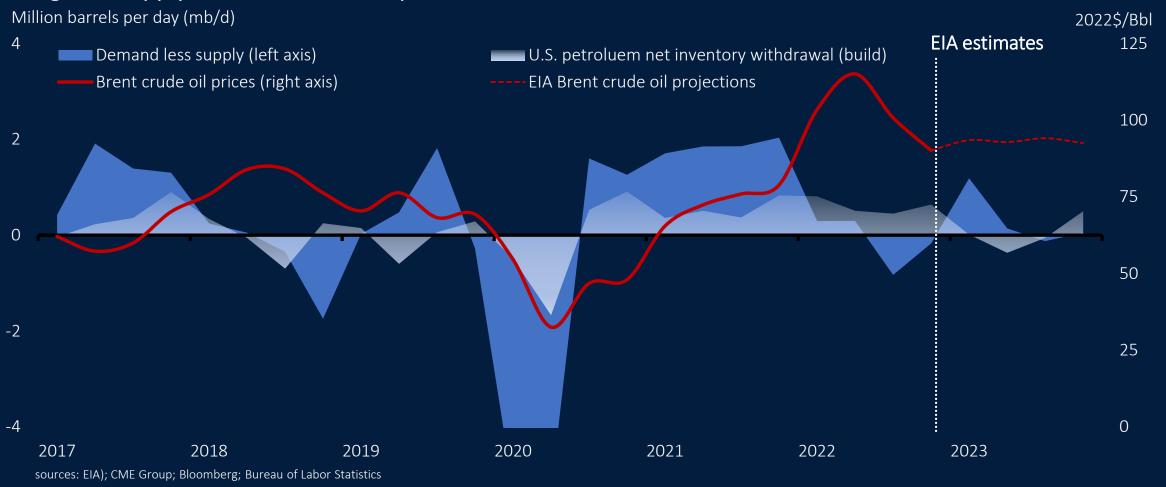
- The supply projections by EIA should be interpreted as amounts needed to balance global markets in their view
- EIA's expected 2023 oil production growth of 0.7 mb/d compares with demand growth of 1.2 mb/d, with key uncertainties around the potential loss of Russian production and strength of non-OPEC growth to compensate



EIA expects the global oil market balance to support prices of \$95 per barrel in 2023



EIA global supply/demand and Brent price estimates as of Nov. 2022





U.S. liquid fuels consumption could near its record levels in 2023 per EIA



- High-frequency indicators of transportation and industrial activity have remained solid
- EIA projects U.S. annual oil consumption growth 2.5% (0.5 mb/d) y/y in 2022 and 0.5% y/y (0.1 mb/d) in 2023

U.S. demand indicators, y/y%



+1.1% +3.6%





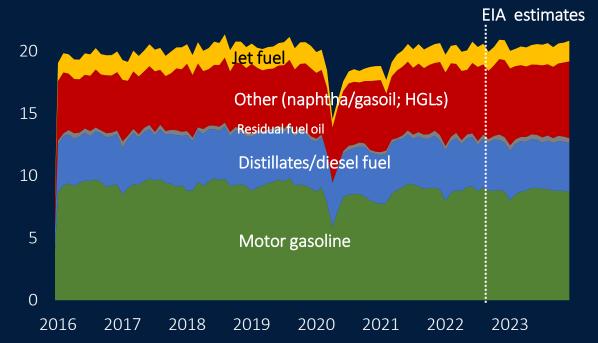




+2.1%

U.S. liquid fuel consumption by fuel

Million barrels per day 25



sources: EIA; API



Gasoline prices have historically reflected those of oil, which accounted for the majority of the changes in gasoline prices compared with last year

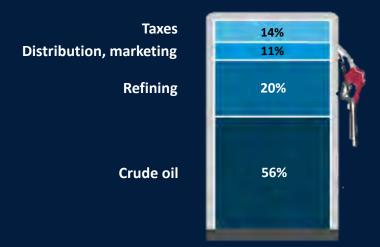


- Increased refiners' crude oil acquisition costs in the U.S. drove over 70% of the rise in gasoline prices year-to-date per EIA and AAA
- New Hampshire's gasoline prices averaged four cents per gallon below the U.S. average over the first 11 months of 2022 per AAA

EIA: What we pay for gasoline

Regular gasoline prices, October 2022

U.S. average retail price: \$3.82/gallon NH average retail price: \$3.50/gallon



source: EIA; AAA

U.S. and New Hampshire gasoline prices versus refiners' crude oil costs

Dollars per gallon (2022\$)



sources: Bloomberg; EIA; AAA; Bureau of Labor Statistics; API Team analysis

In New England, inventories of motor gasoline and propane have been in or near historic ranges; distillates have remained relatively low

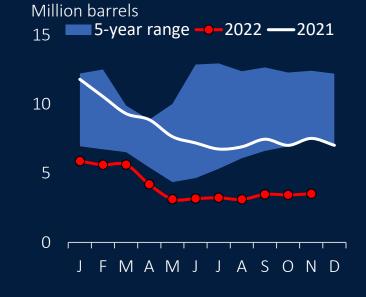


Inventories of distillates have been the main point of concern, and nationwide days of supply – currently 29.0 days as of Nov. 25
 – has exceeded by 11 days the most that these inventories have been drawn down over any period of one to five months over the past 30 years

Motor gasoline inventories

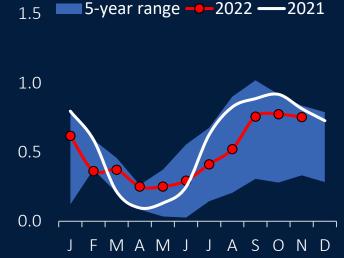


Distillates inventories



Propane/Propylene inventories

Million barrels





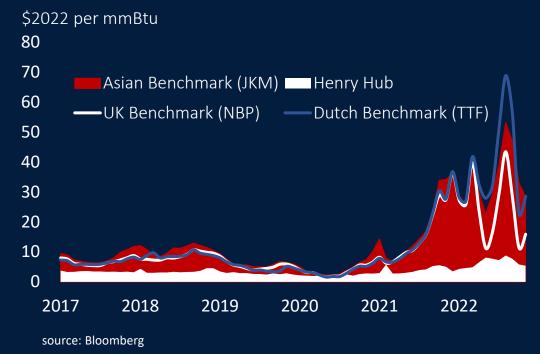
Natural Gas

Historically strong global natural gas prices have spurred U.S. natural gas exports

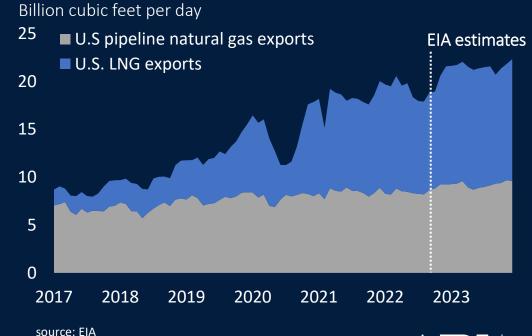


- As natural gas prices in Europe and Asia remained elevated and volatile, U.S. natural gas exports via liquefied natural gas (LNG) and pipeline have achieved record levels
- International prices have remained 3X to 5X higher than U.S. prices at Henry Hub

Global natural gas prices



U.S. natural gas exports



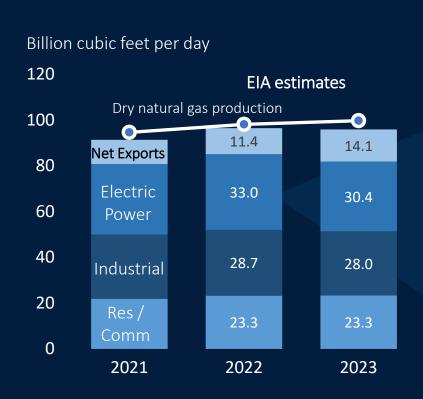


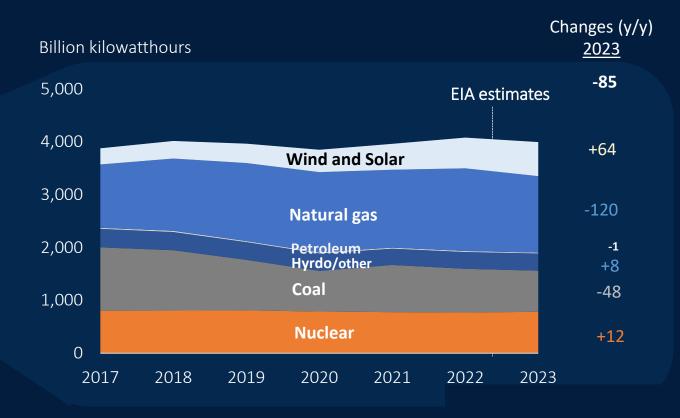
EIA expects 2023 natural gas production growth of 1.6 bcf/d in 2023 could support record LNG exports and 36% of U.S. electricity net generation



- >> For 2023, EIA growth of LNG exports to more than offset lower natural gas consumption in domestic electricity generation
- Natural gas could still represent 36% of U.S. net electricity generation in 2023 despite increases by other sources per EIA

Natural gas consumption and production by sector Electricity net generation by sector





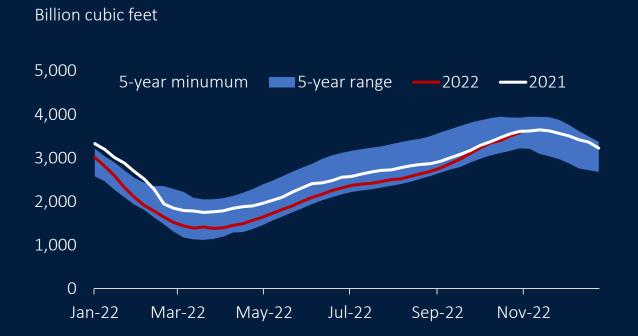
source: EIA (Nov. 2022)

Natural gas prices have remained highly seasonal and could remain elevated per EIA projections



- Natural gas net injections into underground storage caught up with their 5-year average in November per EIA
- Natural gas prices through the value chain have risen so far through 2022, and EIA expects elevated prices to persist in 2023

U.S. working gas in underground storage



EIA natural gas prices by end-use sector





source: EIA (Nov. 2022)

Infrastructure constraints have influenced regional natural gas prices



Natural gas price basis, 2023 average futures prices by hub as of Nov. 25 Green shading reflects state natural gas production in Aug. 2022



- Futures prices show pipeline transport costs and constraints between producing and consuming regions
- Pipeline constraints have raised prices in New York and New England, but lowered those in producing regions
- Southeast prices have risen to large premia above Henry Hub
- Pacific NW and Midwest prices lowered by gas-on-gas competition with Canada
- Prices in Oklahoma and N. Texas at a discount, rather than typical premium, to Henry Hub, which reflects growing LNG exports



Key implications

For consumption

- A combination of global demand outpacing supply and low inventories has historically exerted upward price pressures
- Due to the war in Ukraine impacting global markets, U.S. east coast distillates inventories have fallen to historic lows. The inventories could remain adequate if the winter is not severe and there are no international supply disruptions

For production

- As U.S. natural gas production achieved record levels in Q4 2022 despite ongoing work force, supply chain, financial and policy headwinds, the enabling factors for a stronger oil production recovery have become clearer
- While focus has remained on commodity prices, fostering infrastructure investments and project execution is critical

For economics and energy policies

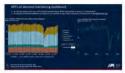
- Energy policymakers have a dilemma with solid oil demand but the lowest strategic petroleum reserves in nearly 40 years little margin for error
- Ensuring 2022-2023 winter supplies has been the immediate focus with potential losses of more Russian volumes due to sanctions, but longer-term policy support is essential to enable a robust oil production response across the value chain and more states



API economics resources available at www.api.org



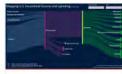
Explore API's Interactive Data Visualizations.



Tracking U.S. Oil Demand

Primary monthly API data tracking refined product consumption

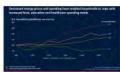
Explore Visualization al



U.S. Consumer Expenditure Flows By Income Level

Mapping U.S. consumer expenditure flows by income level and spending category

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U.S. Consumer Expenditure Summary

Summarizing leading U.S. consumer expenditure categories

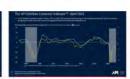
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U.S. Consumer **Expenditure** Burden By Income Level

Measuring U.S. consumer expenditure burden by spending category and income level

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API's Distillate Economic Indicator ™

API's proprietary Distillate Economic Indicator™ leverages refined product demand estimates to broadly track economic activity

Reports & Surveys

Economic Outlook

Data Visualization

Explore Visualization all



API's Economic Industry Outlook



The API Industry Outlook, developed by API's Dean Foreman, is a quarterly report that provi natural gas and oil industry as it relates to the economies.

Read The Blog:

Chief Economist's Posts on the Energy Tomorrow blog

Contact

Read The News Releases:

Chief Economist's News Releases, 2017 Chief Economist's News Releases, 2018 Chief Economist's News Releases, 2019 Chief Economist's News Releases, 2020

Downloads

- Monthly Statistical Report
- Q2 2020 Quarterly Outlook (Jun 2020)
- Q3 2020 Quarterly Outlook (Sep 2020)
- Q4 2020 Quarterly Outlook (Dec 2020)
- QI 2021 Quarterly Outlook (Mar 2021)



BIA Energy Symposium

December 7, 2018







ABOUT CLEAN ENERGY NH

New Hampshire's leading clean energy advocate (501(c)3 Nonprofit), dedicated to:



Strengthening NH's Economy



Protecting Public Health



Reducing Emissions

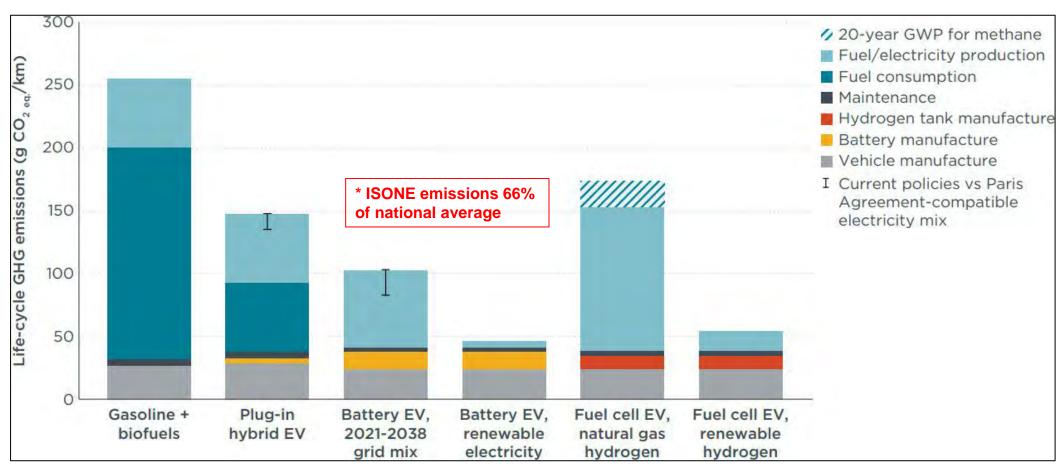
Learn more & become a member at: http://www.cleanenergynh.org

Dessert First - Closing Thoughts

- EVs offer significant economic, social, and environment benefits.
- Next Several Years Will Be Transformative for Auto Industry and US Transportation System.
- NH Has Fallen Behind on EV adoption and Public Charging Roll Out.
- Decisions Made Now Will Influence NH's Economy, Communities, and Environment for Decades to Come.
- Policies and Programs Are Needed At State Level to Keep Up with Surrounding States.

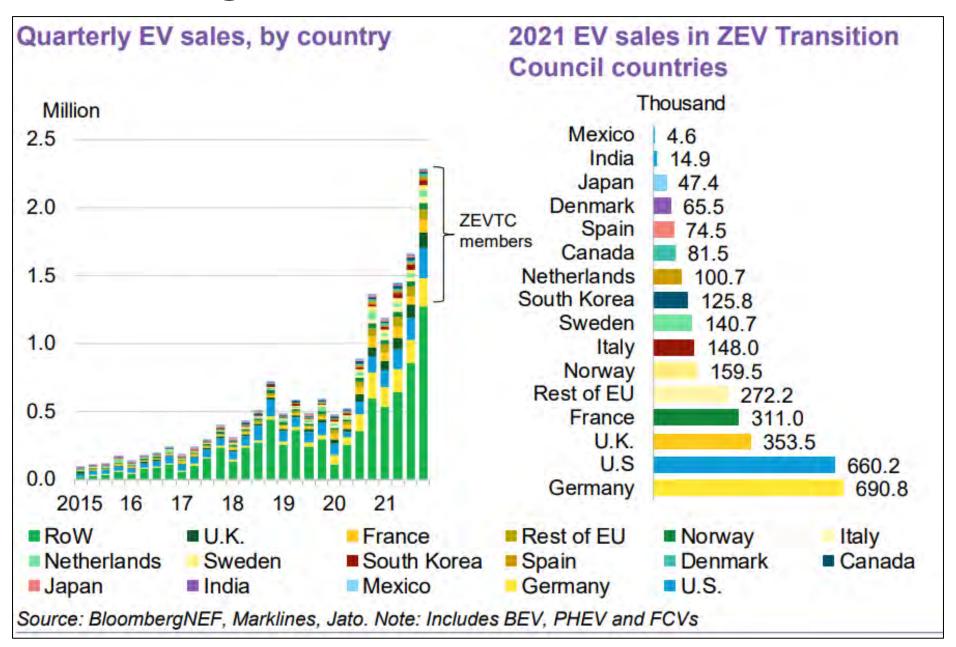
EV Benefits Energy Use and Emission Reductions

EVs are 3-4x More ENERGY Efficient; Reducing EMISSIONS by 60-80%



Source: https://theicct.org/wp-content/uploads/2021/12/Global-LCA-passenger-cars-jul2021 0.pdf

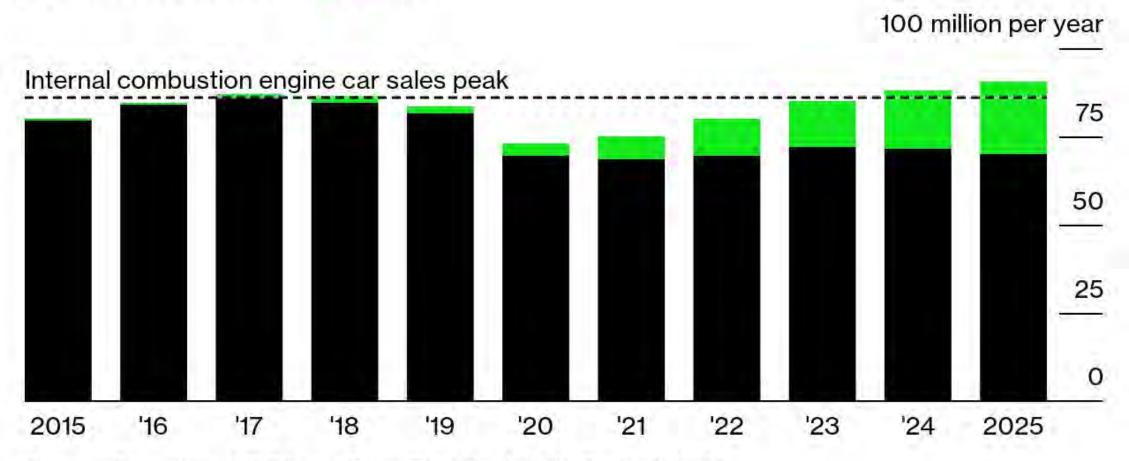
Global Passenger EV Sales Reach New Record in 2021



Peak ICE Is Behind Us

Global passenger vehicle sales by powertrain

■ Internal combustion
■ Electric

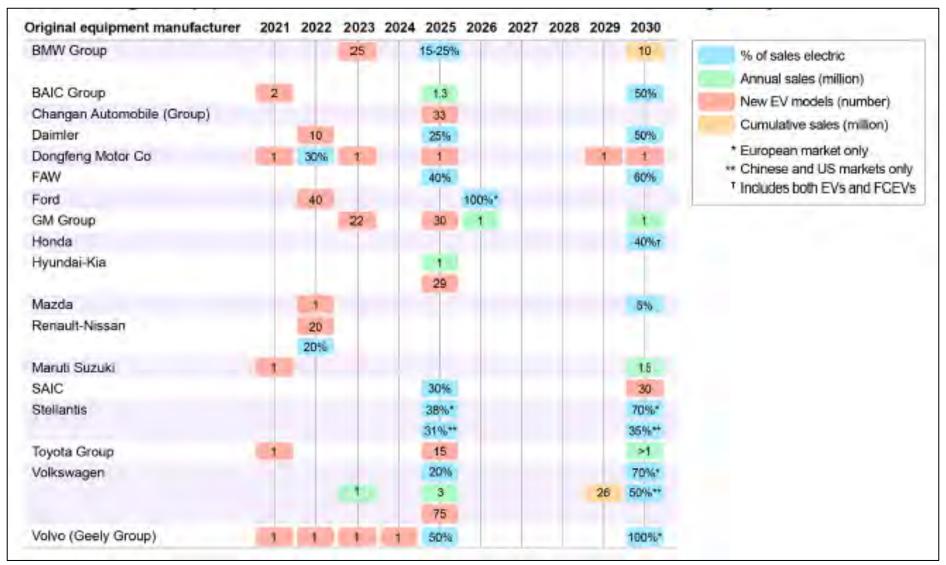


Source: BloombergNEF Long-Term Electric Vehicle Outlook 2022

Note: Electric vehicles include plug-in hybrid vehicles

Bloomberg Green

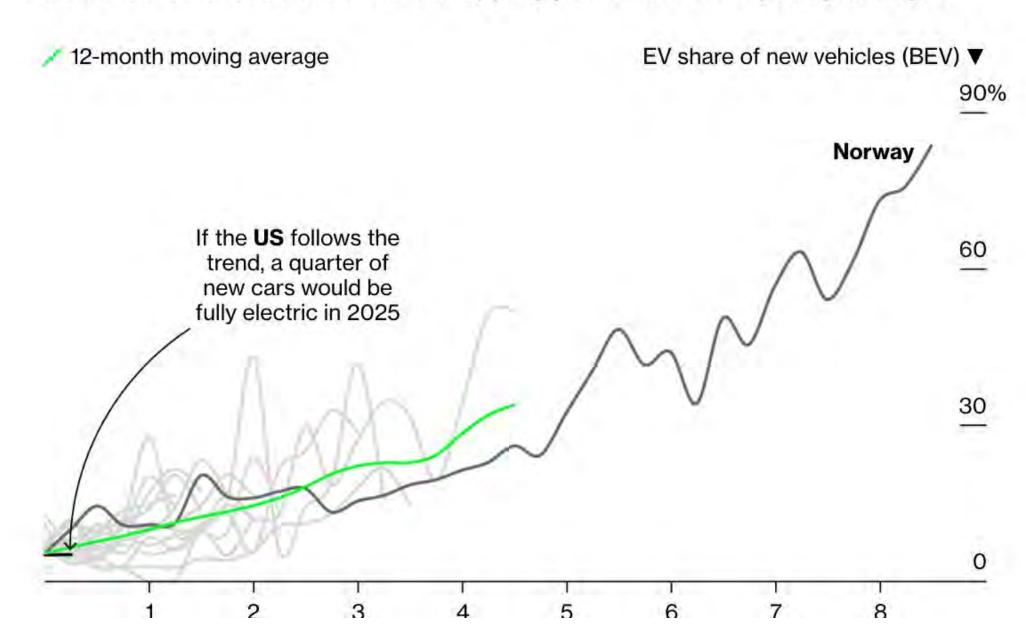
Original Equipment Manufacturer Announcements Related To Electric Light-duty Vehicles



Source: IEA (2021), Global EV Outlook 2021, https://www.iea.org/reports/global-ev-outlook-2021

How Fast Is the Switch to Electric Cars?

19 countries have reached the 5% tipping point—then everything changes



Adoption of EVs Consistent with Previous Transitions

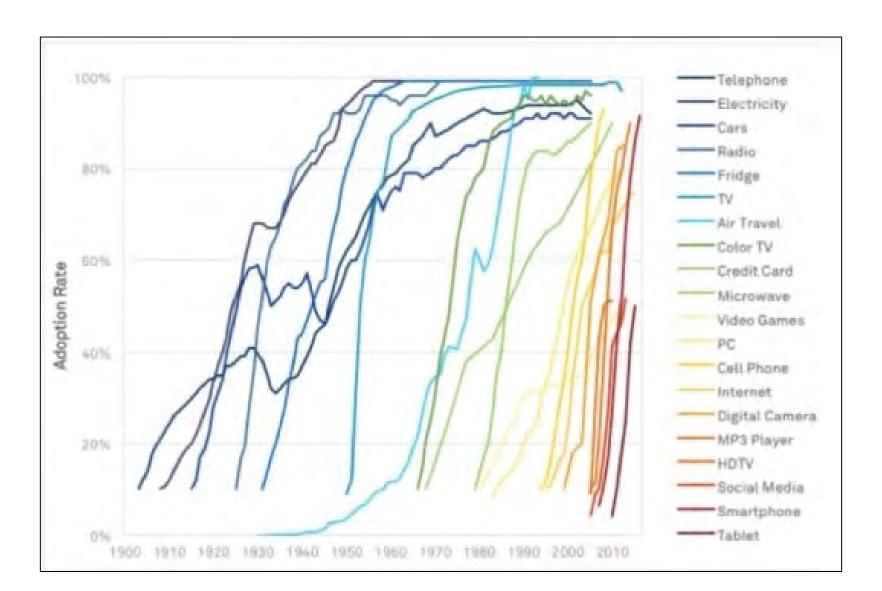
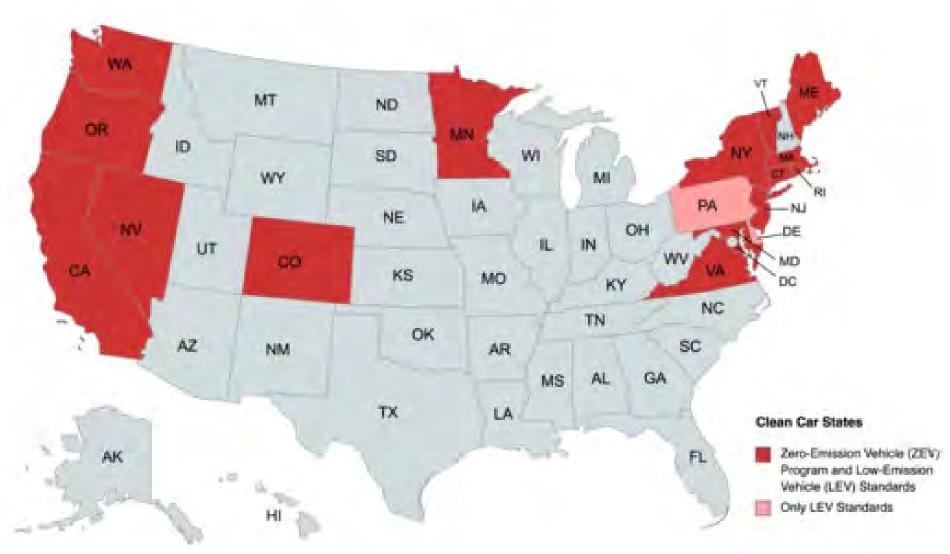
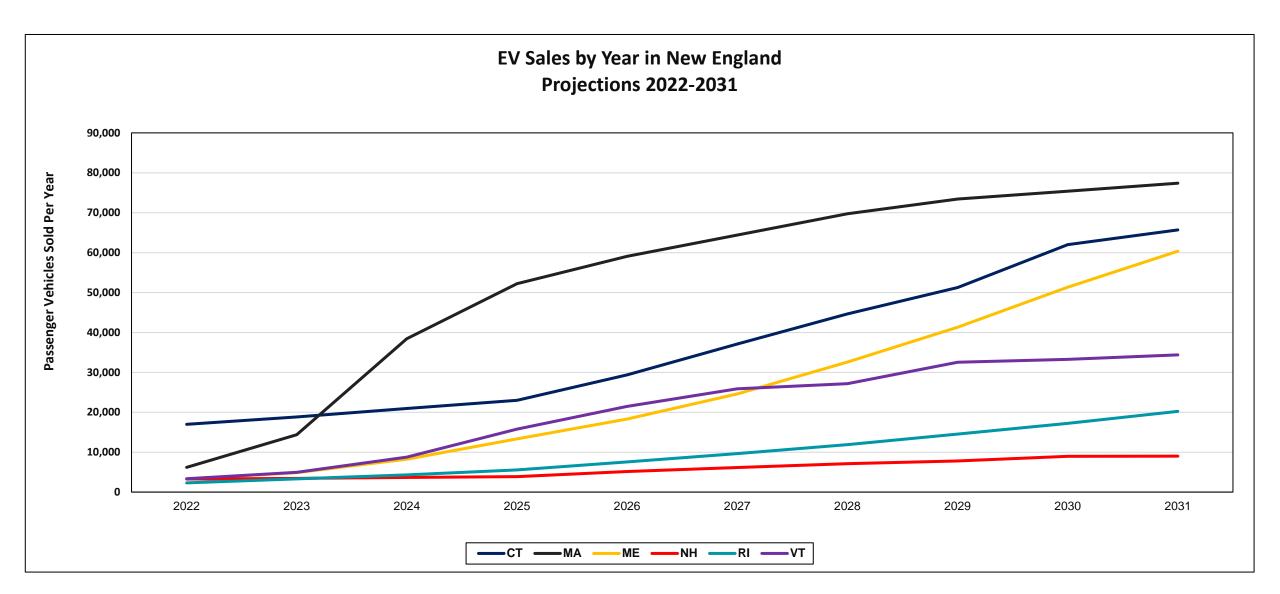


Image Credit: Tony Seba

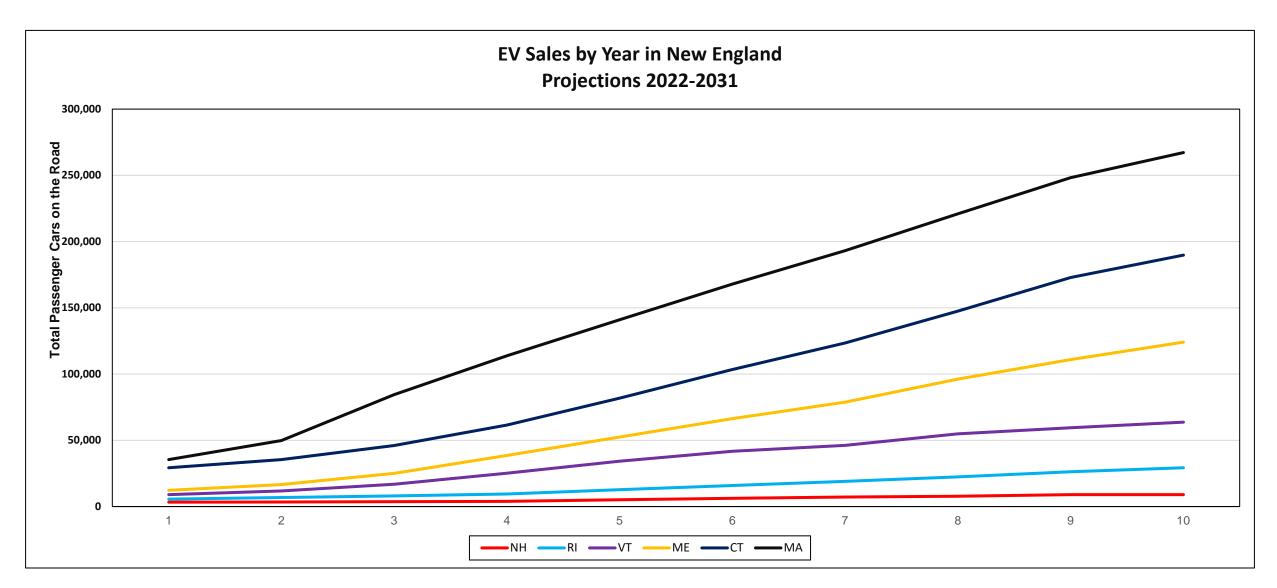
States and Provinces Surrounding NH Will Be Early Adopters

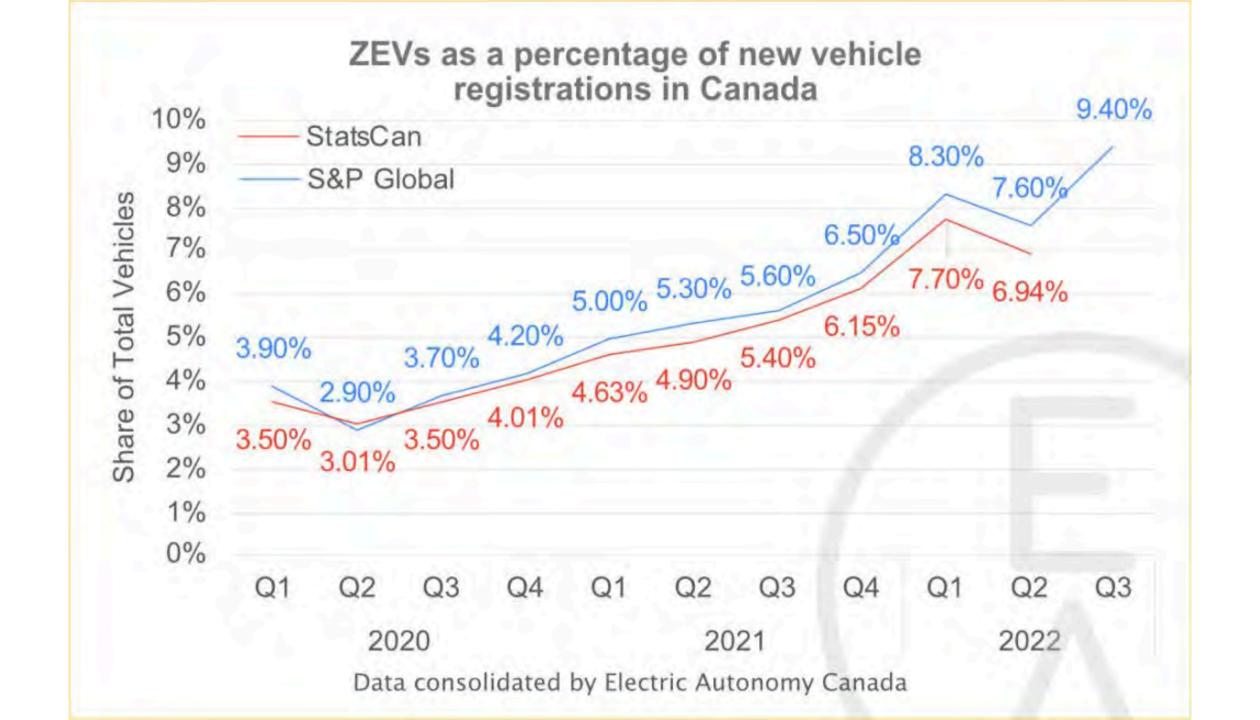


Deeper Look at EV Adoption in NH Lowest NE Transportation Electrification

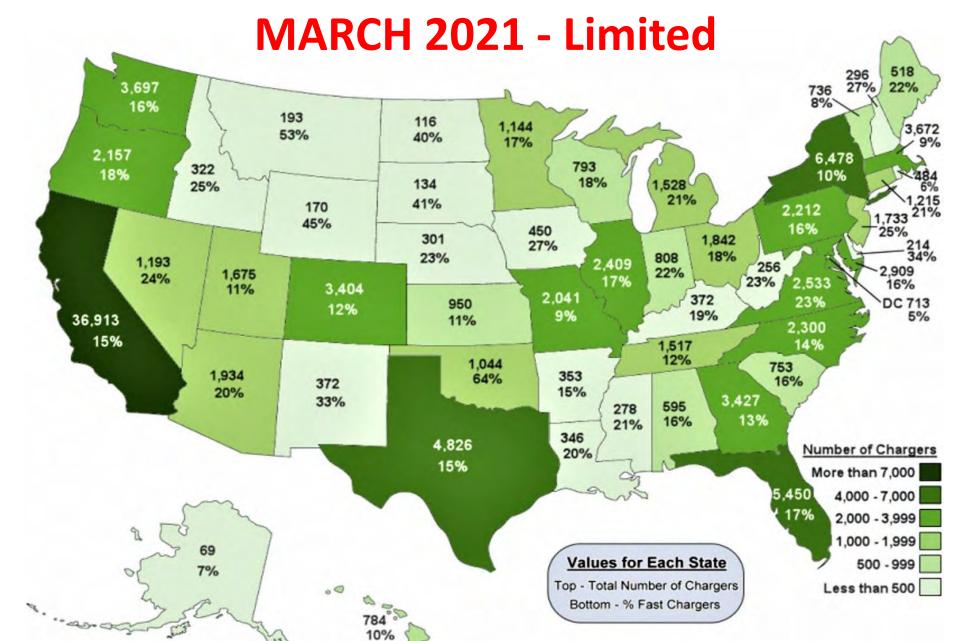


Deeper Look at EV Adoption in NH Lowest NE Transportation Electrification

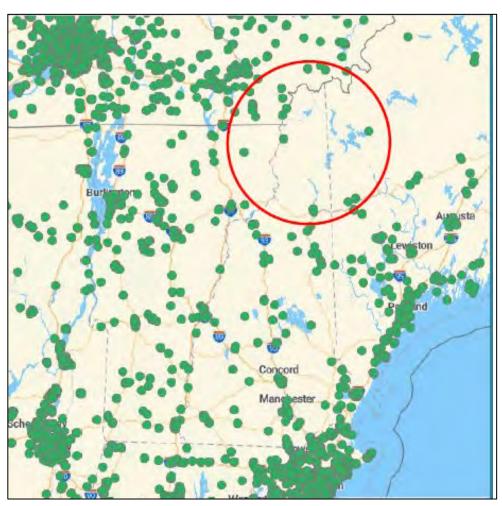


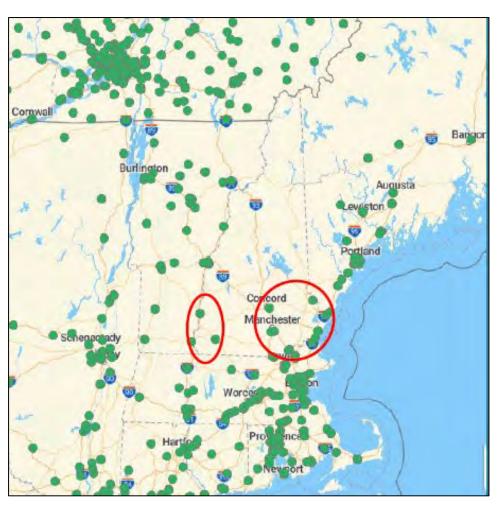


Publicly Available Electric Vehicle Supply Equipment



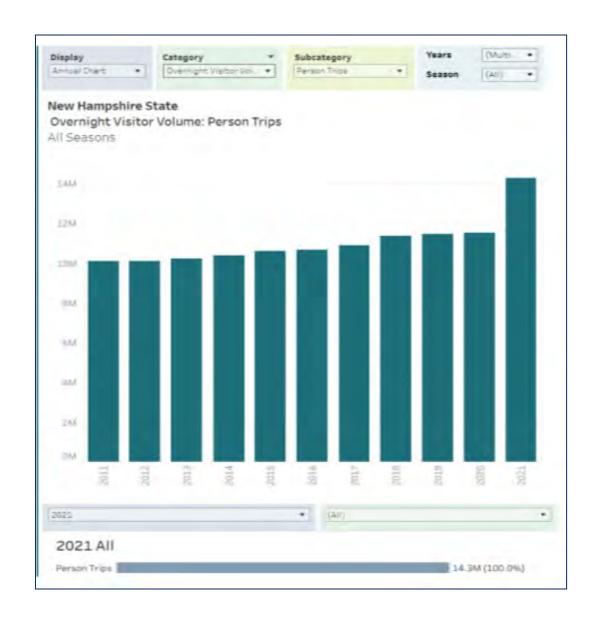
Funding for Electric Vehicle Supply Equipment Limited

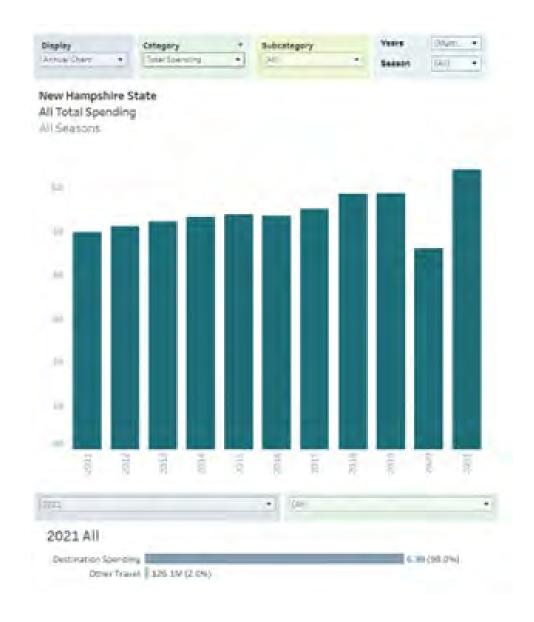




Source: Jessica Wilcox, EBC Presentation and https://afdc.energy.gov/stations/#/find/nearest Current data November 1, 2022

Travel & Tourism Industry Impact on NH

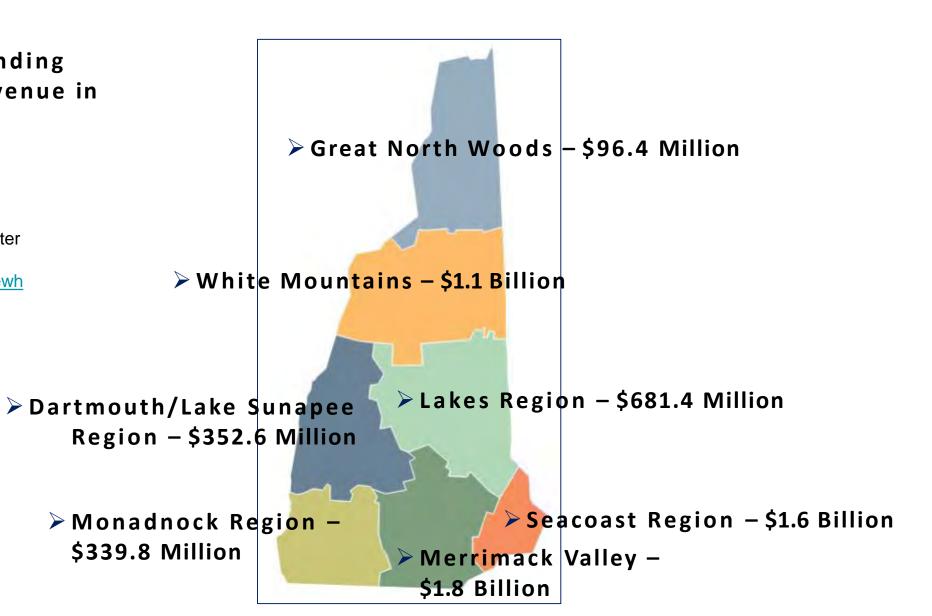




Travel & Tourism Industry Impact on NH

In 2021, destination spending generated billions in revenue in each travel region:

Source: New Hampshire Travel Barometer – Impacts, Dean Runyan Associates https://www.travelstats.com/qimpacts/newh ampshire



Limited Public Funding for Electric Vehicle Supply Equipment

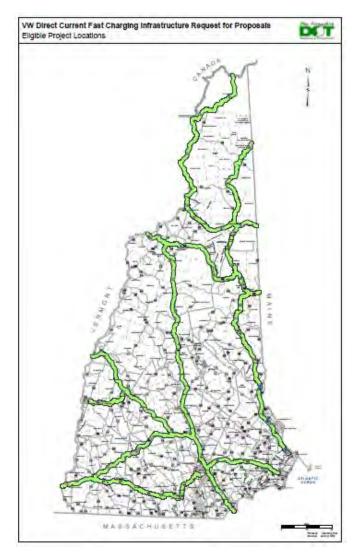
Funding Source Quantity Timing

VW Mitigation Trust\$3 Million Q4 – 2023

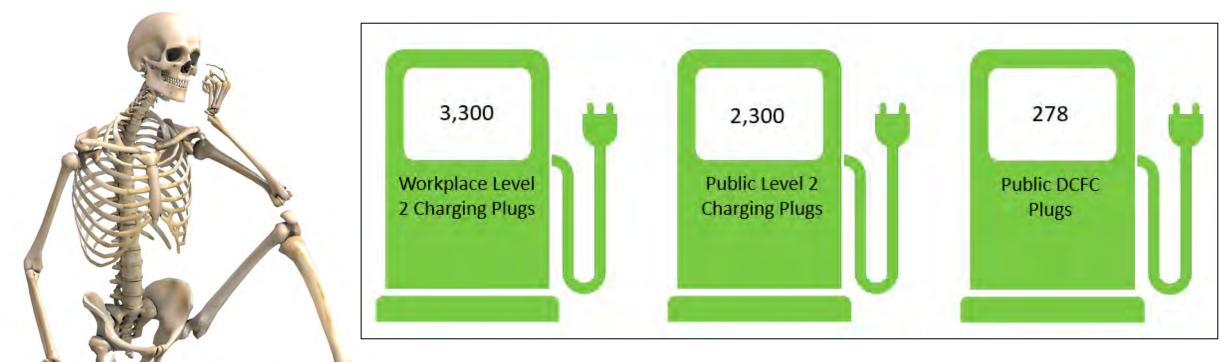
Eversource Make Ready \$2 Million Q4 - 2023

Unitil Make Ready \$4 Million DENIED

National Electric Vehicle \$17 Million 2023-2027 Initiative



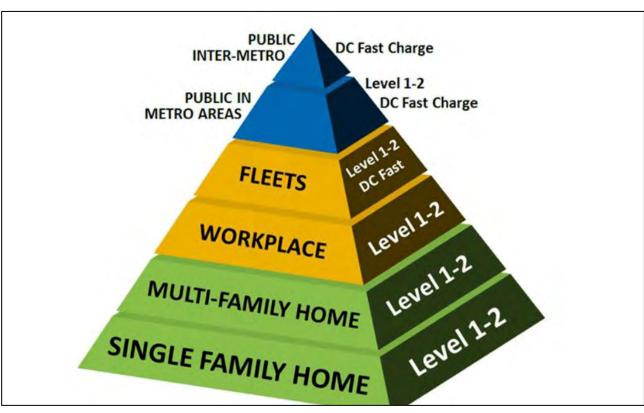
Current Funding MIGHT Reach The Backbone BUT Just a Few of the Bones in The Body



Number of Charging Plugs Needed in NH by 2030

EV Charging Infrastructure Will (NEED TO) Be Everywhere





Questions?

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@cleanenergynh







Transactive Energy Rate Pilot

BIA-NH December 7, 2022



Agenda

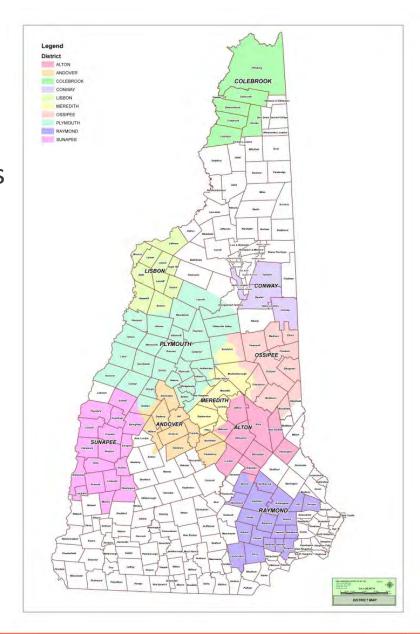
- NHEC Strategic Planning Goal
- Transactive Energy Rate (TER)
- Member Benefits

"By 2025 we will have 350 gigawatt hours worth of energy storage at our disposal through our electric car fleet. Between 2025 and 2030 this will grow to 1 terawatt hours worth of storage. That's more energy than is currently generated by all the hydroelectric power stations in the world. We can guarantee that energy will be used and stored and this will be a new area of business."

Michael Jost, Chief Strategist Volkswagen

About NHEC

- Founded in 1939
- 230 employees serving more than 85,000 homes and businesses in 118 communities, with over 6,000 miles of line (~15 services/mile)
- Largest electric cooperative in New England and second largest electric utility in New Hampshire
- New Hampshire is open to retail competition and NHEC is a "Default Service" provider of energy
- Launched NH Broadband LLC with goal to get fiber-to-the-home internet to all unserved and underserved NHEC members



Transactive Energy Business Model: Strategic Plan Goal



2017: Transactive Energy Business Model becomes a Focus Area in Strategic Plan



2019: Transactive Energy Business Model Pilot to use "Price Signals"



2020: Develop a Transactive Energy Rate "Price Signal"



2021-2022: Test the mechanics of a Transactive Energy Rate

- Develop and test the required elements of a transaction.
 - Publishing, accounting, verification, reporting, payment



2023: Launch the Transactive Energy Rate Pilot

- Publish the Day Ahead hourly price
- Compensate or charge members on device performance
- Q1 2023 launch targeted (one year, 500 member pilot, batteries and EV's to start)

Transactive Energy Rate Example

How a Transactive Energy Rate Works

Register a Device to Rate

Members or Participating Aggregators will register their device for the rate.

V2G Chargers & EVs Batteries (incl. Solar)

Day-Ahead Hourly Price Signals

The utility passively sends a set of day-ahead 24 hourly price signals to registered devices.

Inform, not control

Devices React & Share Usage Info

Devices react to price information based on third-party preferences & send usage info to utility.

Buy/use when low Sell/reduce when high

Monthly Bills & Credits Generated

Participating devices live as a separate utility bill line item & reflect usage cost or credits.

Transparency New Benefits



Transactive Energy Rate Pilot: Battery Use Example

Transactive Energy Rate (TER) Example													
Day	11/16/2022												
Hour Ending	1	2	3	4	5	6	7	8	9	10	11	12	
TER (\$/kWh)	\$0.062	\$0.062	\$0.060	\$0.059	\$0.061	\$0.063	\$0.072	\$0.082	\$0.090	\$0.092	\$0.084	\$0.087	
Battery kWh (+/-)			10	10	Member charges the battery								
Charge/(Credit)			\$0.60	\$0.59	pulling energy from NHEC during								
lowest cost hours													
Hour Ending	13	14	15	16	17	18	19	20	21	22	23	24	
\$/kWh	\$0.074	\$0.076	\$0.063	\$0.067	\$1.469	\$1.487	\$0.074	\$0.069	\$0.069	\$0.065	\$0.062	\$0.059	
Battery kWh (+/-)					-10	-10							
Charge/(Credit)					-\$14.69	-\$14.87	Member discharges the Battery						
selling energy to NHEC during													

highest credit hours

^{*}Example of two Tesla Powerwall 2 batteries 27 kWh total storage, example creates a \$28.37 credit for the day.

Transactive Energy Rate Member Benefits

Transactive Energy Rate (TER) Pilot: Member Benefits

TER Annual Potential Revenue for Distributed Energy Resources

- Home Battery (5kW, 13.5 kWh): ~\$1,200/yr credit
- EV Charger only (6.6kW, 62 kWh, 13.5k Miles/yr): ~\$350/yr fuel charge
 - ~\$1,800/yr savings at \$4/gallon and 25 MPG (gas engine)
- Vehicle to Grid Charger (6.6kW, 62kWh 13.5k Miles/yr):
 ~\$1,200/yr net credit
 - ~\$3,350/yr savings at \$4/gallon and 25 MPG (gas engine)
- Solar PV System, RECs sold to NHEC (8.6kW): ~\$1,100/yr credit (no load)
- Residential Solar PV System w/ Battery, RECs sold to NHEC (8.6kW PV), Res. load of 6,100 kWh/yr): ~\$1,700/yr credit



Transactive Energy Rate (TER) Pilot: Plymouth State University

Plymouth State University (PSU) has joined forces with NHEC and Fermata Energy to test the Transactive Energy Rate (TER)

- NHEC helped PSU find an affordable lease with Nissan for two new LEAF's
- Fermata Energy installed a 15 kW bidirectional charger on PSU's campus
 - Two 20 kW chargers expected soon
- Fermata Energy maximizes value through scheduling charging and discharging for PSU
- Anticipated TER value created is ~\$4,000/yr for each vehicle (~\$8,000/yr total)





Transactive Energy Rate (TER) Pilot: Integrations

General Motors

- Managed Charging starting in Dec. 2022
 - Chevy Bolt and Chevy Volt
- V2G testing Q2 2023
 - Chevy Sliverado, additional GM models to be included during the term of the program



V2G fully Integrated July 2022

Generac

PowerCell batteries and FLO Chargers Q1 2023









Fermata Energy Charger

1st installation of a Vehicle to Grid charger in New Hampshire

Plymouth State University 15 kW- to be replaced with a 20 kW in the fall (no charge)



Ford Charge Station Pro

19.2 kW

80 amps on demand

It gives. It takes. It works with you, then for you. Unlock the full potential of the F-150® Lightning™

Enables Intelligent Backup Power

\$1,310.00

Included with F-150® Lightning™ with Extended-Range Battery.

View product details 🔮





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NH Offshore Wind Update

Ted Diers, Assistant Water Division Director

December 2022





Progress to date

2019

- NH Governor Chris Sununu requests BOEM form Gulf of Maine Intergovernmental Renewable Energy Task Force.
- Task Force formed and holds first meeting.
- NH Executive Order 2019-06 requires a report on greenhouse gas emissions and port & transmission infrastructure.

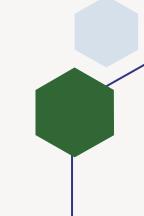
2020

• NH Commission to Study Offshore Wind and Port Development forms; includes representatives from state government, the business community (including NH's commercial fishing industry), and labor unions.

2021

- BOEM and states resume talks about Task Force.
- BOEM releases schedule for upcoming leasing auctions -- Gulf of Maine for late in 2024.





Progress to date

2022

- NHDES and NHDOE releases report on greenhouse gas emissions and port & transmission infrastructure
 - https://www.des.nh.gov/sites/g/files/ehbemt341/files/documents/offshore-wind-deployment-report.pdf
- 2nd meeting of the Tri-State Task Force BOEM releases Request for Information (RFI)
- NH Legislature passes and Governor signs SB 268 and SB 440.
- NHDOE selects Normandeau Associates (with team) to conduct Offshore Wind Assessment
- NHDES, NH Fish and Game and NH SeaGrant conduct outreach efforts on RFI
- State hosts an Offshore Wind Summit to bring industry together to discuss future opportunities
- NH participates in multi-state discussion about compensatory mitigation, supply chain, transmission, and floating wind technology.



State Legislative Activities

In the 2022 Session of the NH State Legislature, two pieces of legislation relating to offshore wind activities were passed and signed into law, SB 268 and SB 440:

- <u>SB 268</u>: The focus of this bill is to ensure New Hampshire's statutes included our regulatory policies regarding offshore wind deployment, including the need to address compensatory mitigation for negatively impacted commercial fishing activities along with other commercial and recreational maritime activities; the catalyst for this piece of legislation was to ensure NH had the ability to utilize federal consistency for offshore wind projects in federal waters in the Gulf of Maine.
- <u>SB 440</u>: The focus of this bill is to ensure the NH Department of Energy's Office of Offshore Wind Industry Development advises the NH Public Utilities Commission (PUC) and is part of any conversations regarding a NH utility being interested in pursuing clean energy resources produced in the Gulf of Maine.



What's next?

2023

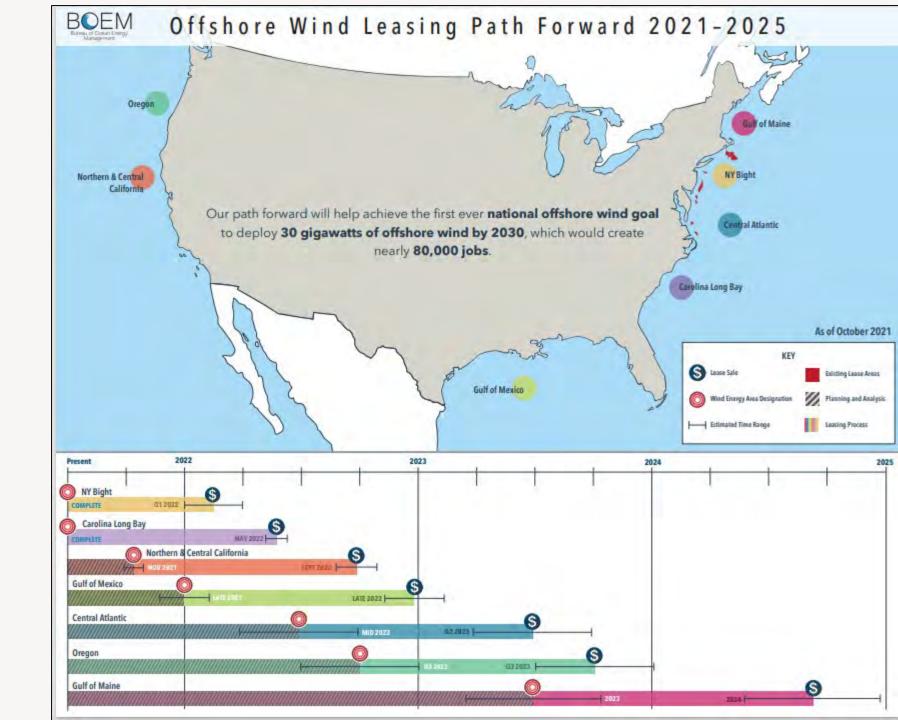
- Offshore Wind Assessment the State will be released to show impacts assessment based on SWOT analysis
 of the potential economic, energy, and environmental impacts for New Hampshire and the New England
 Region of offshore wind in the Gulf of Maine; stakeholder engagement by the consultant will also be part of
 the process for their analysis.
- Task Force meeting and release of The Call.
- Finalize Compensatory Mitigation guidance
- Improvements to NH's Port Infrastructure The NH Port Authority has five projects it has either started or is in the final stages of securing funding for that are part of its efforts to ensure New Hampshire's main port in Portsmouth and its supporting facilities in other parts of the state have the capacity and capability to service the large cargo ships that are part of offshore wind supply chain operations; the state is moving these projects forward as quickly as possible to ensure completion of all five projects before construction of any offshore wind facilities in the Gulf of Maine begins.



Leasing in the OCS

Expect lease auction in the Gulf of Maine in 2024.





Starting the Planning Process in the Gulf of Maine: First Steps



Commercial Track



Request For Competitive Interest (RFCI)

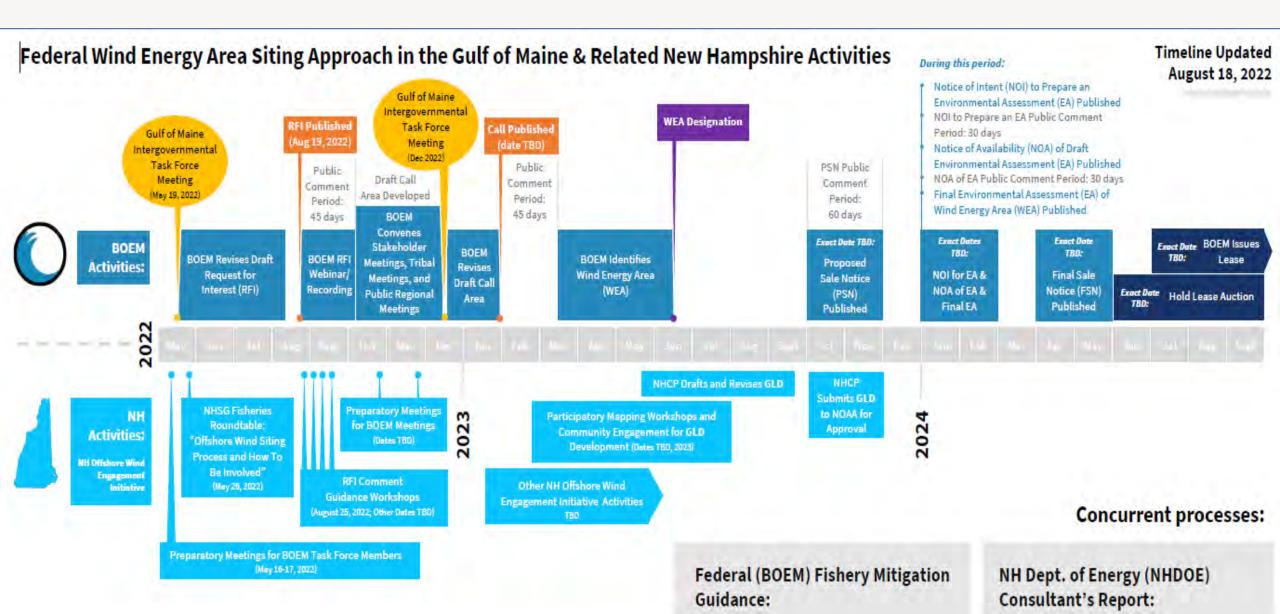
Non-Competitive Leasing Process: Research Lease

Research Track

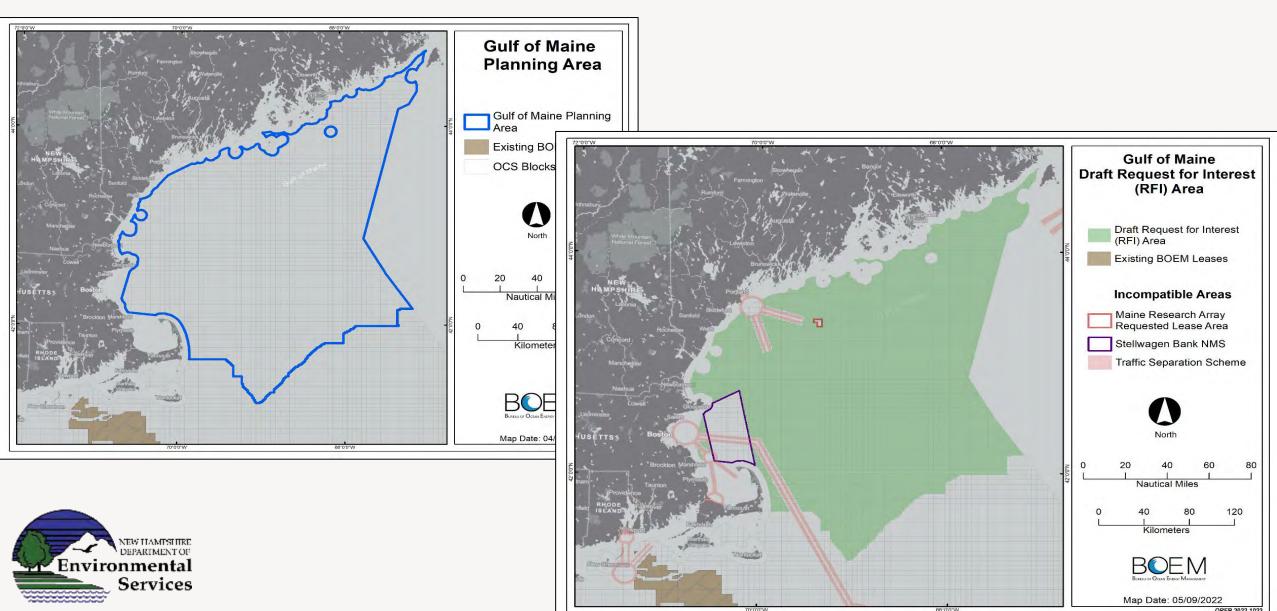
AUGUST 2022



The Leasing Process



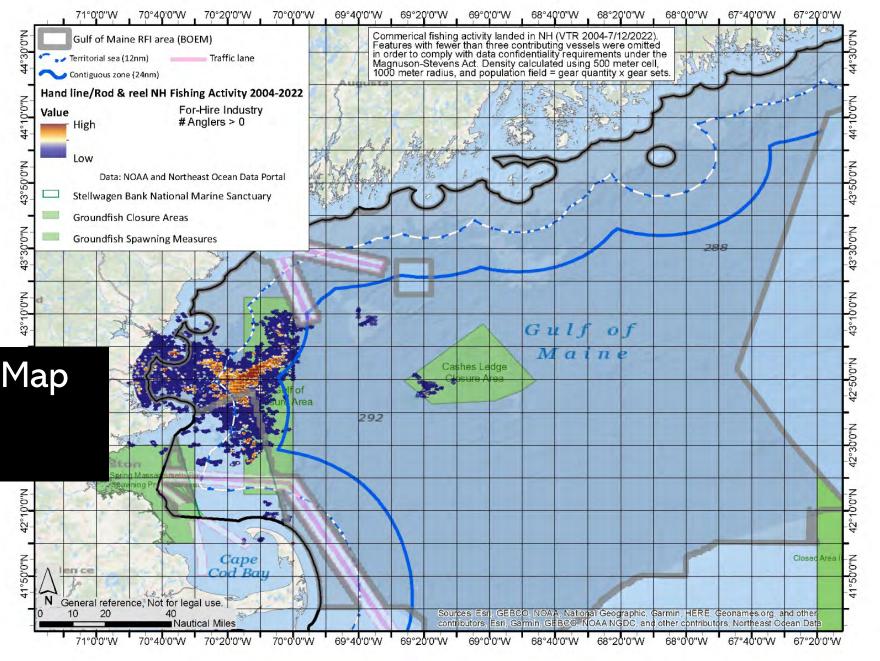
The Winnowing



RFI Outreach

- 4 stakeholder meetings
- Materials for public comment

Example Constraints Map (recreational fishing)





Now what?

- Expect "THE CALL" in Winter/Spring 2023
- Task Force meeting associated with The Call
- Opportunities for public comment



"* Steps for Research and Commercial Leasing in the Gulf of Mair

The lease process is not the beginning of the end, it is the end of the beginning. The really hard work comes after the leases.

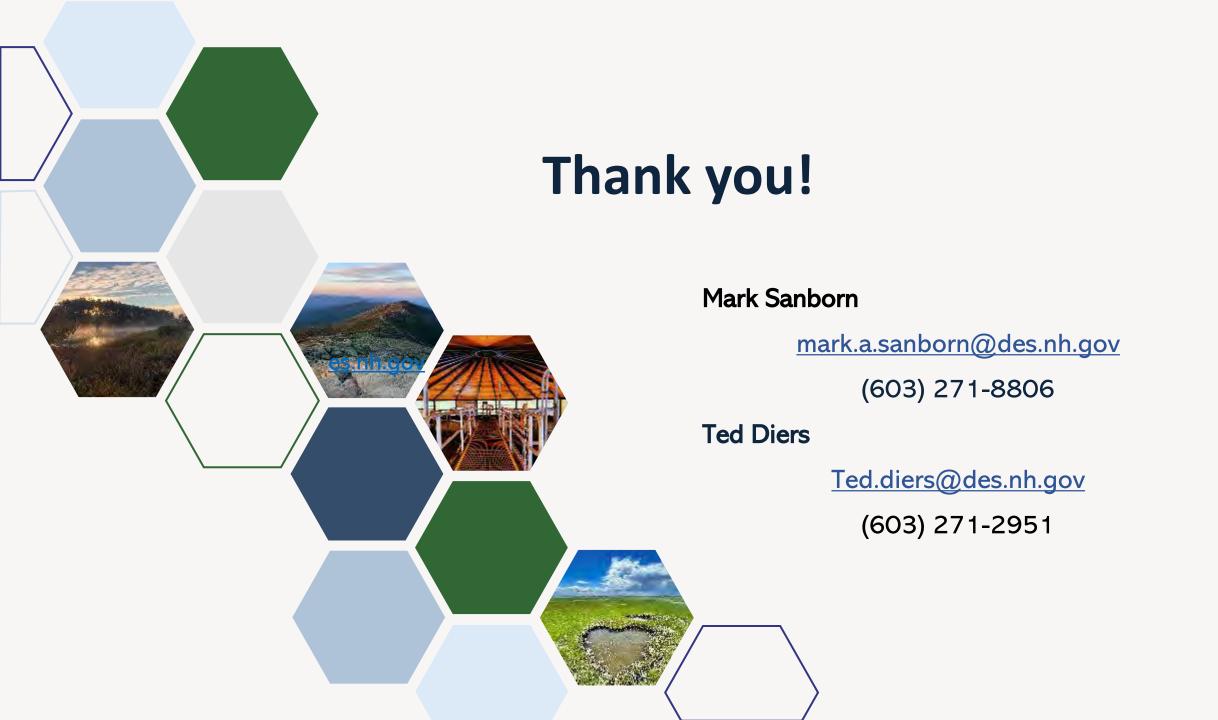


Federal Consistency and Geographic Location Description GLD

- Federal Consistency is a powerful tool!
- Federal activities outside CZ not subject to federal consistency unless NH develops and NOAA approves a GLD.
 - 1. A coastal *effects analysis* describing the reasonably foreseeable effects on state's costal resources and/or uses;
 - 2. A description of the specific geographic boundaries of the area outside the state coastal zone for which the GLD is sought; and
 - 3. The specific federally permitted activities that are subject to federal consistency review within the GLD boundary.









Overview of New England's Energy Transition

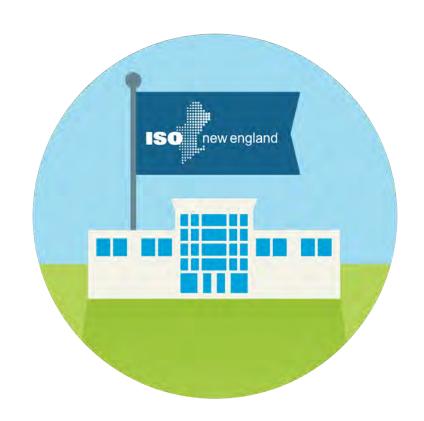
Business & Industry Association 2022 New Hampshire Energy Symposium

Eric Johnson

DIRECTOR, EXTERNAL AFFAIRS

ISO New England (ISO) Has More Than Two Decades of Experience Overseeing the Region's Restructured Electric Power System

- Regulated by the Federal Energy Regulatory Commission
- Reliability Coordinator for New England under the North American Electric Reliability Corporation
- Independent of companies in the marketplace and neutral on technology



ISO New England's Mission and Vision

Mission: What we do

Through collaboration and innovation, ISO New England *plans* the transmission system, *administers* the region's wholesale markets, and *operates* the power system to ensure reliable and competitively priced wholesale electricity

Vision: Where we're going

To harness the power of competition and advanced technologies to reliably plan and operate the grid as the region transitions to clean energy

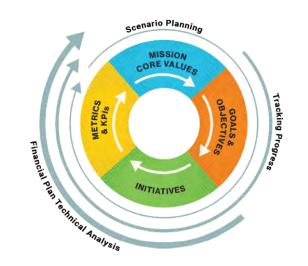




The ISO's new **Vision** for the future represents our long-term intent and guides the formulation of our Strategic Goals

ISO New England's Strategic Plan



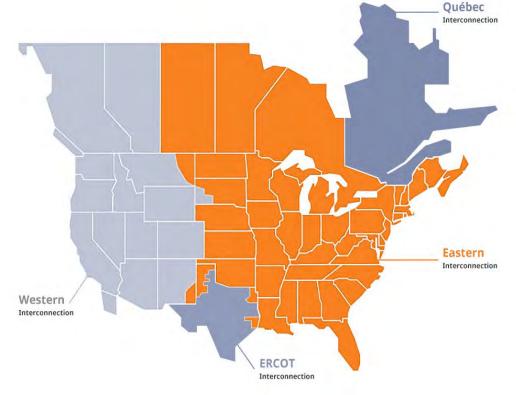


- On October 26, the ISO released <u>Vision in</u>
 Action: ISO New England's Strategic Plan
- The plan provides insight into how the ISO intends to fulfill its three critical roles during the clean energy transition
- In addition to discussing the ISO's key goals and initiatives, the plan offers perspectives on trends shaping the power industry
- ISO CEO Gordon van Welie presented an overview of the plan at the Nov 1 Open Board Meeting

New England's Power Grid Is Part of a Larger Electric Power System

 Part of the Eastern Interconnection, one of four large power grids in North America

- Interconnected through primarily alternating current (AC) transmission
- Tied to Québec only through direct current (DC) transmission
- 2003 blackout ushered in wide-area monitoring and mandatory reliability standards
- Subject to reliability standards set by NERC and NPCC*

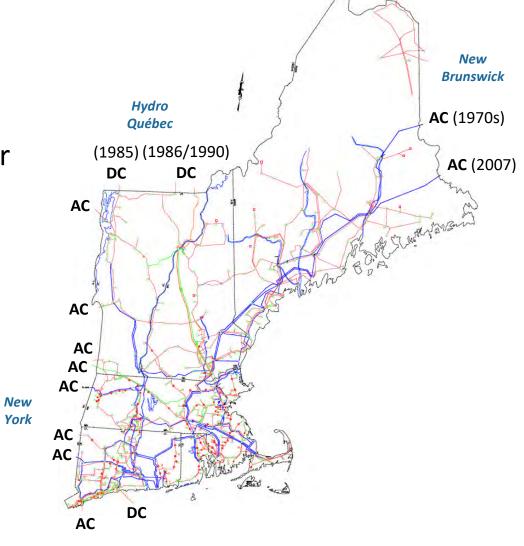


^{*} North American Electric Reliability Corporation (NERC) and Northeast Power Coordinating Council (NPCC)

New England Has Multiple Ties to Neighboring Regions

 Transmission system is tied to neighboring power systems in the U.S. and Eastern Canada:

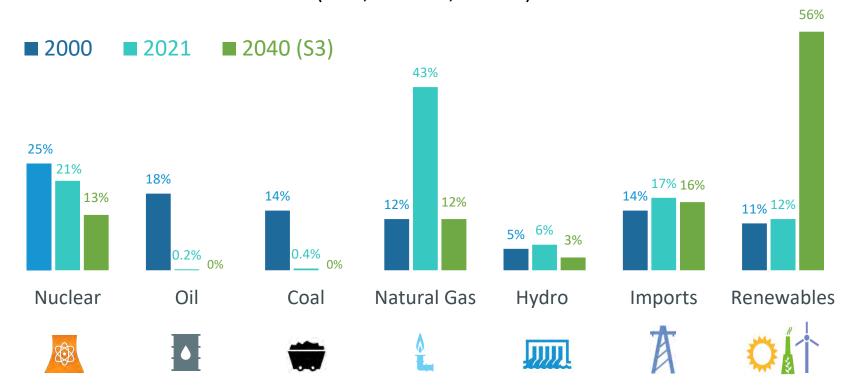
- New York (8 AC ties, 1 DC tie)
- Hydro Québec (2 DC ties)
- New Brunswick (2 AC ties)
- 16% of the region's energy needs were met by imports in 2021



Note: AC stands for Alternating Current and DC stands for Direct Current

Dramatic Changes in the Energy Mix Continue

Percent of Total **Electric Energy** Production by Source (Past, Present, Future)



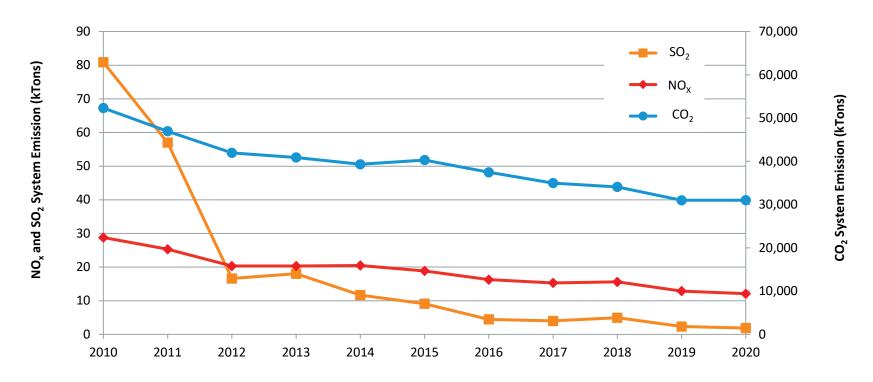
Source: ISO New England Net Energy and Peak Load by Source; data for 2021 is preliminary and subject to resettlement; data for 2040 is based on Scenario 3 of the ISO New England 2021 Economic Study: Future Grid Reliability Study Phase 1.

Renewables include landfill gas, biomass, other biomass gas, wind, grid-scale solar, behind-the-meter solar, municipal solid waste, and miscellaneous fuels.

Major Emissions Reductions

Emissions from regional generators have fallen significantly since 2001

Annual New England System Generator Emissions, 2010-2020* (Thousand Short Tons)



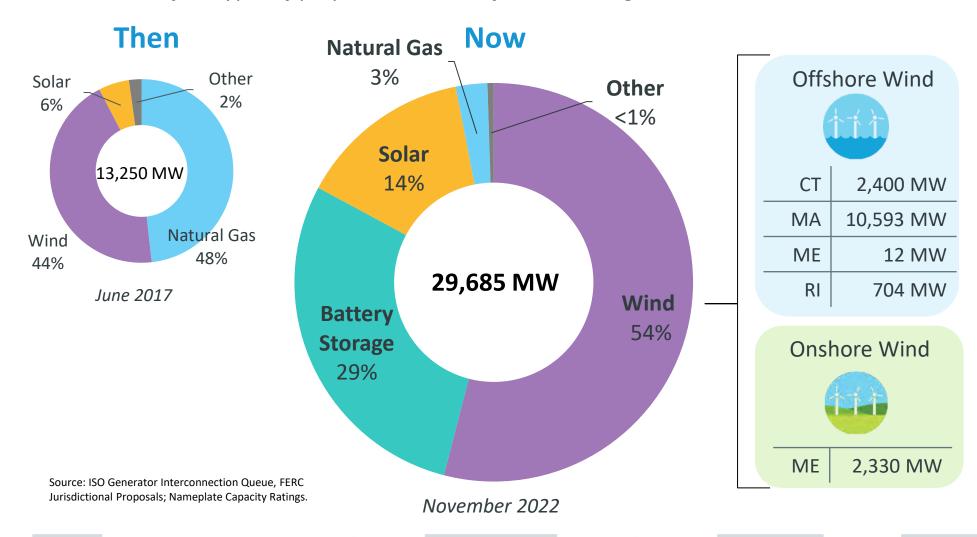
Carbon Dioxide (CO₂) **41**% Nitrogen Oxide (NOx) **58**% Sulfur Dioxide (SO₂) **498**%

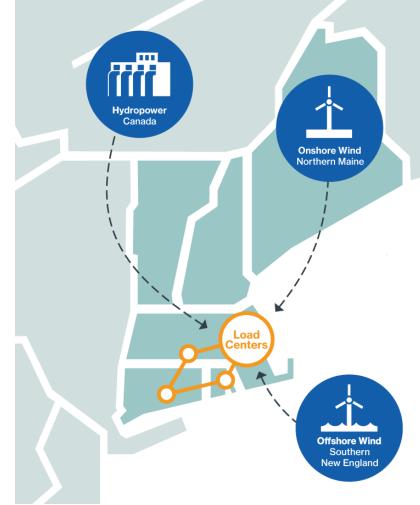
*2020 data is preliminary and subject to change. Source: ISO New England, New England Electric Generators Air Emissions Report

SO-NE PUBLIC

The ISO Generator Interconnection Queue Provides Snapshots of the Future Resource Mix

Dramatic shift in types of proposed resources from natural gas to wind





Lines represent types of ETUs private developers have proposed in recent years

Source: ISO Interconnection Queue (November 2022)

Developers Are Proposing Large-Scale Transmission Projects to Deliver Clean Energy to Load Centers

- Developers are proposing 5
 elective transmission upgrades (ETUs) to
 help deliver over 10,000 MW of clean
 energy to New England load centers
- Wind projects make up almost 55% of new resource proposals in the ISO Queue
 - Most are offshore wind proposals in southern New England, but some are onshore wind proposals in northern New England and would require transmission to deliver the energy to load centers

2050 Transmission Study: A High-Level Study for the Years 2035, 2040, and 2050

- Initial study scope and assumptions developed in conjunction with the states
- Aims to inform the region of the amount, type, and high-level cost estimates of transmission infrastructure that would be needed to cost-effectively and reliably serve peak loads, including electrified transportation and heating, in a cleanenergy future
- Study looks well beyond the ISO's typical
 10-year horizon for transmission planning
- It is **not** a plan to build specific projects

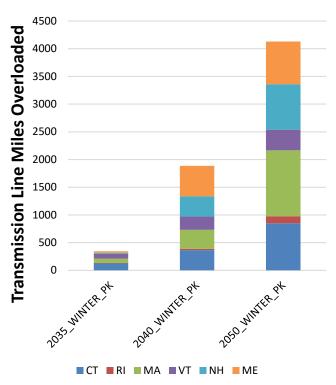
The most up-to-date information on the 2050 study is available at the <u>Planning Advisory Committee</u> and <u>Longer-Term Transmission Studies</u> webpages.

ISO-NE PUBLIC

2050 Transmission Study: Key Takeaways

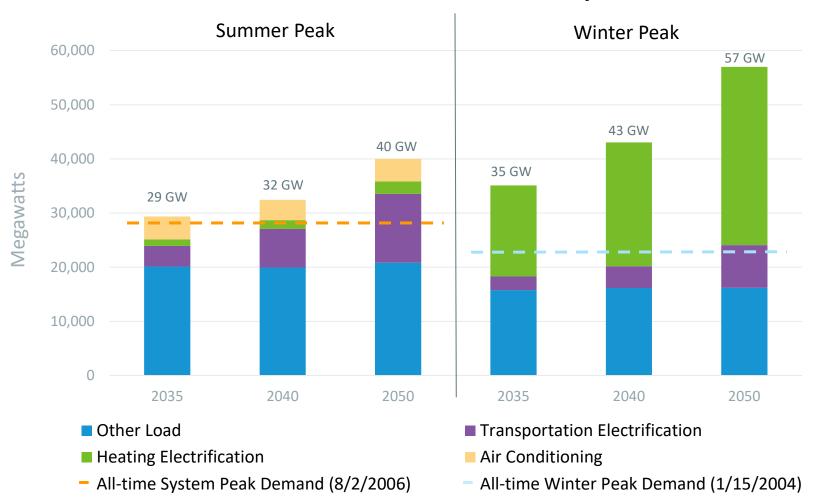
- The assumptions used for the 2050 Transmission Study represent numerous paradigm shifts for New England
 - Shift from a summer-peaking area to a winter-peaking area
 - Rapid growth in the development of renewable resources
 - Electrification of *heating* and *transportation* more than doubles the amount of peak power consumption by 2050
- Achieving a **load-generation balance** with the input assumptions requires:
 - The dispatch of some fossil units for energy balance in all snapshots
 - Additional resources beyond the input assumptions to meet the load in the Summer Evening and Winter snapshots
- Significant new transmission may be needed to reliably serve load under the assumptions analyzed in this study
 - With the current resource location assumptions, the paths between North and South would need significant upgrades to transfer surplus generation in Northern New England to generation-deficient Southern New England

Total Transmission Line Miles Overloaded for Winter Evening Peak



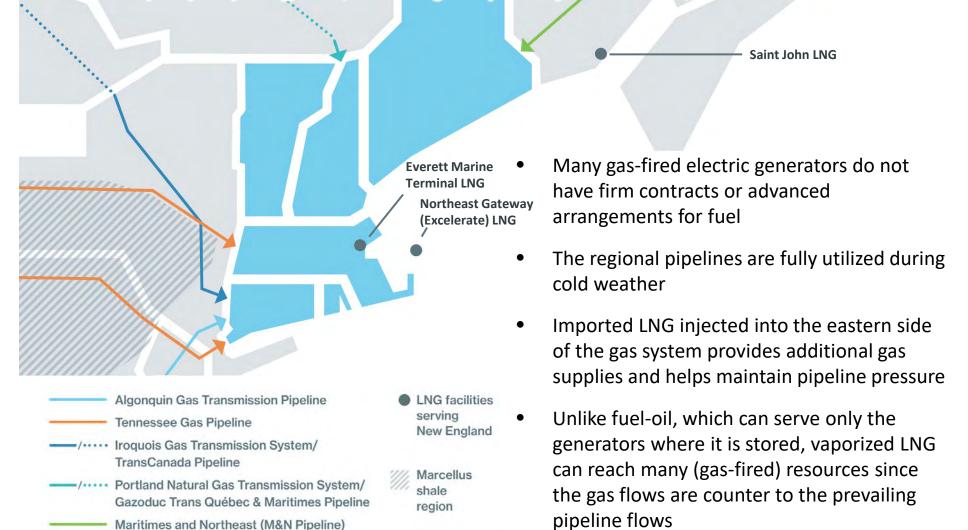
New England System Peak Grows Substantially and Shifts to Winter-Peaking

2050 Transmission Study

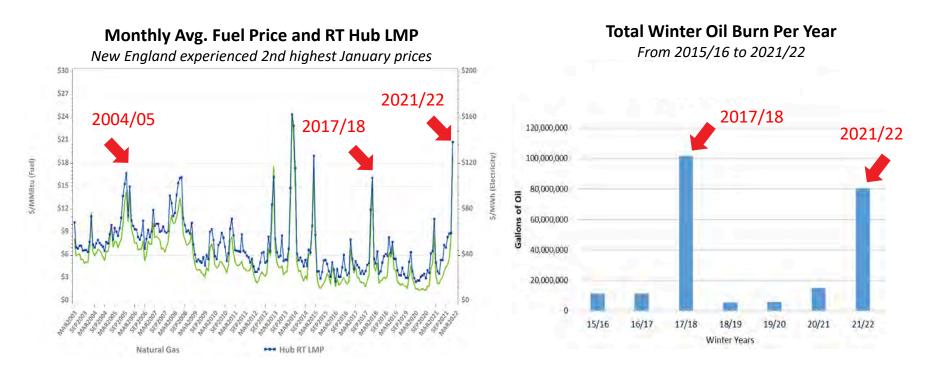


New England's Natural Gas Infrastructure is Limited

Most days capacity is sufficient, but during cold periods firm customers/contracts are prioritized



Pipeline Constraints Make New England Dependent on LNG Imports, Resulting in Volatile Natural Gas and Electricity Prices, and Higher Oil Usage



Winter 2021/22 weather was moderate compared to 2017/18, but natural gas prices reached near-all-time highs

Winter 2021/22 fuel-oil burn of ~80 million gallons was three times the previous three winters combined

ISO-NE Draft Problem Statement and Call to Action

On September 2, ISO-NE issued a <u>Draft Problem Statement and Call to Action</u> on <u>LNG and Energy Adequacy</u> in advance of the FERC Gas-Electric <u>Forum</u>

<u>Problem</u>: New England needs to develop and execute a plan to reduce dependence on imported liquefied natural gas (LNG) as the region transitions to clean energy

A robust solution could include:

- Accelerated clean energy development
- Additional transmission development
- Increased in-region liquefaction and dual-fuel resources
- Long duration storage
- Green fuels



In the meantime, the region must secure and stabilize the imported LNG supply chain. Most immediately, New England must ensure continued operation of the Everett LNG Facility beyond 2024.



There Are Four Pillars Necessary to Support a Successful Clean Energy Transition



Significant amounts of clean energy to power the economy with a greener grid



Balancing resources that keep electricity supply and demand in equilibrium



Energy adequacy a dependable energy supply chain and/or a robust energy reserve



Robust transmission to integrate renewable resources and move clean electricity to consumers across New England

For More Information



Subscribe to the ISO Newswire

<u>ISO Newswire</u> is your source for regular news about ISO New England and the wholesale electricity industry within the six-state region



Log on to ISO Express

ISO Express provides real-time data on New England's wholesale electricity markets and power system operations



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Download the ISO to Go App

<u>ISO to Go</u> is a free mobile application that puts real-time wholesale electricity pricing and power grid information in the palm of your hand

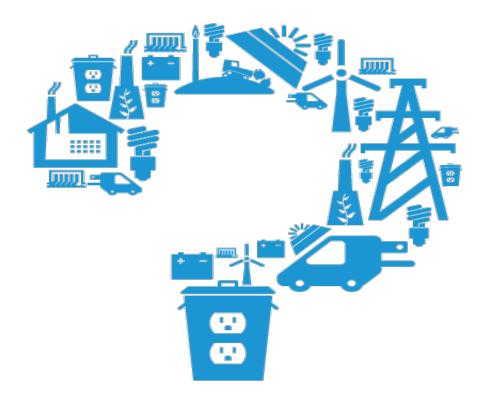








Questions





New Hampshire Department of Energy

Options for Large End Use Customers

December 7, 2022

Topics:

State Incentive Programs

- C&I Solar Program
- C&I Wood Pellet Program
- Non-Residential Competitive Grant Program

Federal Programs

- EE Revolving Loan Fund
- EE Community Block Grants
- New Tax Credits
- Competitive Funding Opportunities

State Policies

- Competitive Suppliers
- Net Metering

State Commercial & Industrial Incentive Programs:

Solar Incentive Rebate

- Rebate of up to 25% of total cost of installation, up to max of \$10,000
- \$0.20/watt
- Expansions to existing systems are <u>not</u> eligible

Wood Pellet System Rebate

- Rebate of up to 40% of total cost of installation, up to max of \$65,000
- Additional rebates for thermal storage and REC eligible meters

• Competitive Grant Program

- Projects that do not fall into either rebate program
- RFP response due by 12/15 @ 4:30pm

New Federal Programs:

- Energy Efficiency Revolving Loan Fund (EERLF)
 - Application by New Hampshire due 4/23
 - Eligible uses include commercial energy audits, upgrades, and retrofits
 - Allocation of \$813,450 for New Hampshire
- Energy Efficiency Community Block Grants (EECBG)
 - Allocation of \$1,641,260 for New Hampshire
 - Additional funds made available directly to the largest 10 cities/towns and all 10 counties.
 - Eligible uses include commercial building audits and establishing financial incentive programs
 - Entirely up to communities and counties how they want to use these funds

New Federal Programs:

- Competitive Funding
 - US DOE has many competitive funding opportunities available
 - Specific project types
 - Website: https://www.energy.gov/clean-energy-infrastructure
- If your business has a project that might be a good fit, let us know!
 - Depending on the program, sometimes the state needs to apply, others the business can apply directly.

Federal Tax Credits:

CAVEAT: CHECK WITH YOUR TAX PROFESSIONAL

- Qualified Commercial Clean Vehicles (Section 45W)
 - 15% of cost, or incremental cost for such a vehicle that runs on gas or diesel
 - Maximum credit of \$7,500 for up to 14,000lbs
 - Maximum credit of \$40,000 for all others
 - Eligibility: vehicles placed in service after 12/31/22 through 2032
- Energy Efficiency Commercial Buildings Deduction (179D)
 - Decrease the increase in efficiency from 50% to 25%
 - Deductions amounts based on square foot between \$0.50-\$5.00 depending on efficiency gains, prevailing wages, and apprenticeship programs
 - Cap reduced from lifetime cap to a three-year cap

State Policies:

Competitive Suppliers:

- Purchase electricity from third party supplier rather than the utility
- Longer term contracts, or month to month
- https://www.energy.nh.gov/engyapps/ceps/shop.aspx
- Critical to read terms of contract to determine if price and duration make sense for your company

Net Metering:

- Sale of excess electricity back to the grid from onsite renewable generation
- 100kw to 1MW 100% credit for default service rate
- Up to 100kw 100% credit for default service rate, 100% for transmission charge, and 25% for distribution charge

Thank you!

Josh Elliott
Director, Division of Policy and Programs
New Hampshire Department of Energy

Joshua.W.Elliott@energy.nh.gov (603) 271-6003

RESILIENT BUILDINGS — GROUP —

Superior energy performance

Commercial Energy Efficiency Incentives & Programs

Chase Pennoyer, VP Operations







Technical Assistance Programs



Community Development Finance Authority Energy Audit Program

75% cost coverage for a level II Energy Audit



NHSaves Technical Assistance

Walkthrough Energy Audits

Supporting a portion of the cost for more indepth audits

Types NHSaves Incentives

Retrofits

Upgrade the energy efficiency of an existing system

- Incentive amount based on cost of measure (Up to 50%)
- Energy savings calculated against existing equipment

New Equipment

Investment in new system

- **Incentive amount** based on delta between baseline and efficient equipment (incremental cost, up to 75%)
- Energy Savings calculated as delta of baseline and efficient cases

New Construction / Major Renovation

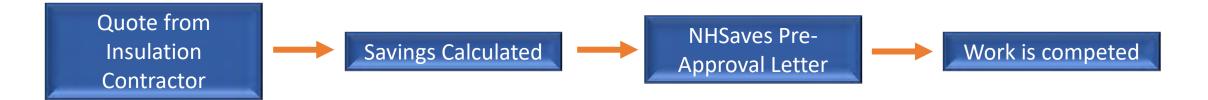
Gut rehab or new construction

- Incentive amount determined by program pathway
- Energy savings calculated as delta between baseline and efficient



Healthcare Facility in Manchester, NH

Project Flow



Project Cost

- **Project Cost** = \$40,133.00
- NHSaves Incentive = \$15,145.00 (37%)

- **Total Lifetime Savings** = 8,980.00 MMBtu
- Annual Cost Savings = \$4,488.75
- Simple Payback = 5.5 Years

Equipment Rental Facility in Concord, NH

Project Flow



Project Cost

- **Project Cost** = \$31,276.00
- NHSaves Incentive = \$8,173.00 (26%)

- **Total Lifetime Savings** = 2,650 MMBtu of Natural Gas & 229,825 kWh
- **Annual Cost Savings** = \$3,163.00
- 0% On Bill Financing
- **Simple Payback** = 7.3 Years

New Restaurant in Concord, NH

Project Flow



Project Cost

- Incremental Project Cost = \$50,288
- NHSaves Incentive = \$21,371 (42%)

- **Total Lifetime Savings** = 5,631 MMBtu of Natural Gas & 737,325 kWh
- Annual Cost Savings = \$14,335
- Simple Payback = 2.0 Years

Food Processing Facility in Concord, NH

Project Flow



Total Economic Benefit of Project

- Technical Analysis Cost = \$725.00 (Covered by NHSaves)
- Total Steam Trap Upgrades = \$12,049.00
- NHSaves Incentive = \$5,358.62 (44%)

- Total Lifetime Savings = 628.2 MMBtu of Natural Gas
- Annual Cost Savings = \$3,598
- Simple Payback = 1.85 Years



Key Points

- Technical Assistance leads to sound investments
- High energy costs result in better ROIs
- Engage with NHSaves as early as possible



Chase Pennoyer Vice President of Operations, **Resilient Buildings Group**

Thank you

RESILIENT BUILDINGS

— GROUP — Superior energy performance

Vergent Power Solutions

BIA of NH Energy Symposium

Incentives, Programs & Options for Large Users

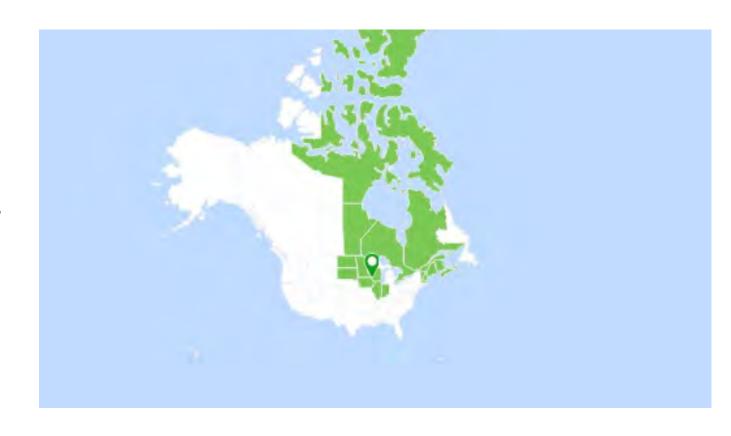


Vergent Power Solutions

Vergent Power Solutions, Inc is the exclusive distributor for Capstone Turbine Corporation for New England, the upper Midwest and Eastern Canada. Offices in Boston, Minneapolis and Toronto. We have over 200 turbines in our fleet.

Cogen products up to 1 MW. They run on anything gaseous; primarily natural gas or biogas. We have a 1 MW turbine going to the City of Lebanon landfill gas to energy project. Operational in 2023.

We have a Low Carbon Fuel business to help gas customers decarbonize. We source various feedstocks of RNG now and are vetting carbon capture technologies.





DG Market – Cogen Net Power Costs

~ 500 kW Operating Expenses	\$10/ MMBtu	\$12/ MMBtu	
Fuel and Maintenance	\$ 587,141	\$ 687,070	
Power only Cost	\$ 0.167	\$ 0.196	
Heat Offset	(288,310)	(346,000)	
Thermal Offset Value	\$ (0.082)	\$ (0.098)	
Net Operating Cost	\$ 298,831	\$ 341,070	
Net Power Cost/kWh	\$ 0.085	\$ 0.097	
Electricity Total	\$.13/ kWh \$.14/ kWh		
Grid Cost	\$ 470,516	\$ 506,710	
Savings	\$ 171,685	\$ 165,640	
Savings as %	36%	33%	

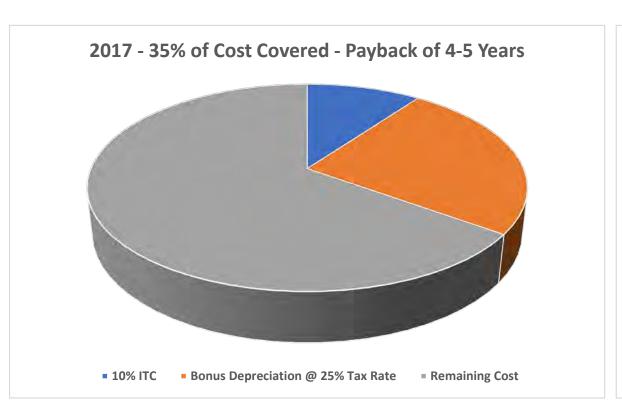


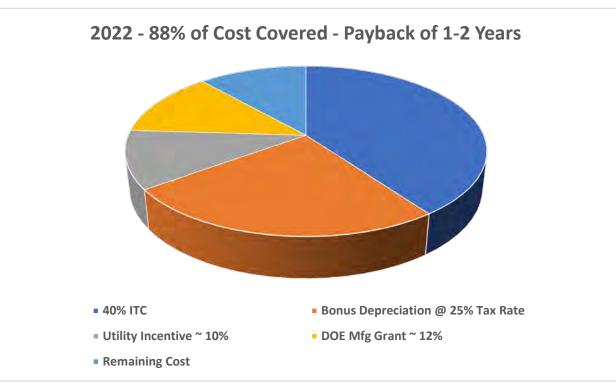
DG Market – Cogen CAPEX

500 kW System		CAPEX	
Installed Cost	\$2	2,400,000	
40% ITC	\$	(960,000)	
80%/20% Bonus Depreciation @ 25%		(600,000)	
Utility Incentive ~ 10%		(263,545)	
DOE Mfg Grant ~ 12%		(300,000)	
Total Incentives	(2,123,545)		
Net Cost	\$	276,455	
Savings	\$	171,685	
Payback		1.61	



Options for Large Users – Cogen in 2017 and Now







A little more on the ITC

- President Biden signed the Inflation Reduction Act (IRA) on August 16, 2022, The IRA provides tax incentives for renewable and qualifying clean energy technologies that begin construction before 2025. You need to start by then but not necessarily finish.
- Base ITC of 30%; Capstone gets a 10% bonus for domestic content so 40% in total.
 An additional 10% if you are in an Energy Community.
- Direct Pay for non-tax paying entities now where they had no ITC before.
- After 2025 you'll need to use RNG or Hydrogen. You'll get an ITC or PTC.
- Microgrids are also included at 30% so battery, solar and microgrid controllers



A little more on the IJA DOE grant

H.R. 3684 Subtitle C – Industrial Energy Efficiency as part of the Infrastructure, Investment and Jobs Act (IIJA)

Eligible entities (pg. 635) are small or medium sized manufacturers: `(A) the gross annual sales of which are less than \$100,000,000; ``(B) that has fewer than 500 employees at the plant site of the manufacturing firm; and ``(C) the annual energy bills of which total more than \$100,000 but less than \$3,500,000.

Covered projects (pg. 634) are those recommended in an energy assessment (EE)

Implementation grants to implement covered projects – up to \$300,000 or 50% of project cost (pg. 638-39)

The CHP-TAP are at U Maine Orono; UNH and UMass Amherst. Good to do this first to have funding for up-front interconnect studies.



Cogen is not for the faint of heart

- Need power and thermal load that are easy to connect into (boiler loop). Need space
- Need to interconnect with utilities and get an air permit (these are with 3rd parties and out of our control). The interconnect cost and timing are the two most uncertain project items.
- Need to dedicate human and financial resources
- You need to have a long term view on gas vs. other options. Cogen saves vs. marginal emissions. You can blend in RNG over time. It's a cost effective option that stands up environmentally and is resilient. Also good use for steam boilers and cogen that have a long useful remaining life.
- If OK with above and willing to host we'll develop the project for you



One last thought.....getting more options on the power side if you use RNG

- Previously you could only sell/ export power to the grid and get their price
- Now if you use RNG and are Class I it opens up a lot of renewable power buyers.
 - NH RPS Class I power and thermal REC's.
 - RNG produced in ISO-NE and transported via common carrier pipeline to the generation source can get MA Class I REC's and any Clean Peak \$; the MA APS (thermal) is likely to get replaced by a Clean Heat Standard which will also allow biogas
 - Potentially NH Community Power; Community Choice Aggregation Plans
 - Federal Renewable Fuel Standard eRIN's make renewable power and transportation company pulls it out of EV charger.





Roadmap to Decarbonization

How the commercial and industrial sector will decarbonize in the years to come

December 7, 2022











The Roadmap to Achieving a Low-Carbon Footprint (with a Focus on Feasibility)







Load Green Reduction Procur

- » LED lighting upgrades
- » Energy efficiency
- » Equipment upgrades
- » Co-generation

Green Energy Procurement

- » RECs
- » Carbon offsets
- » Commodities

Integrating Renewable Energy Solutions

- » Onsite & offsite wind & solar
- » Community solar
- » Utility green-tariffs
- » Back-up generation
- » Battery storage

Fleet Management

- » EV infrastructure
- » Electrification solutions





2022 New Hampshire BIA Energy Symposium

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