



# IMM Annual Markets Performance Report

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*Highlights of the 2023 Report*

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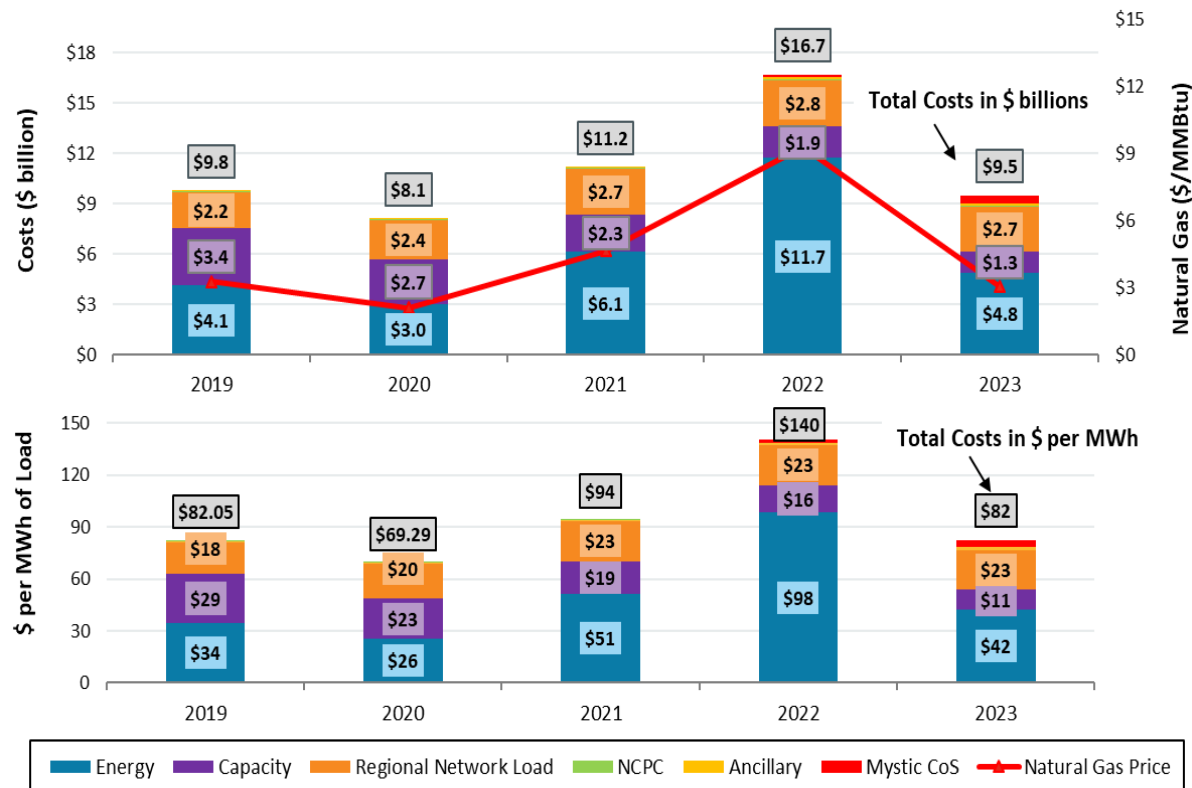
# Selected Highlights

- Capacity, energy, and ancillary service markets performed well and, with the exception of the Forward Reserve Market (FRM), exhibited competitive outcomes
  - Energy prices reflected changes in underlying primary fuel prices, electricity demand and the region's supply mix
  - Day-ahead market did a good job anticipating real-time conditions, resulting in few supplemental commitments; there were also few local reliability commitments and generator posturing actions
  - On the System Operations side, there were very few periods of tight system conditions and scarcity pricing that impacted overall energy market outcomes
- The overall growth in renewable generation in the wholesale market has been gradual over the past five years, but the combined impact of behind-the-meter solar and wholesale market solar on load and pricing (time-of-day) profiles is noticeable
- Forward Capacity Market continues to procure surplus capacity at prices well below Net CONE with new additions comprising mostly battery, wind and solar technology, while fewer imports cleared



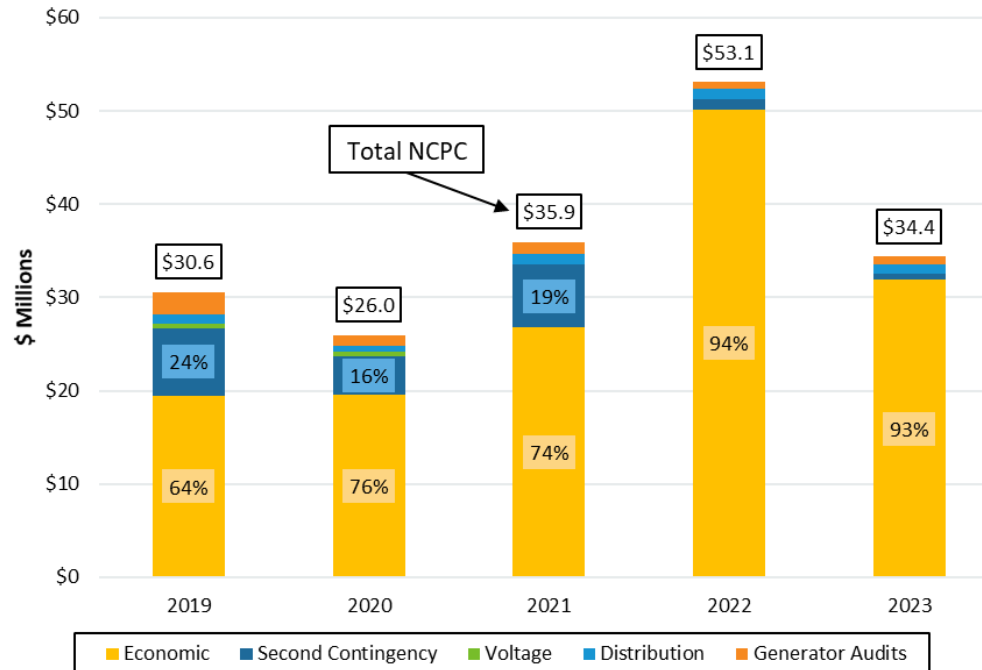
# Lower energy costs, comprising half of total costs, drove an overall decrease in wholesale costs due to lower natural gas prices

- Lower total Wholesale Costs (\$9.5bn, down from \$16.7bn) driven by energy costs (\$4.8bn, down from \$11.7bn); energy costs were ~50% of total costs compared to 70% in 2022
- Transmission costs are a large component (28%), and the market impacts of investments are evident in terms of low congestion, fewer local reliability and voltage commitments and less local market power issues



## ***Uplift (NCPC) down in line with energy prices and mostly covered resource costs from economic commitments; few out-of-merit local reliability or voltage commitments***

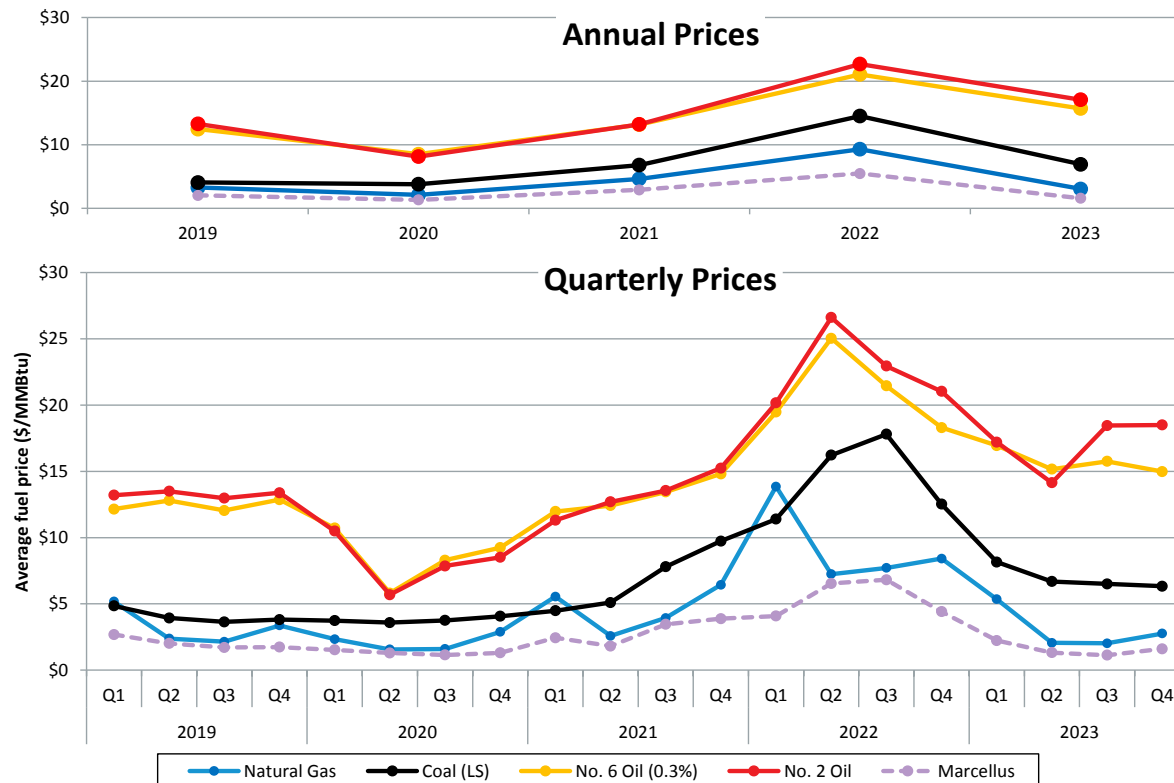
- Supplemental payments under the Mystic Cost of Service Agreement (\$460m or 5% of total costs) were more than 10 times energy market uplift



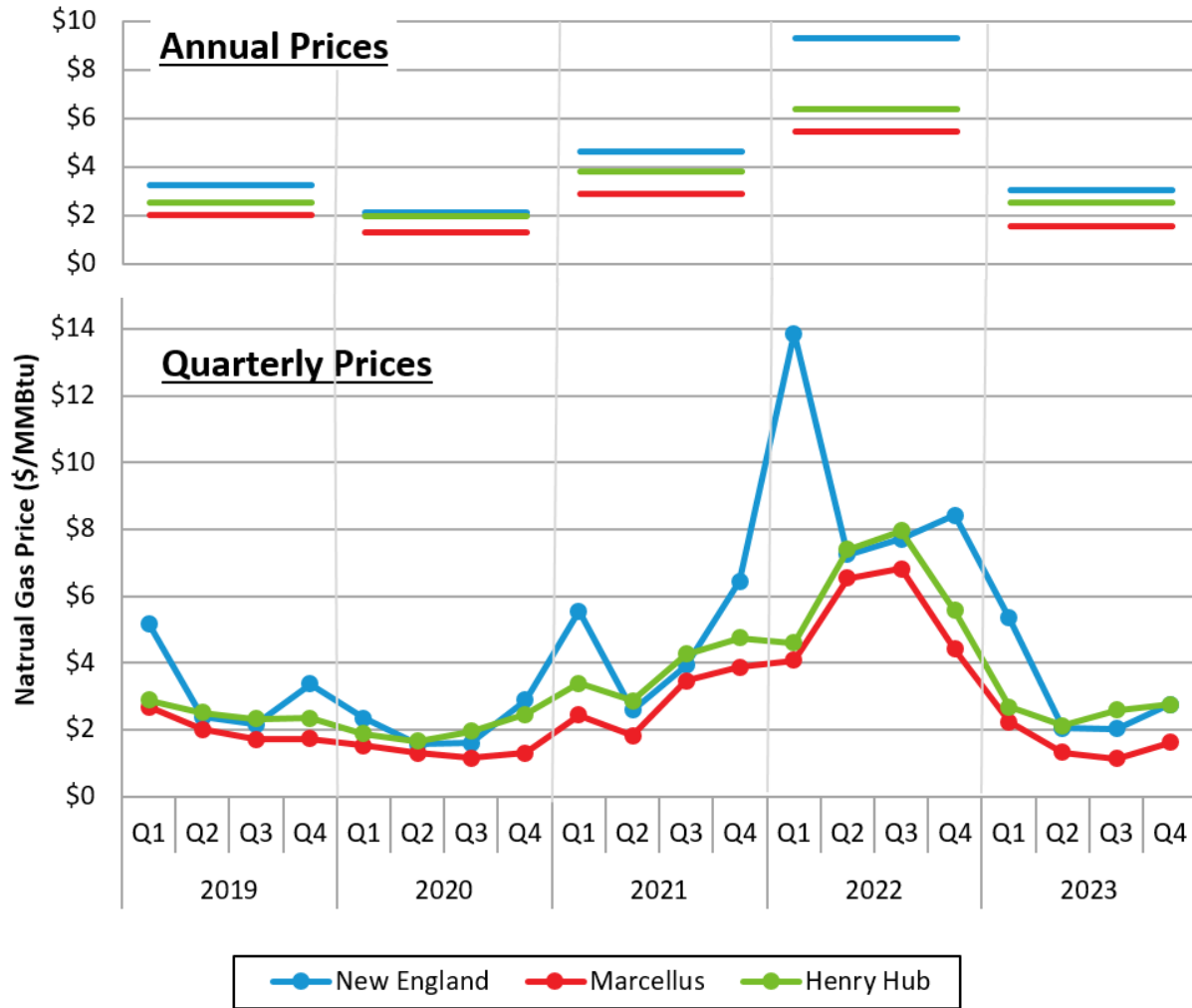
<b>NCPC as % Energy Payments</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>
Day-Ahead NCPC	0.3%	0.3%	0.3%	0.1%	0.1%
Real-Time NCPC	0.4%	0.5%	0.3%	0.3%	0.6%
<b>Total NCPC as % Energy Costs</b>	<b>0.7%</b>	<b>0.9%</b>	<b>0.6%</b>	<b>0.5%</b>	<b>0.7%</b>

# Following the Russian invasion of Ukraine and resulting uncertainty in global energy markets in 2022, fuel prices returned to relatively normal levels

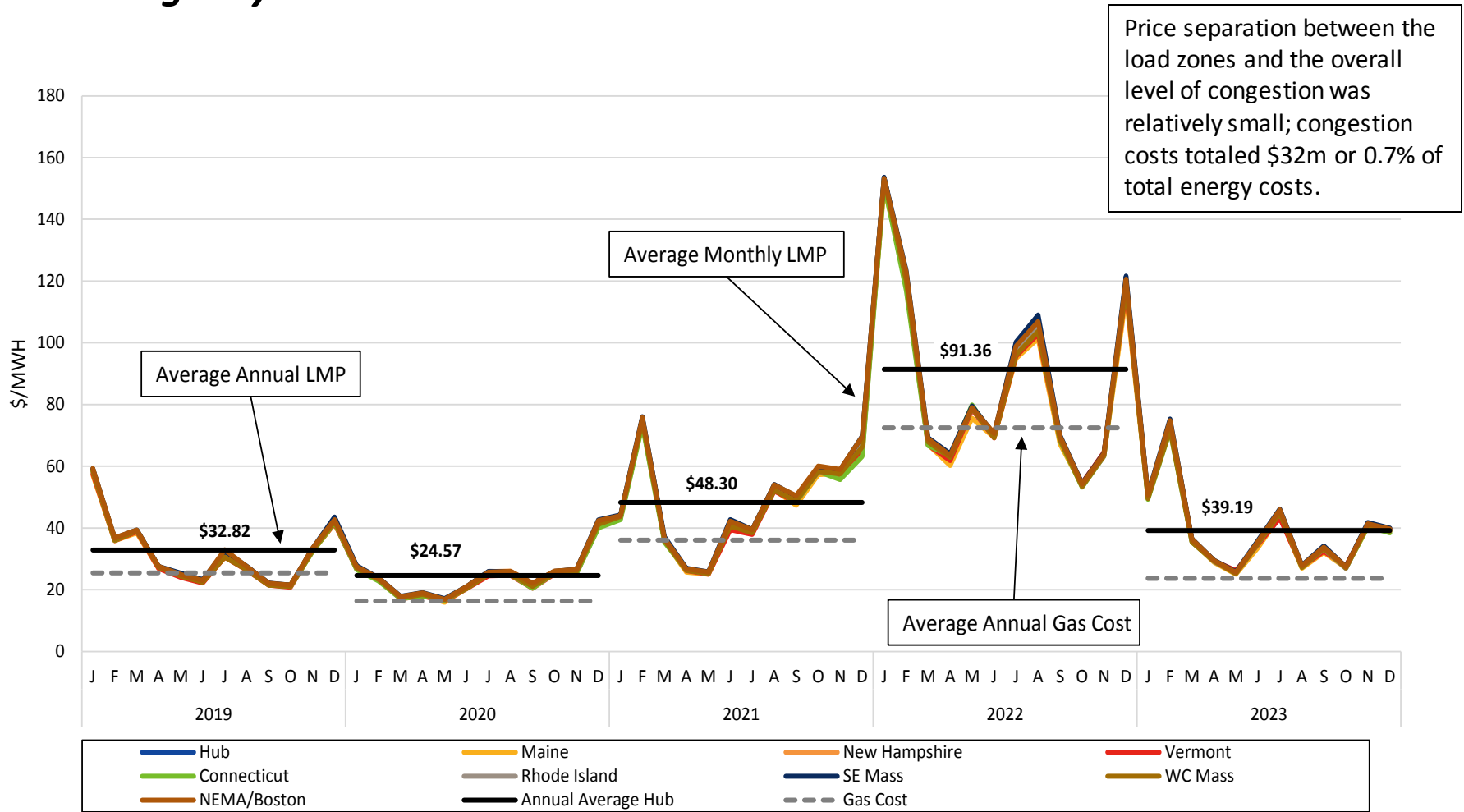
- Following historically high energy and natural gas prices in 2022, overall levels in 2023 returned to a typical range, particularly levels seen between 2015 and 2021
- Day-ahead energy price down 60% (to \$37/MWh), natural gas prices down 70% (to \$3/MMBtu)
- U.S. natural gas production set record highs and stocks rose above five-year averages



***Mild winter weather and lower natural gas demand resulted in a lower price spread between New England and major trading hubs***



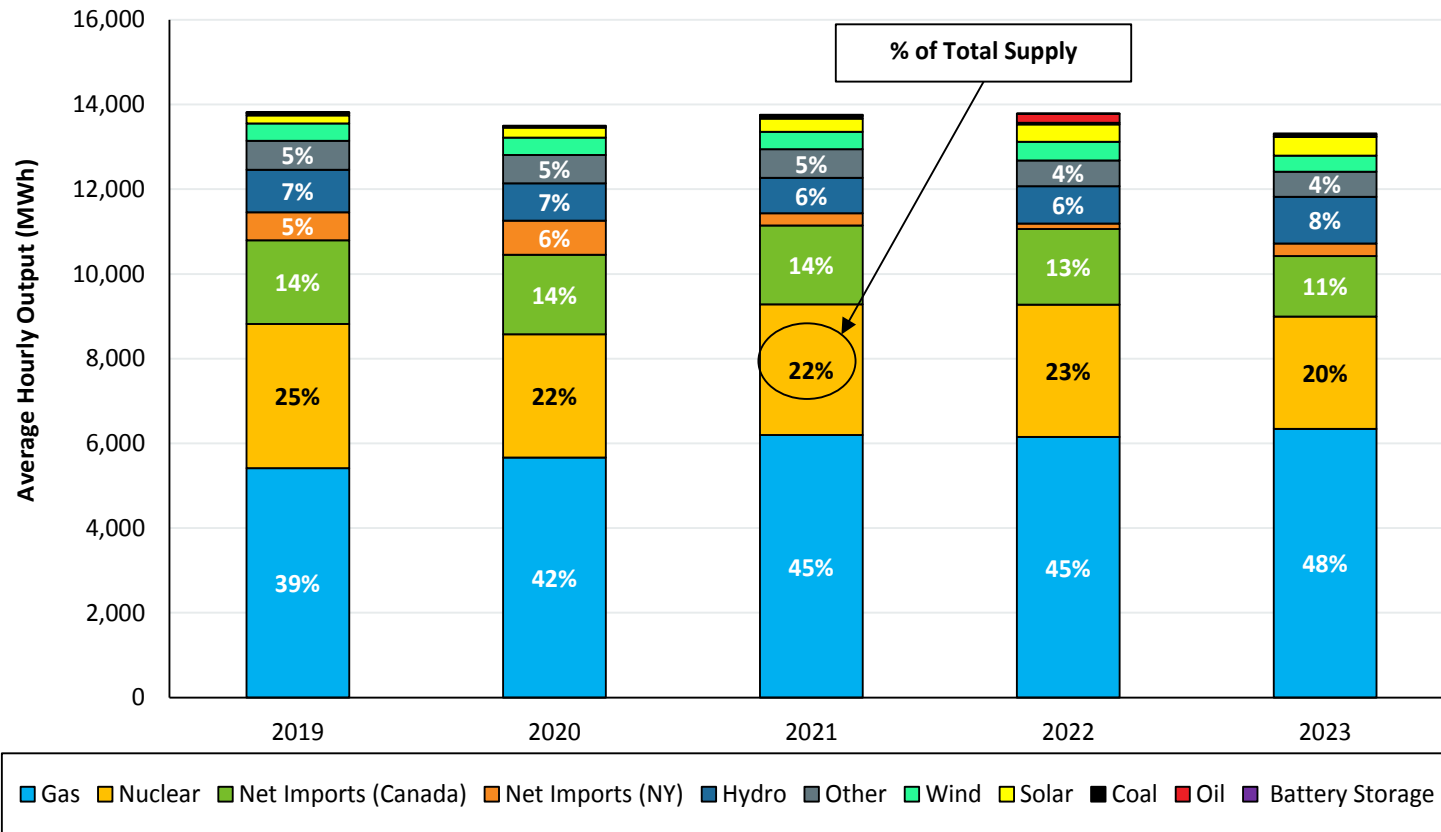
# Energy prices reflected lower average natural gas prices, as well as a lack of sustained cold weather during the winter months and a less constrained natural gas system



Note: LMPs in this graph are load-weighted day-ahead prices

## Highest share of natural gas-fired generation in five years as imports and nuclear generation fell; gas generation set the real-time price 84% of the time

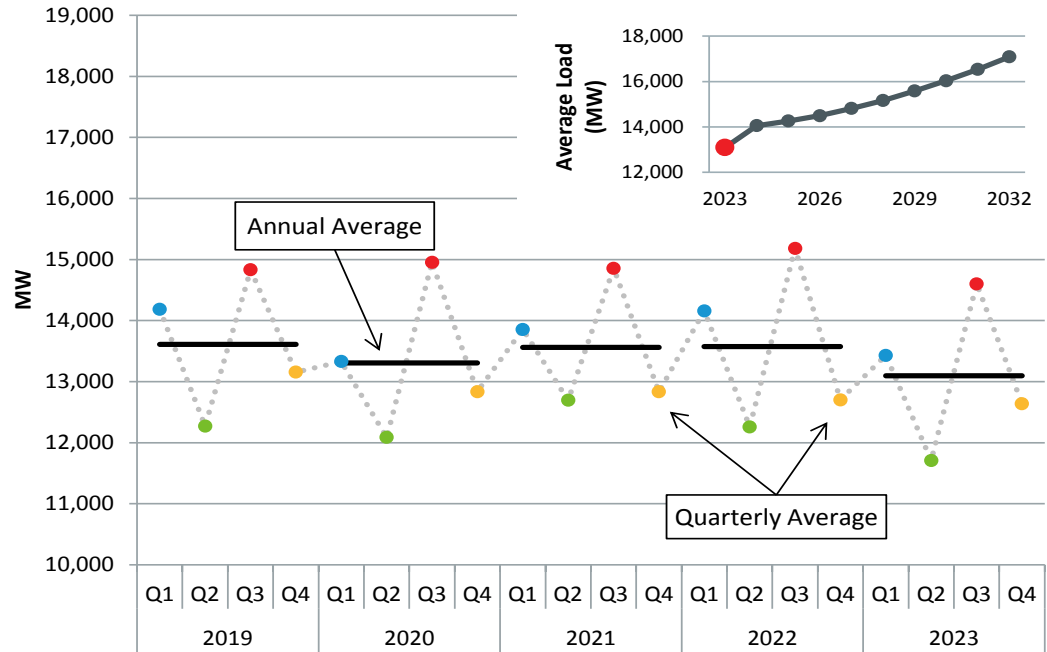
- Supply mix changes included an increased share of natural gas, fewer imports from HQ (13-yr low), and lower nuclear generation due to refueling outages



# Mild weather conditions in both winter and summer, as well as the growth in solar generation, drove lower average and peak demand

- Energy Demand (Load) was 4% lower than 2022, and at its lowest level since at least 2000 due to mild weather conditions and the growth in behind-the-meter solar generation

### Average Hourly Load by Quarter and Year

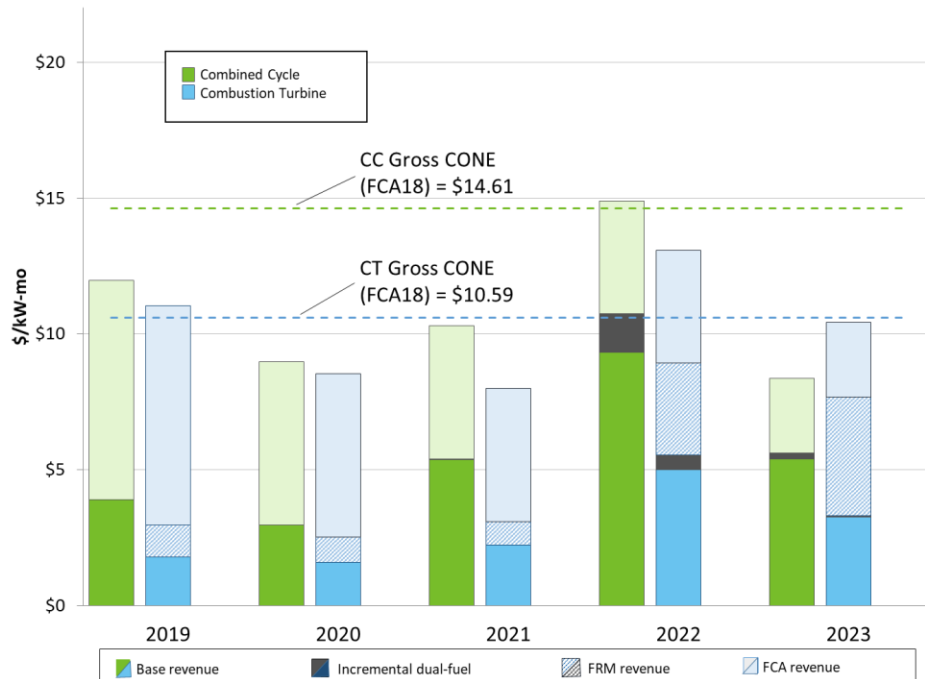


### Average, Peak and Weather-Normalized Load

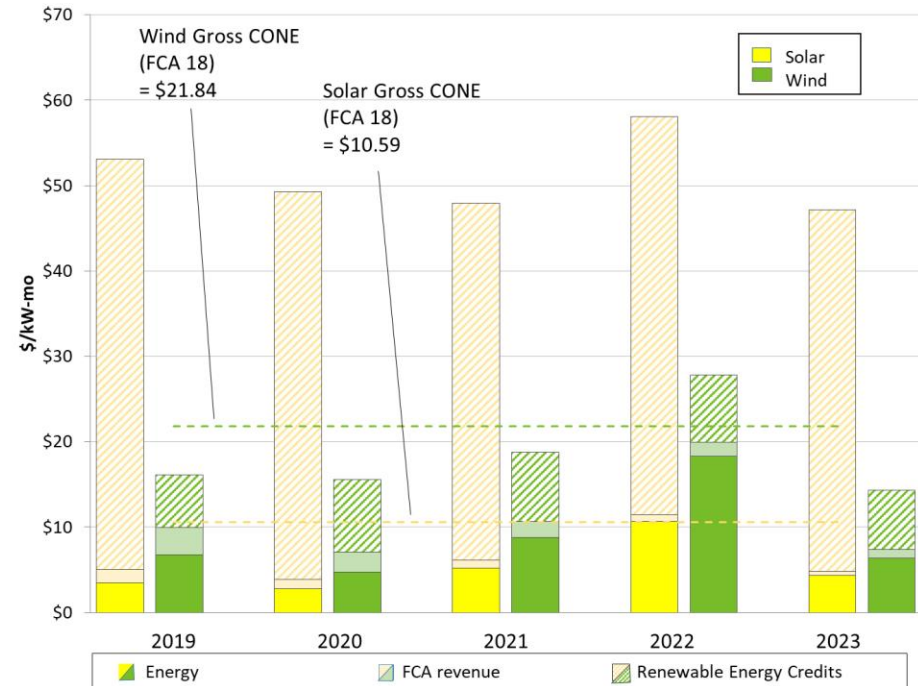
	2019	2020	2021	2022	2023	% Change '23 to '22	Sparkline
<b>Demand (MW)</b>							
Load (avg. hourly)	13,611	13,305	13,560	13,576	13,096	↓ -4%	
Weather-normalized load (avg. hourly)	13,558	13,242	13,419	13,514	13,132	↓ -3%	
Peak load (MW)	24,361	25,121	25,801	24,780	24,016	↓ -3%	

# Profitability metrics down from the high levels of the prior year due to lower energy prices

## Estimated Net Revenue for New Gas-fired Generators

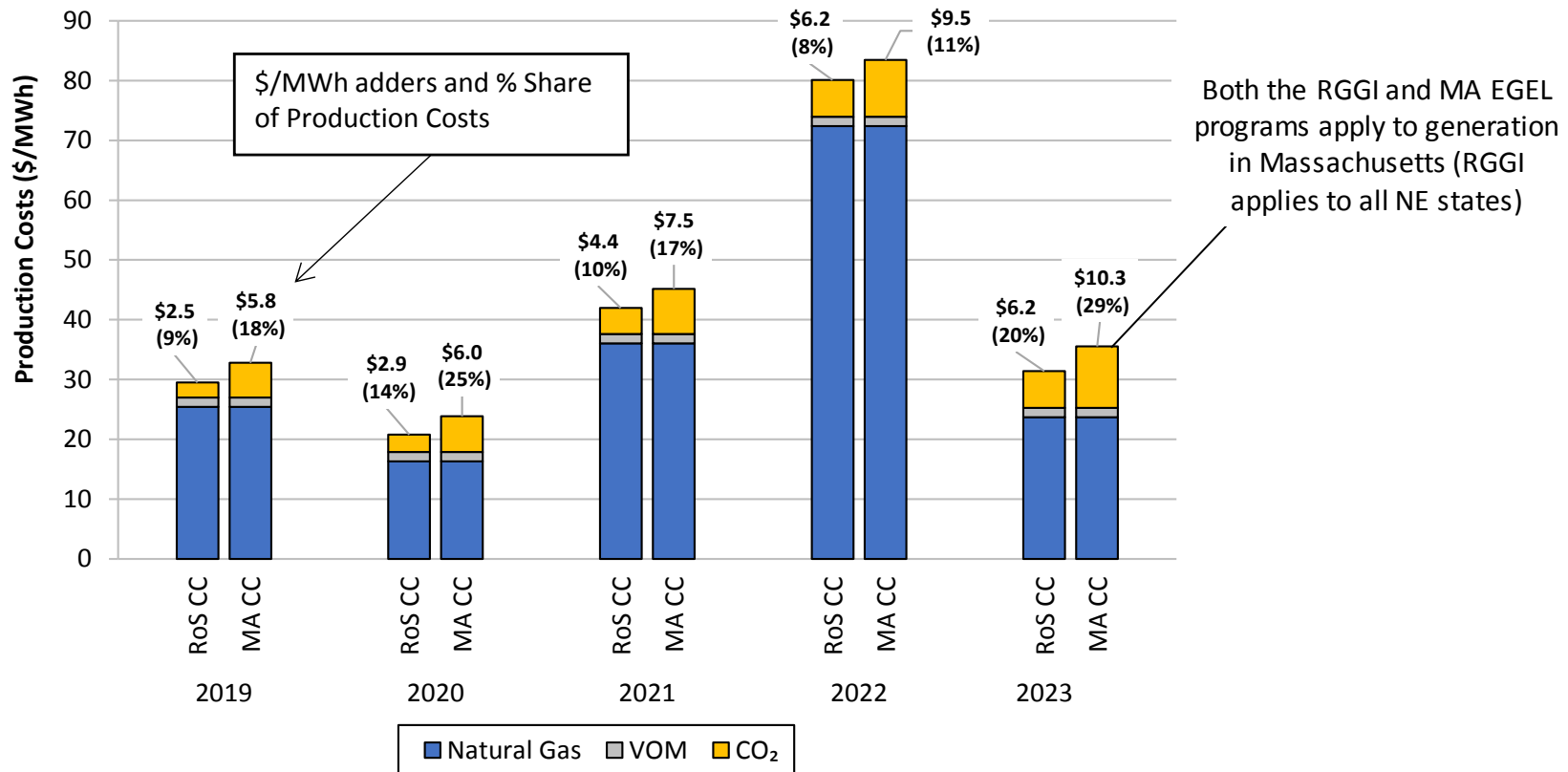


## Estimated Net Revenue for Solar- and Wind-Powered Generators



# CO<sub>2</sub> emissions prices were a larger component of fossil fuel generation costs

- For an average combined cycle generator, carbon program prices added ~\$6/MWh (20%) for RGGI across New England, and ~\$10/MWh (29%) for RGGI + MA EGEL in Massachusetts;
- Combined, CO<sub>2</sub> prices added \$6/MWh to the average annual energy price on a load-weighted basis (or 15% of \$39/MWh) and about \$690m to total energy costs (or 14% of \$4.8bn)



## Notes:

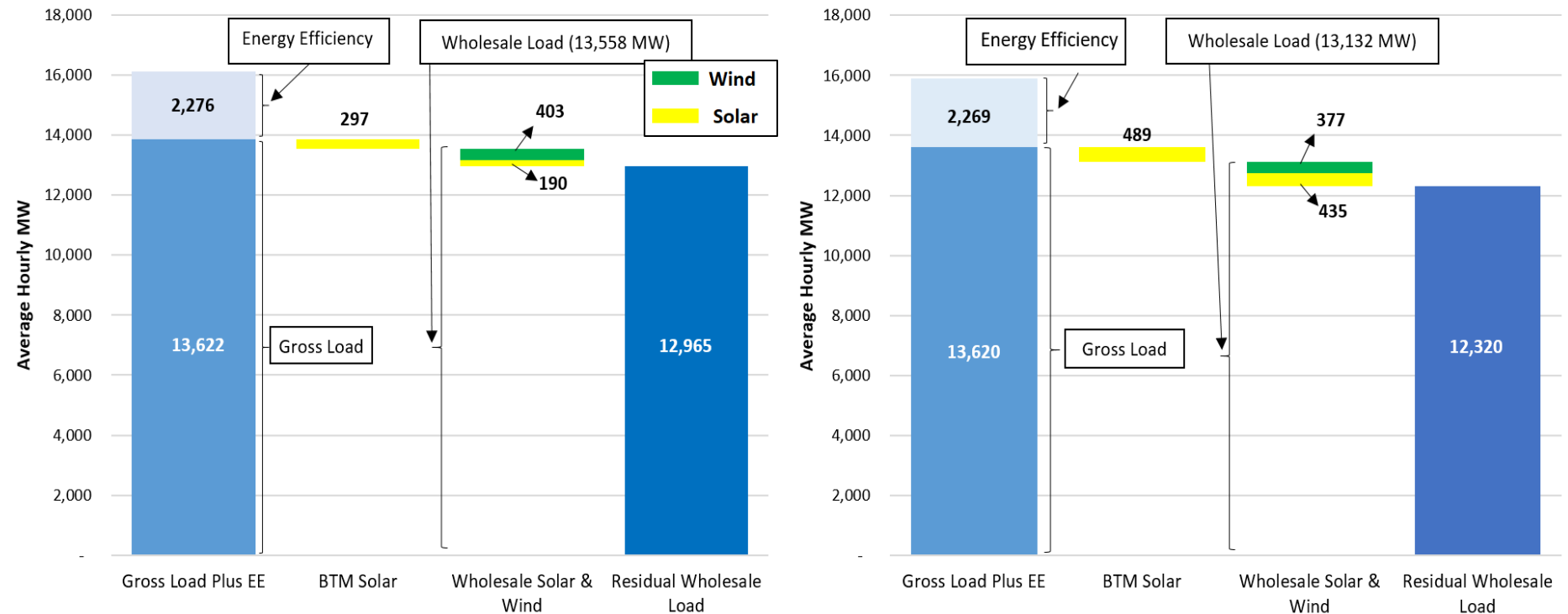
- Combined cycle generation only is shown here since they are the dominant fossil-fuel generation class by output and set price the majority of the time; RoS CC: (Rest of System) Combined cycles located outside of Massachusetts

# Five-year snapshot of wind and solar contributions to meeting load shows a gradual change on average

- Overall growth in renewables in wholesale market has been gradual over past five years, but the combined impact of behind-the-meter solar and wholesale market solar on load and pricing (time-of-day) profiles is noticeable
- Wholesale solar and wind mainly clear in the real-time market only, and we continue to see virtual supply play an important price-converging role by clearing more supply on high solar and wind days in the day-ahead market

2019

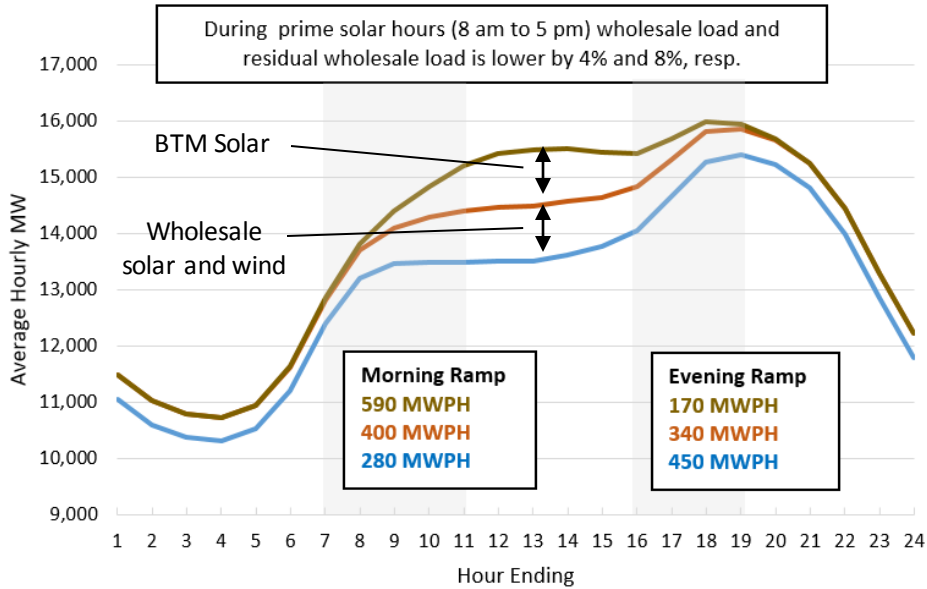
2023



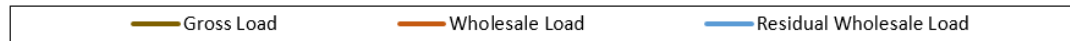
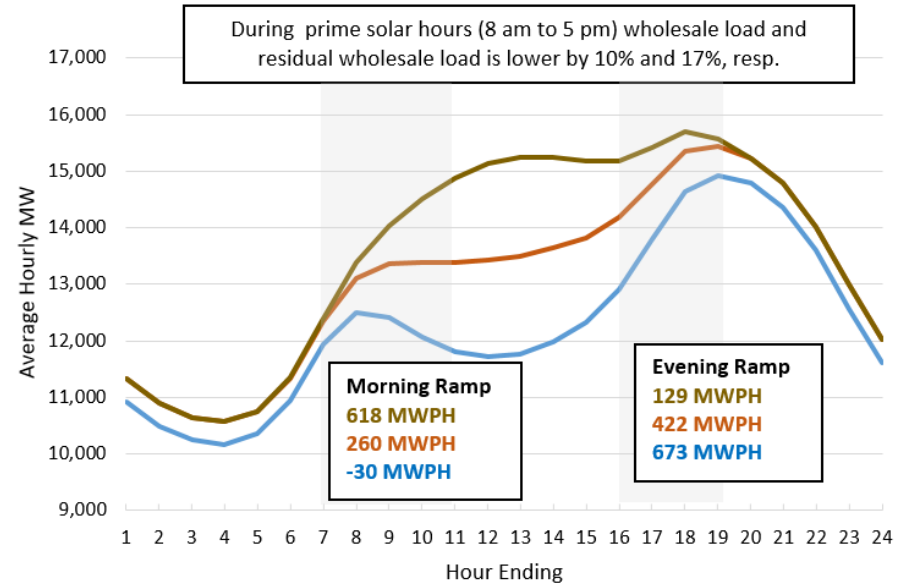
Note: Load is weather-normalized to allow for like-for-like comparison

# But the impact on time-of-day load profiles and prices is more pronounced

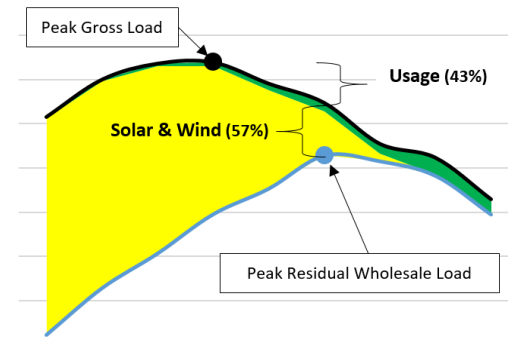
2019



2023

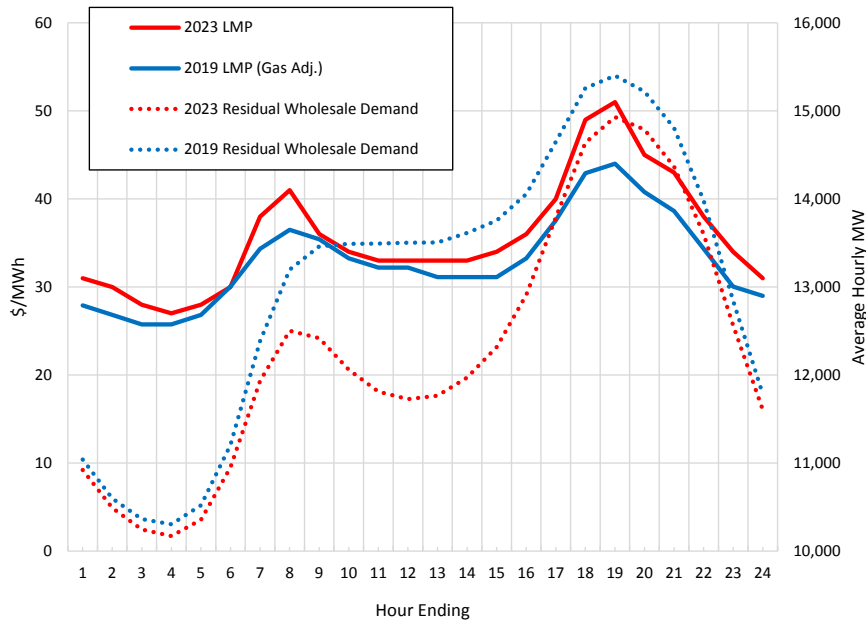


## Peak Demand Impacts, 2023

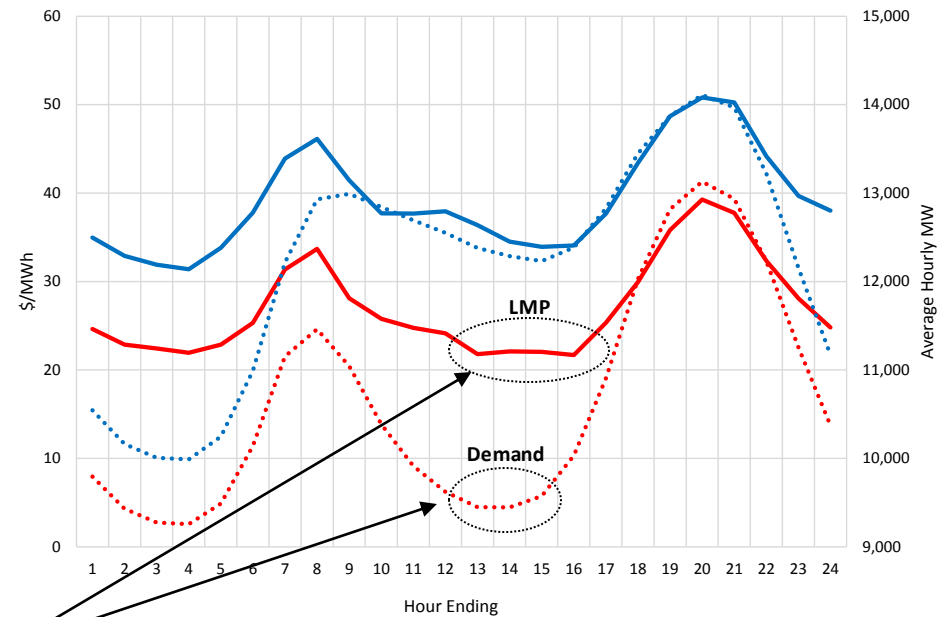


# But the impact on time-of-day load profiles and prices is more pronounced (cont.)

### Annual



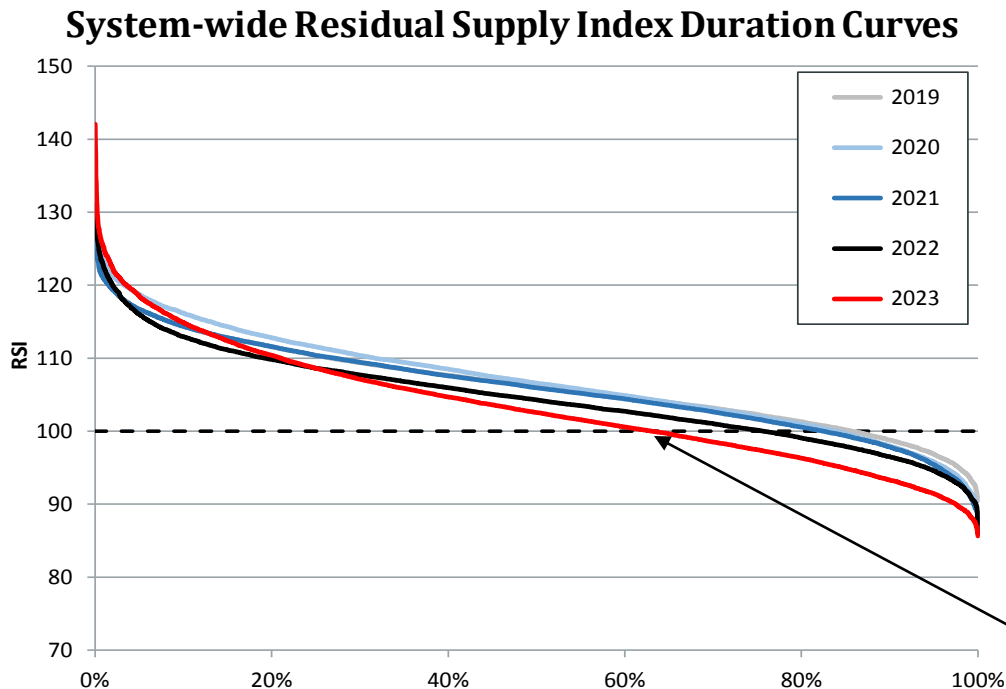
### Spring



Lower afternoon demand and prices are particularly evident during the Spring

## ***Energy supply offer mitigations were low and down on 2022 in line with lower levels of local market power (reliability commitments)***

- Low levels of structural market power in the energy and capacity market, and the recent change to the Forward Reserve Market offer cap helps alleviate market power concerns
- A slight decline in structural competitiveness indices in the energy market due to outages, rather than long-lasting changes impacting portfolio concentration
- Energy market mitigations remain low, but we continue to emphasize the importance of reviewing conduct & impact thresholds and other aspects of mitigation rules

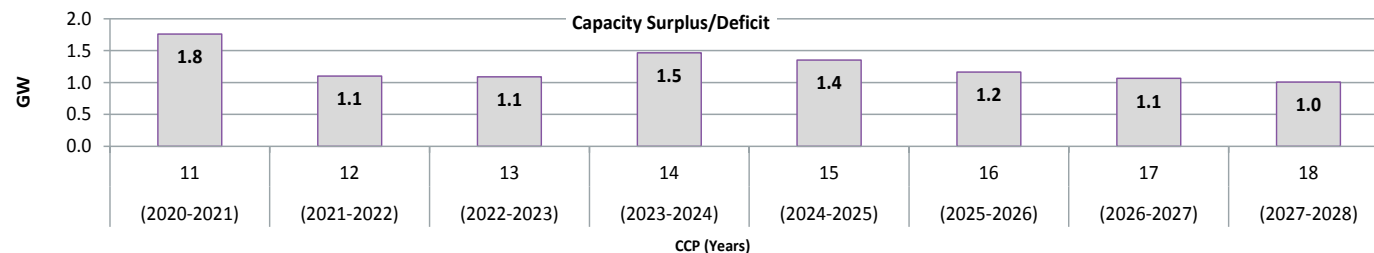
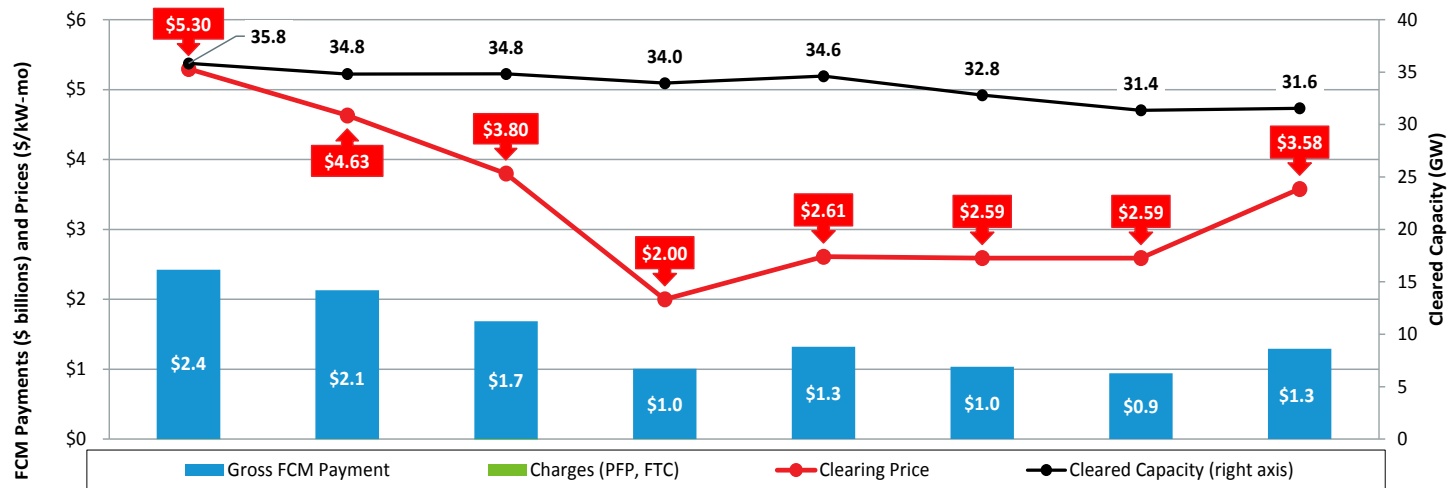


- Economic withholding analysis and indices indicate low impacts of above-cost bidding on clearing prices and dispatch

Pivotal Supplier in 37% of intervals in 2023 (vs. 25% in 2022), driven by outages in Q4

# Forward Capacity Auction continued to procure a surplus of capacity with prices well below the Net Cost of New Entry

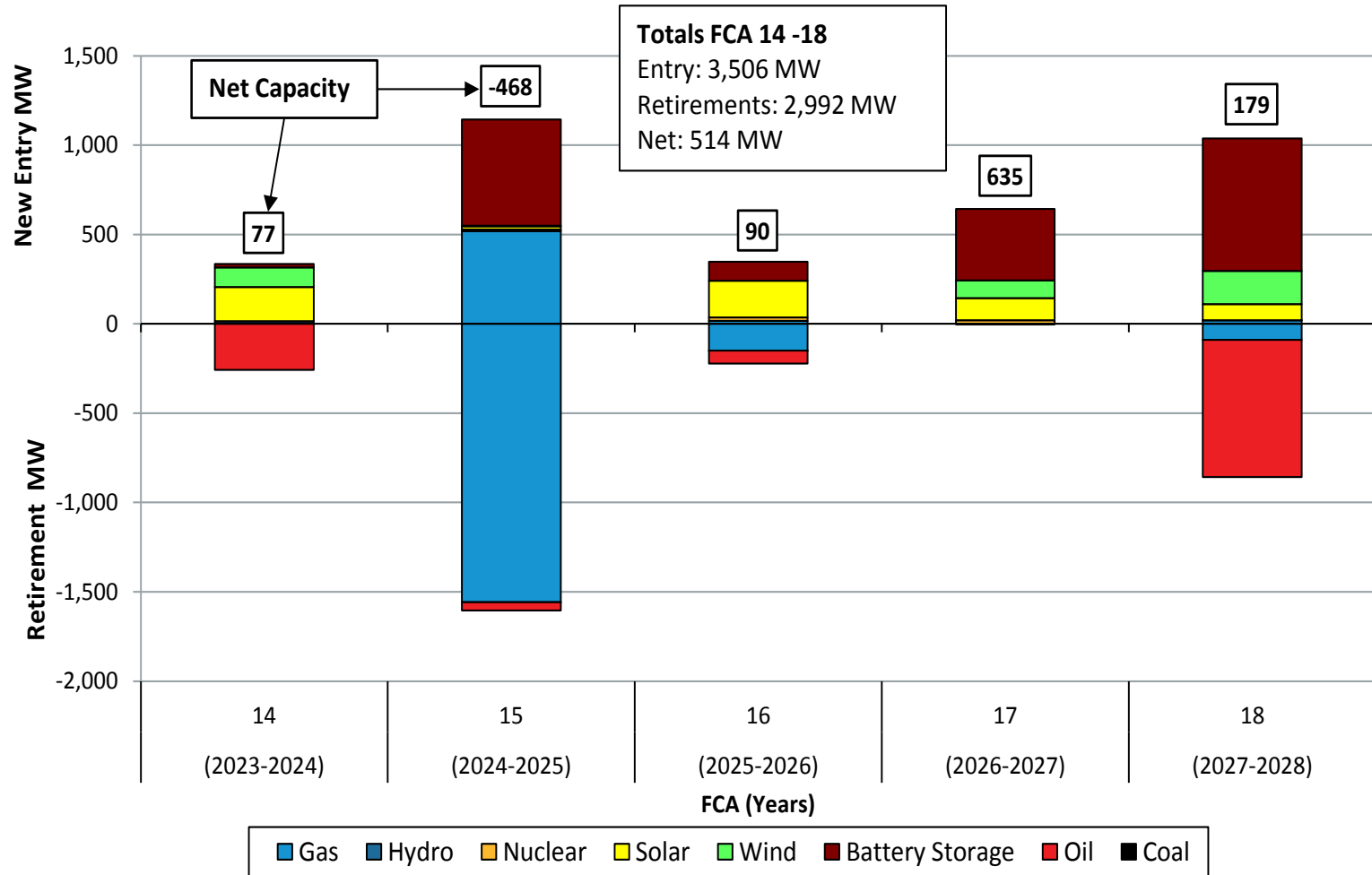
- New additions comprise mostly battery, wind and solar technology, while fewer imports cleared for the 2026/27 and 2027/28 delivery periods
- PFP capacity scarcity conditions continue to be infrequent with just \$11m in charges/credits in 2023 (30 minutes of reserve shortage)
- IMM supports the development of a prompt and seasonal capacity market, and supported the further delay to the FCA 19 schedule



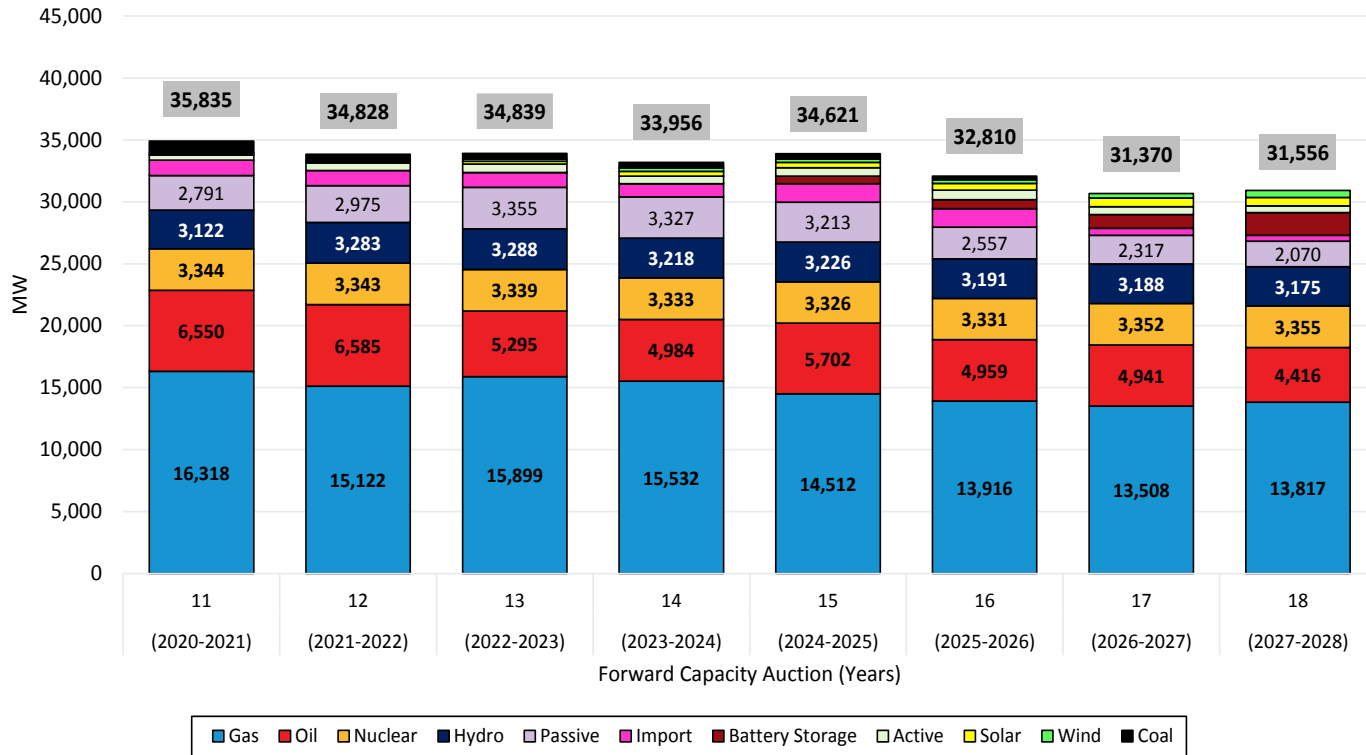
CCP (Years)

ISO-NE PUBLIC

# New generation capacity additions mainly comprise batteries, solar and wind



# Contracted capacity has been declining slightly but surplus remains steady



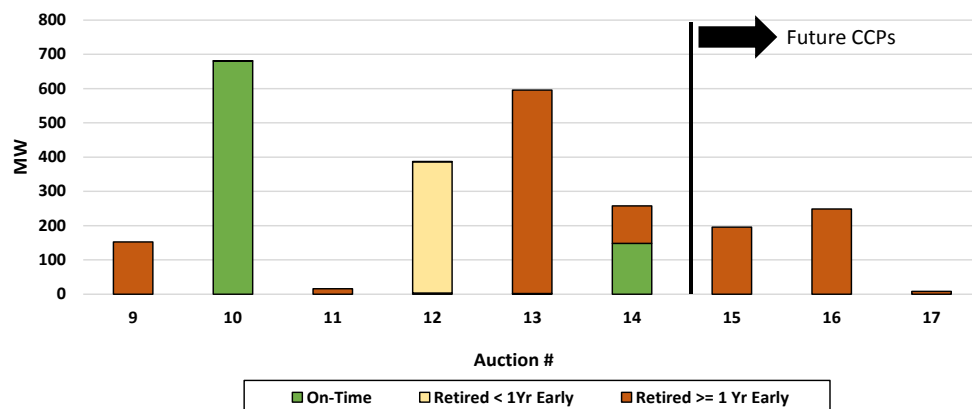
Battery, wind and solar technologies growing, with most exits comprising gas and oil resources

Note: Figure does not show operational capacity outside of the capacity market (~5,200 MW over past 5 auctions).

## New market enhancement recommendations issued in 2023 reports

1. To limit the potential exercise of market power in the Forward Reserve Market, undertake a review (and reduction) of the offer cap from its current value of \$9,000/MW month
  - We also recommend that the ISO cease the publication of auction offer data or delay publication until several auction cycles have passed
  - Changes were proposed by the ISO and approved by FERC in time for the Summer 2024 auction
2. Establish an automated process for applying the reserve down flag to better account for the deliverability of reserves in generation pockets, and in turn to improve reserve accounting and associated market outcomes (including price formation)
  - While market impacts related to this issue are not large in magnitude, they consistently persist from year to year
3. Publish generation retirements that have occurred either prior to the effective retirement date in the FCM or outside of the FCM process

**Resource Retirement Timing by FCA**



# Questions

