MAY 16, 2023 | NEPOOL RELIABILITY COMMITTEE |
DOUBLETREE HOTEL, WESTBOROUGH, MA

Operational Impact of Extreme Weather Events

Preliminary Results of Energy Adequacy Studies for Winter 2027

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Operational Impact of Extreme Weather Events – Energy Adequacy Study

- ISO is working with EPRI to conduct a probabilistic energy adequacy study for the New England region in the operational time frame under extreme weather events
- Study results are intended to inform the region on risks
  - These results may help in ‘quantifying’ a problem statement on energy adequacy, against which possible solutions can be assessed
- This study has established a framework for risk analysis under extreme weather events
  - This framework will be essential as climate projections are refined and the resource mix evolves

Operational Impact of Extreme Weather Events – Energy Adequacy Study, cont.

- There are three major steps in this framework:
  - Step 1: Weather Modeling (performed by EPRI)
  - Step 2: Risk Screening Model Development and Scenario Generation (performed by EPRI)
  - Step 3: Energy Assessments (performed by the ISO)
- The ISO has been reviewing and discussing each step of the process with the Reliability Committee
- This presentation briefly summarizes the first two steps and reviews preliminary results of Step 3 energy assessments completed for 2027 winter events

Step 1 – Weather Modeling

- This step included a review of New England's historical weather (1950 – 2021), analysis of global climate model projections, and development of hourly weather variable profiles
  - Hourly weather variable profiles were used to develop hourly demand forecasts and energy profiles for wind and solar resources for the periods being studied
- EPRI used five global climate models spanning a range of climate sensitivities and two emissions pathways to project changes to weather variables for use in subsequent steps in the study
  - See March 2022 and May 2022 RC presentations for detail on climate projections and projected temperature trends

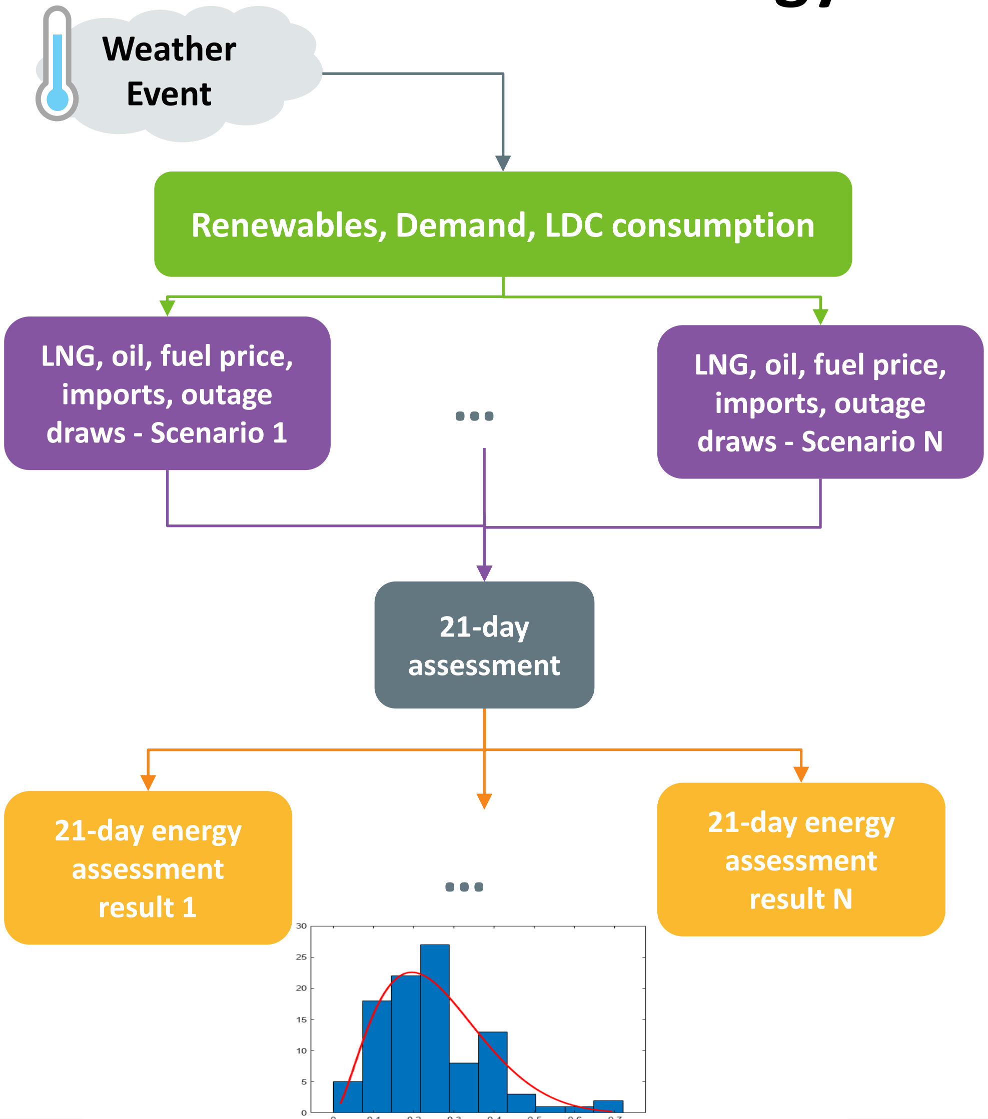
Step 2 – Risk Screening Model Is Used To Facilitate Selection of Extreme Events For Study

- The objective of EPRI's Risk Screening Model is to search the weather data set and select a set of 21-day events that appear most stressful (extreme) to the future New England power system in terms of energy availability
  - This risk screening model is a measure of system risk (supply and demand)
- For each study year, the initial input to the risk screening model is 37,440 events, based on 72 weather years (1950 – 2021), climate-adjusted according to five climate models and two socio-economic pathways
  - Output of risk screening model is 1,470 high risk events (top ~4% of 37,440 events)

Step 2 - Power System Scenario Generation

- Following the identification of events for study, a full set of scenarios must be developed as an input to the 21-day energy adequacy studies
- The goal is to generate a range of possible scenarios incorporating the following uncertainties and their likelihoods:
  - Indirect-weather related uncertainties that may occur during the event and may influence resource (or energy) availability, and
  - Random forced outages and maintenance outages
- Scenario trees were developed to capture various uncertainties
  - See March 14, 2023 presentation for additional detail

The Connection Between Selected Events (in Step 2) and Probabilistic Energy Assessment (in Step 3)



- **For each selected event, ISO will perform a 21-day energy assessment on all scenarios, representing LNG, oil, fuel price, import, and outage uncertainties *(based on modeling reviewed in prior RC meetings)***

- **ISO will perform analysis of 21-day energy assessment outcomes**

2027 STUDY YEAR ASSUMPTIONS AND EVENTS

Assumptions for Study Year 2027

- Generation assumptions include resources that cleared FCA16 and state-sponsored resources under contract or have been selected under recent RFP's
  - Key changes from today's generation fleet include:
    - Addition of ~600 MW of utility-scale PV
    - ~1,400 MW of battery storage
    - ~1,600 MW of offshore wind
    - Retirements totaling ~2,100 MW (including Mystic 8 and 9)
- Demand forecasts incorporate ISO's 2022 heating and transportation electrification forecasts
  - Forecasts include the effects of additional behind-the-meter (BTM) PV for a total of ~9,500 MW

Weather Events Selected By Risk Screening Model For Study Year 2027

- ISO's preliminary studies and results are focused on the 2027 winter events
  - Additional 2027 and 2032 winter and summer studies are ongoing
- The 2027 winter events are characterized by short and long-duration extreme cold, low winds, and low solar irradiance
- This presentation reviews the following 2027 winter events:
  - Winter Cluster 1 (longer-duration events)
    - Jan 22, 1961 (event with highest average system risk*)
    - Feb 2, 1979 (event with highest severity index*)
  - Winter Cluster 2 (shorter-duration events)
    - Feb 14, 2015 (event with highest average system risk)
    - Jan 14, 1982 (event with highest severity index)
  - Medoid events were also studied; results will be briefly summarized

*Average System Risk and Severity Index are metrics calculated by EPRI's Risk Screening Model; these metrics are used to rank events and aid in the selection of events for study

Return Periods for Study Year 2027 Events

- A "return period" has been determined for these events
  - A return period is the expected interval between event recurrences (e.g., "a 1 in 5 year" event)
  - Return periods are commonly used in flood, storm, rainfall reporting, and design criteria
- A return period of ~8 to 10 years has been determined for 2027 Winter Cluster 1 events and ~3 to 5 years for 2027 Winter Cluster 2 events

Cluster	Return period
Winter Cluster 1 (2027)	8-10 years
Winter Cluster 2 (2027)	3-5 years

Scenarios for 2027 Study Year

- Each weather event is studied with a combination of two key variables – Everett Marine Terminal (EMT) and the New England Clean Energy Connect (NECEC) facility; each combination is a scenario which has not been assigned a probability of occurrence

	NECEC **in-service**	NECEC **not in-service**
EMT **in-service**	With NECEC, With EMT	No NECEC, With EMT
EMT **not in-service**	With NECEC, No EMT	No NECEC, No EMT
	Max imports 5,625 MW/hr	**Max imports 4,545 MW/hr**

- Scenarios with NECEC in-service allow up to an additional 1,080 MW/h of max imports from Hydro-Québec

Scenarios for 2027 Study Year, cont.

	NECEC **in-service**	NECEC **not in-service**	
EMT **in-service**	With NECEC, With EMT	No NECEC, With EMT	**Max inj. 1.2 Bcf/d**
EMT **not in-service**	With NECEC, No EMT	No NECEC, No EMT	**Max inj. 0.8 Bcf/d**

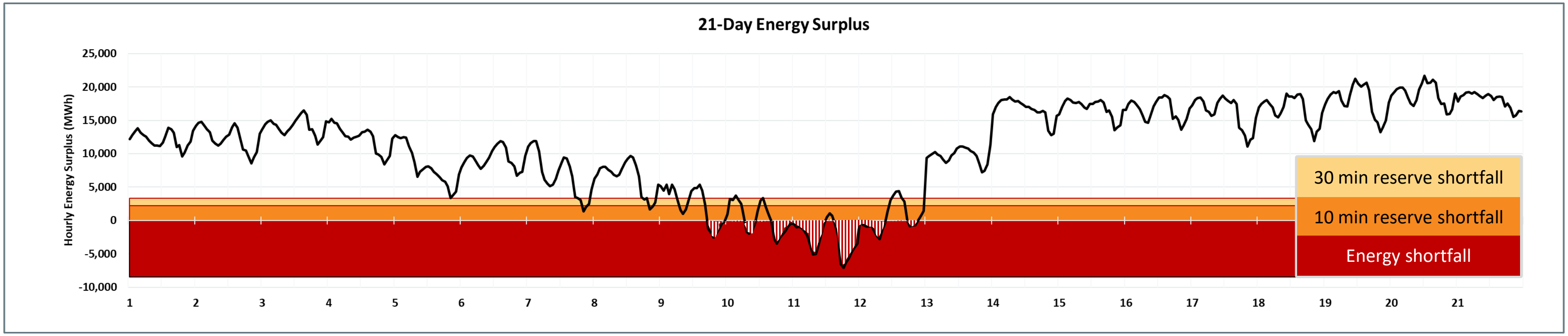
- Scenarios with EMT in-service allow an additional 0.4 Bcf/day of max LNG injection to pipelines
  - Study results with/without EMT are highly dependent on the characteristics of a given event, including the timing of the highest energy demands, starting LNG inventories, and timing of LNG replenishment
  - Higher rates of LNG injection (i.e., LNG injection rates with EMT) may deplete LNG inventories prior to replenishment, leading to larger energy shortfalls in some cases with EMT than in similar cases without EMT

Scenarios for 2027 Study Year, cont.

	NECEC **in-service**	NECEC **not in-service**
EMT **in-service**	With NECEC, With EMT	No NECEC, With EMT
EMT **not in-service**	With NECEC, No EMT	No NECEC, No EMT

- Each scenario is modeled with 720 "cases" which are different combinations of the following uncertainties, each with an assigned probability of occurrence
  - LNG inventory
  - Fuel oil inventory
  - Imports
  - Fuel prices (natural gas more or less expensive than oil)
  - Generator forced outages

21-Day Energy Assessment Calculates Energy Surplus



*The figure above is an example illustration of a 21-day energy assessment forecast

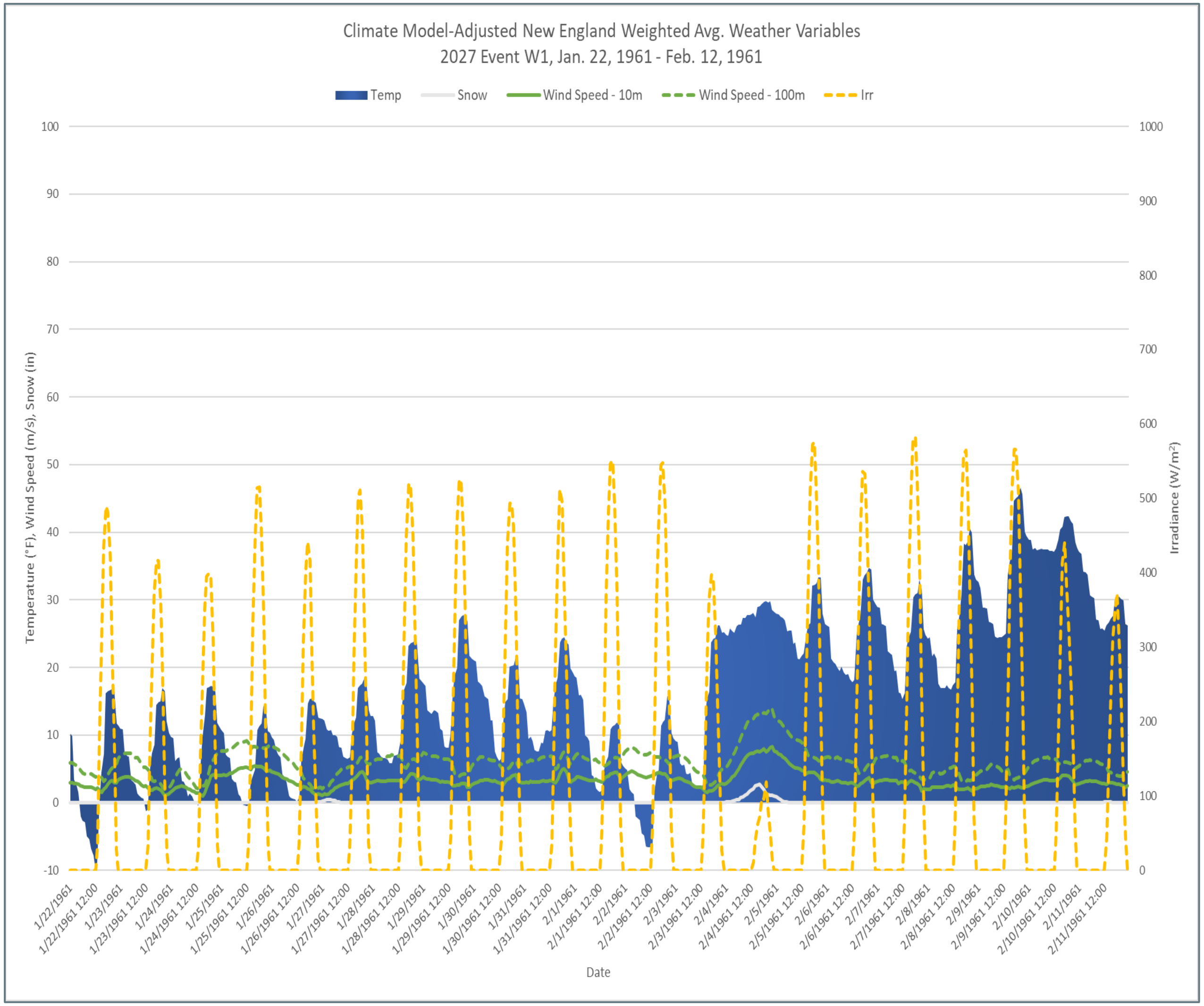
- For each case, energy assessment results include:
  - Energy surplus (black curve)
  - Energy shortfall (red/white striped area): quantity in MWh and duration
  - Reserve shortfalls (black curve in yellow/orange): quantity in MWh and duration
- For each scenario, energy assessment results are a statistical summary across all 720 cases within scenario:
  - “Expected” energy shortfall = probability-weighted average across cases
  - “Worst-case” energy shortfall = case with highest energy shortfall quantity

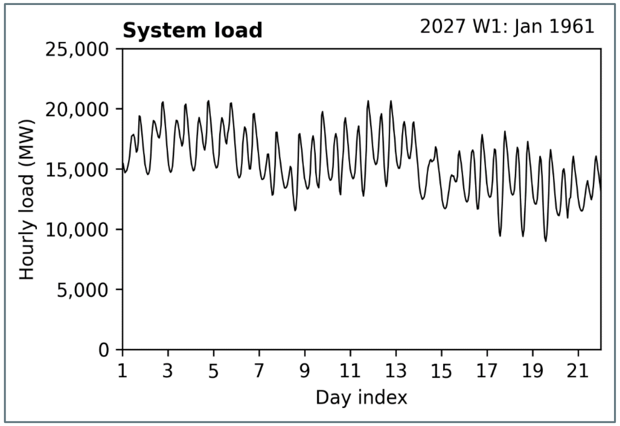
STEP 3: 2027 WINTER CLUSTER 1 (W1) PRELIMINARY RESULTS

Jan 22, 1961 (highest average system risk event) &
Feb 2, 1979 (highest severity index event)

Jan 22, 1961 Winter Event Overview

~12-Day Cold Wave Coincident With Low Wind and Very Low Solar



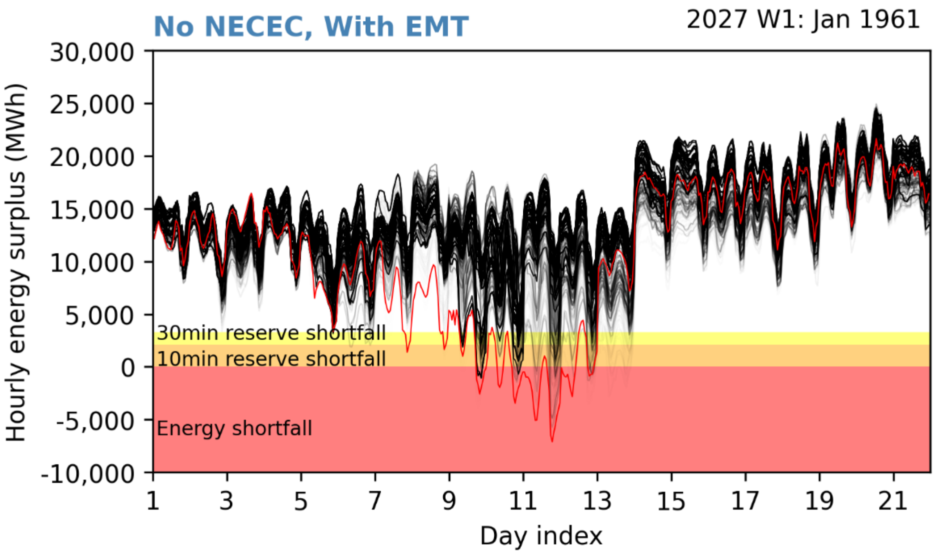


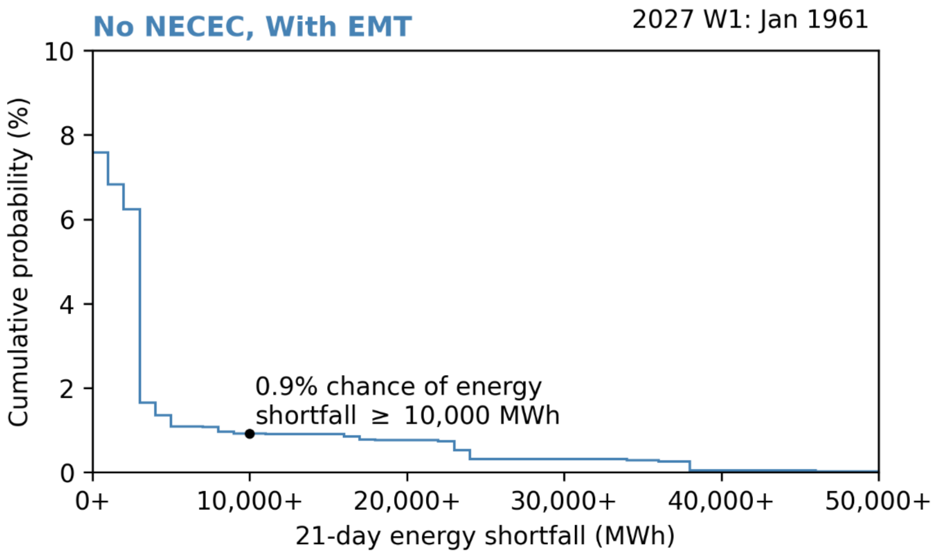
- **Min/Mean/Max (°F):** -9.8/15.8/45.7
- **Mean 100m Wind Speed (m/s):** 6.0
  - Offshore Wind avg. 800 MW/hr
  - Onshore Wind avg. 370 MW/hr
- **Mean Irradiance (W/m²):** 118.8
  - Utility Scale PV avg. 230 MW/hr
  - BTM PV avg. ~1,780 MW/hr
- **Avg. Energy From Renewables:** ~3,180 MW/hr
- **Peak Load:** 20,655 MW (day 4)
- **Peak Energy Demand:** ~424,000 MWh (day 5)
- **Total 21-Day Energy Demand:** 7.82 TWh
- **Historical Relevance:** Coldest 21-day period since 1950; includes two of the top 10 coldest 5-day periods since 1950

*temperatures, wind speeds, and irradiance are based on a New England ten-city weighted average

Summary of 21-Day Energy Analysis Results

Jan 22, 1961 Event; Scenario: no NECEC, with EMT



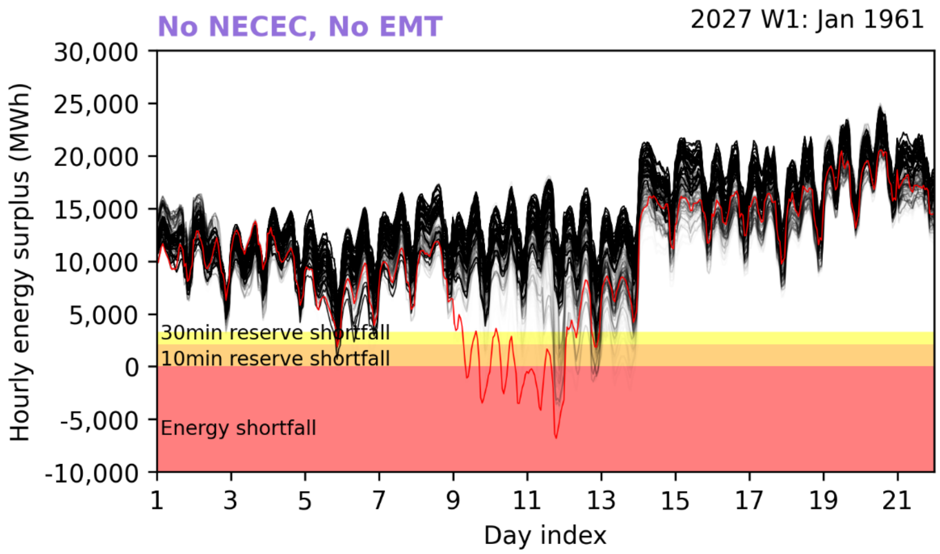


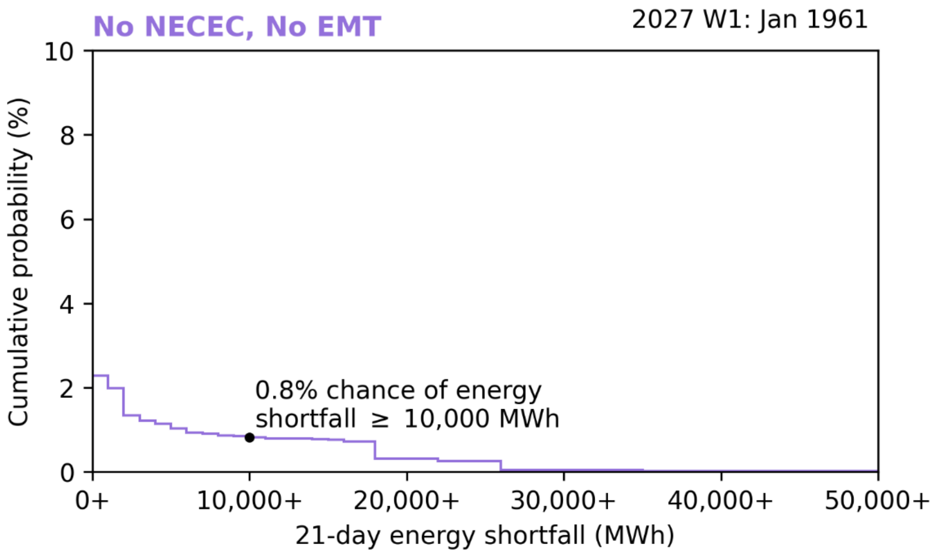
*in the energy surplus chart above (upper-left), the red highlighted trace represents the case that has the highest energy shortfall amount (MWhs); otherwise, the lower the probability of a case, the lighter its corresponding trace

# of cases having energy shortfall (of 720)	Max 21-day total energy shortfall in a case (MWh)	Min 21-day total energy shortfall in a case (MWh)	Expected avg. 21-day total energy shortfall per case with energy shortfall (MWh)	Probability of energy shortfall occurring	Probability of the case with max 21-day total energy shortfall
233	111,353	36	421	7.6%	0.0006%

Summary of 21-Day Energy Analysis Results

Jan 22, 1961 Event; Scenario: no NECEC, no EMT

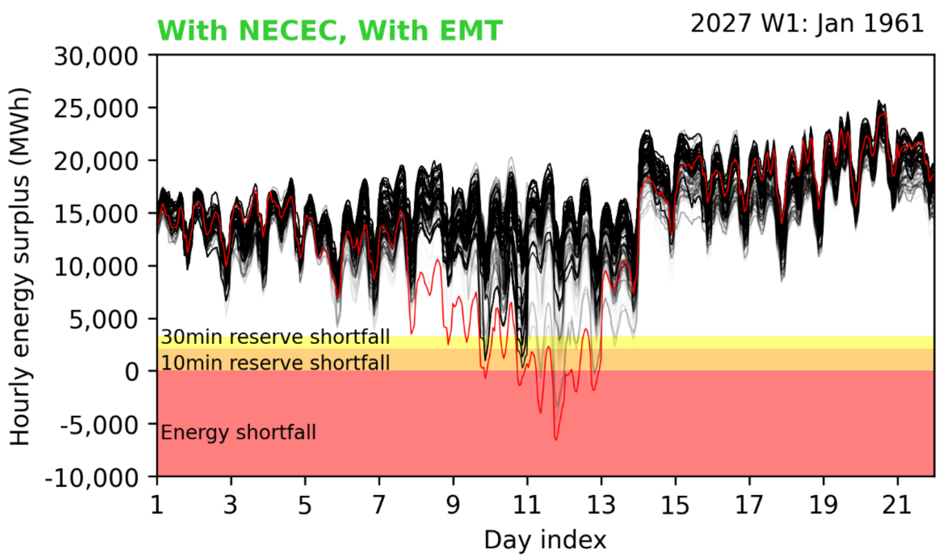


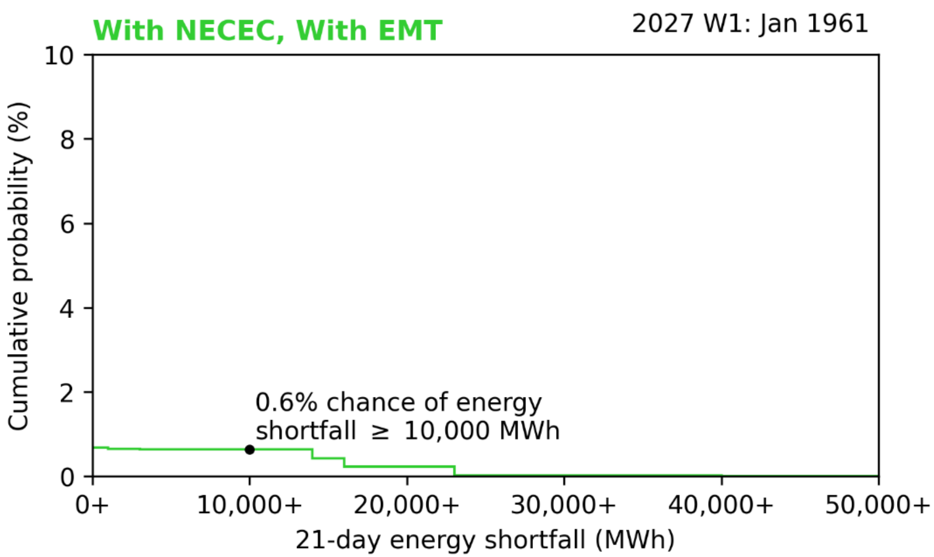


# of cases having energy shortfall (of 720)	Max 21-day total energy shortfall in a case (MWh)	Min 21-day total energy shortfall in a case (MWh)	Expected avg. 21-day total energy shortfall per case with energy shortfall (MWh)	Probability of energy shortfall occurring	Probability of the case with max 21-day total energy shortfall
172	95,888	1	202	2.3%	0.0006%

Summary of 21-Day Energy Analysis Results

Jan 22, 1961 Event; Scenario: with NECEC, with EMT

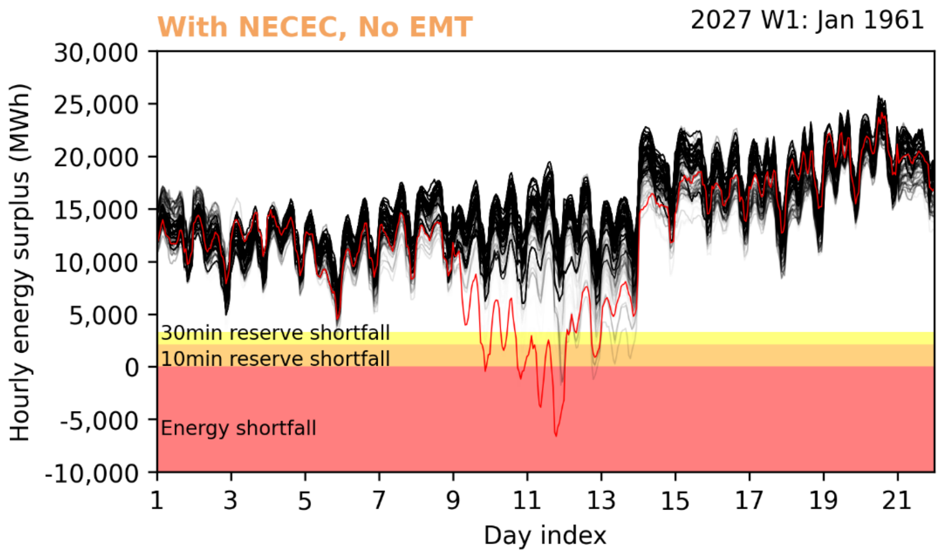


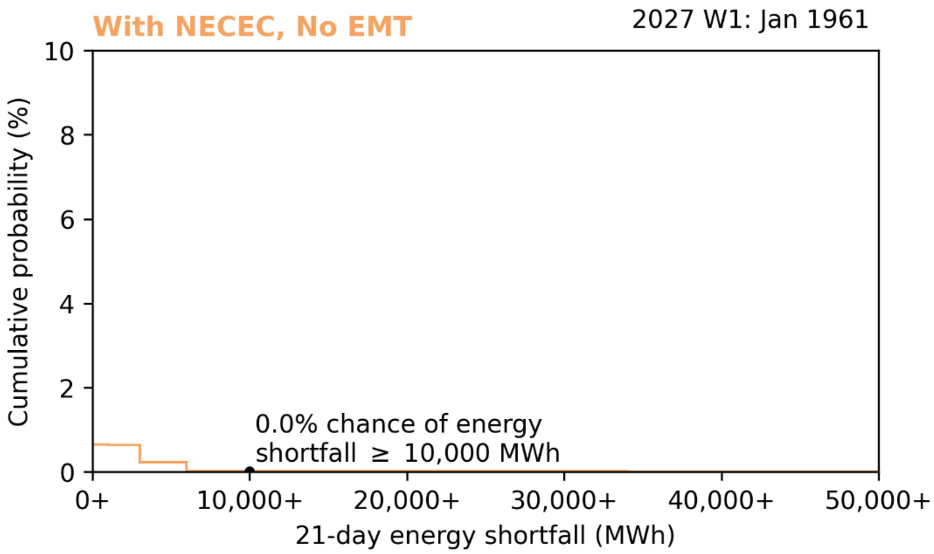


# of cases having energy shortfall (of 720)	Max 21-day total energy shortfall in a case (MWh)	Min 21-day total energy shortfall in a case (MWh)	Expected avg. 21-day total energy shortfall per case with energy shortfall (MWh)	Probability of energy shortfall occurring	Probability of the case with max 21-day total energy shortfall
30	68,932	1	113	0.67%	0.004%

Summary of 21-Day Energy Analysis Results

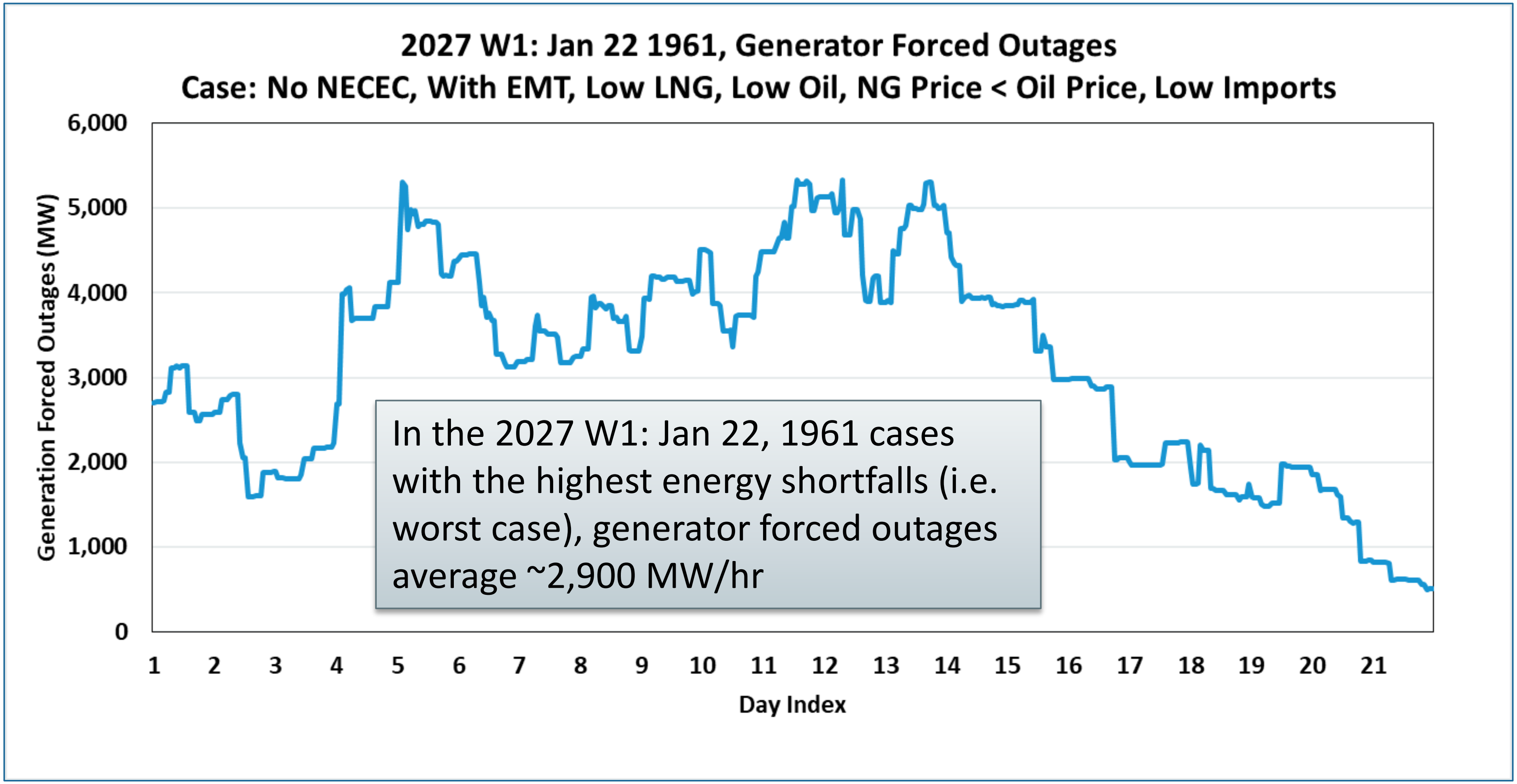
Jan 22, 1961 Event; Scenario: with NECEC, no EMT





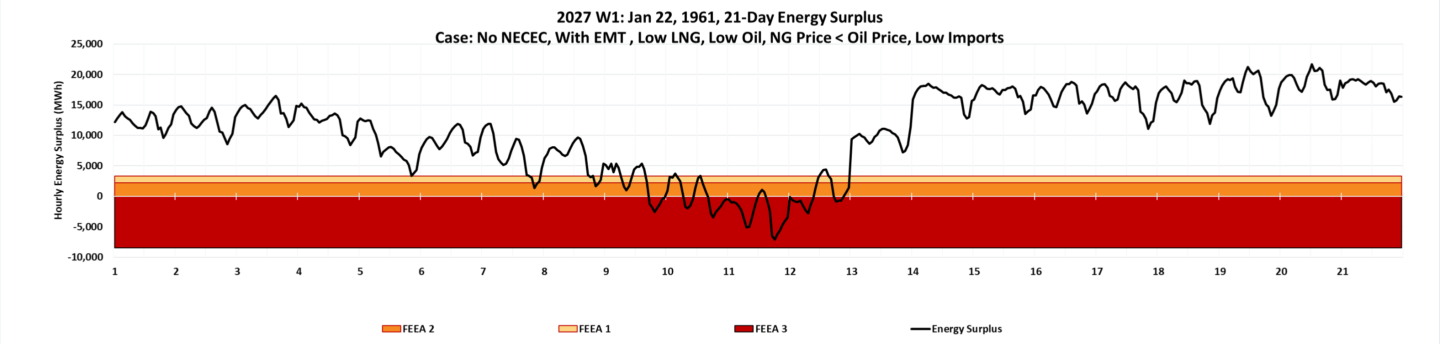
# of cases having energy shortfall (of 720)	Max 21-day total energy shortfall in a case (MWh)	Min 21-day total energy shortfall in a case (MWh)	Expected avg. 21-day total energy shortfall per case with energy shortfall (MWh)	Probability of energy shortfall occurring	Probability of the case with max 21-day total energy shortfall
25	53,518	143	28	0.64%	0.0044%

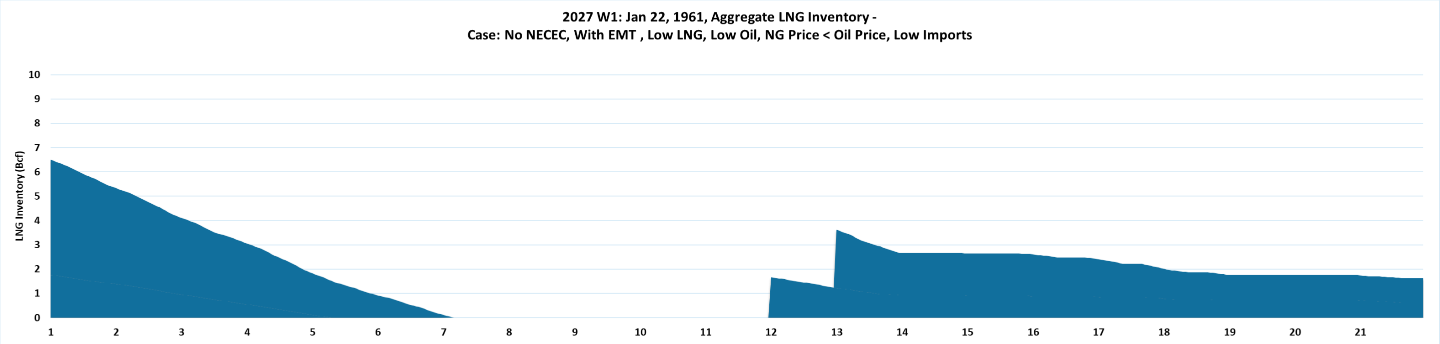
In Worst-Case Energy Shortfalls, Generator Forced Outages Range From ~500 MW/hr to ~5,400 MW/hr

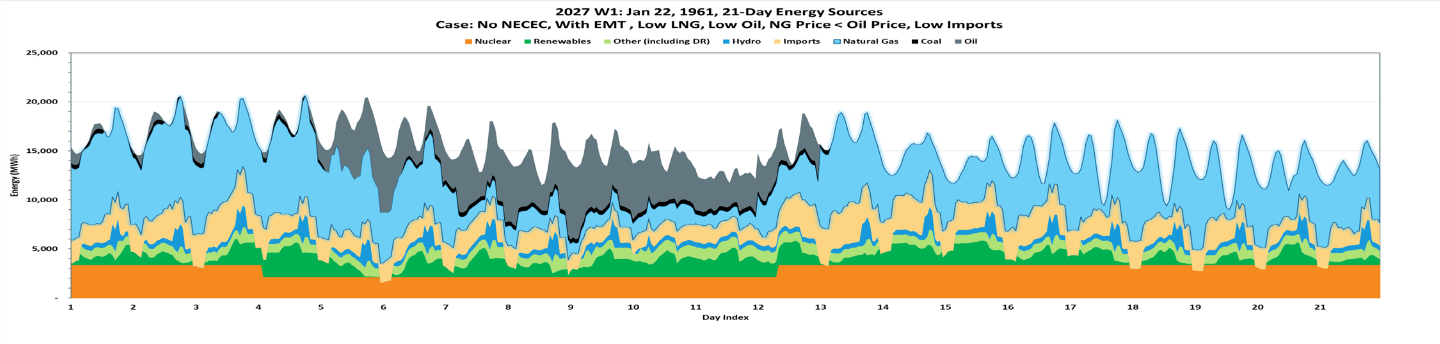


Worst-Case Energy Shortfall

Jan 22, 1961 Event; Scenario: no NECEC, with EMT; Case: Low LNG, Low Oil, NG Price < Oil Price, Low Imports

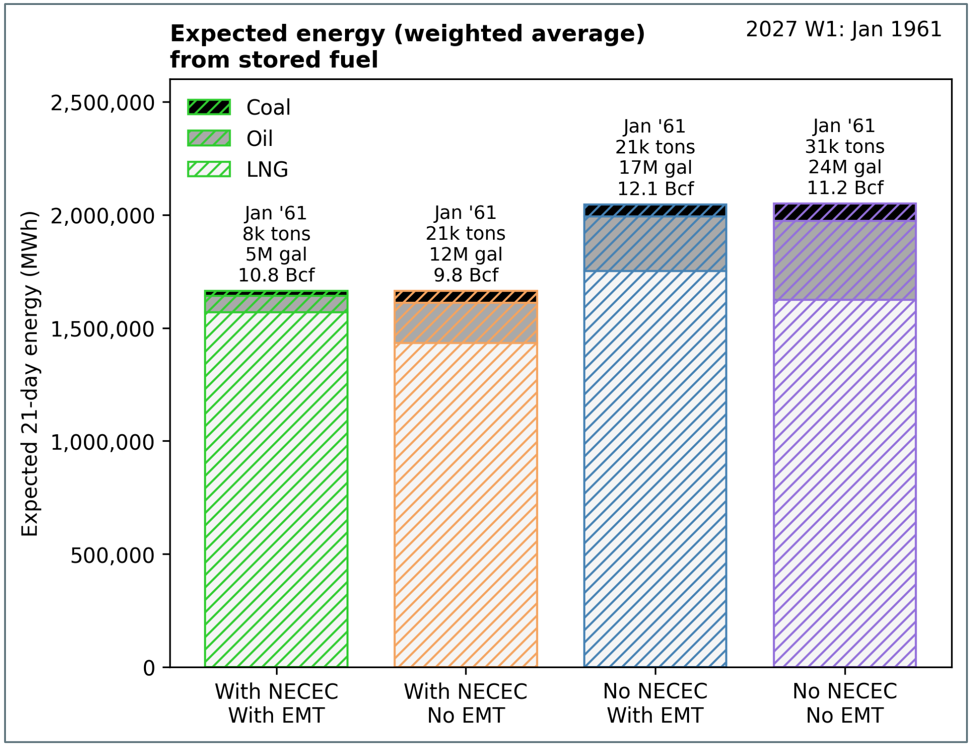


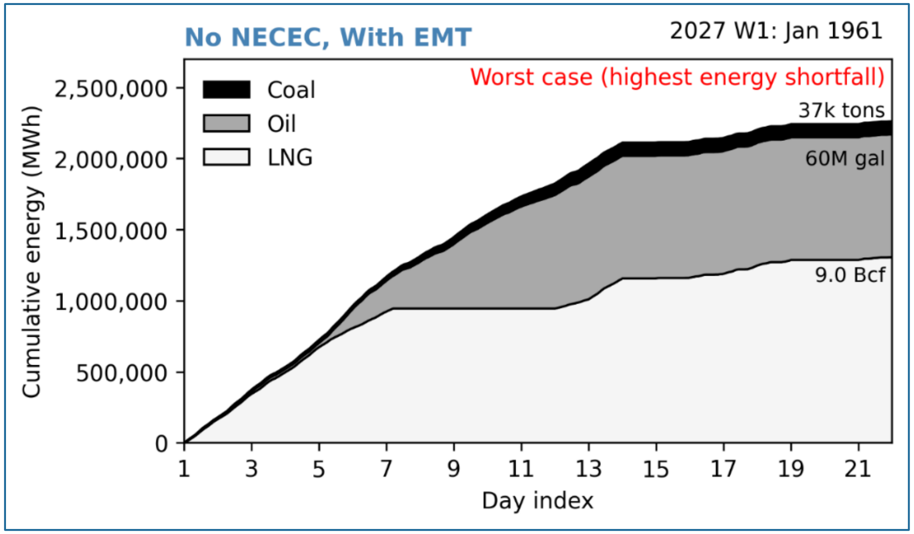




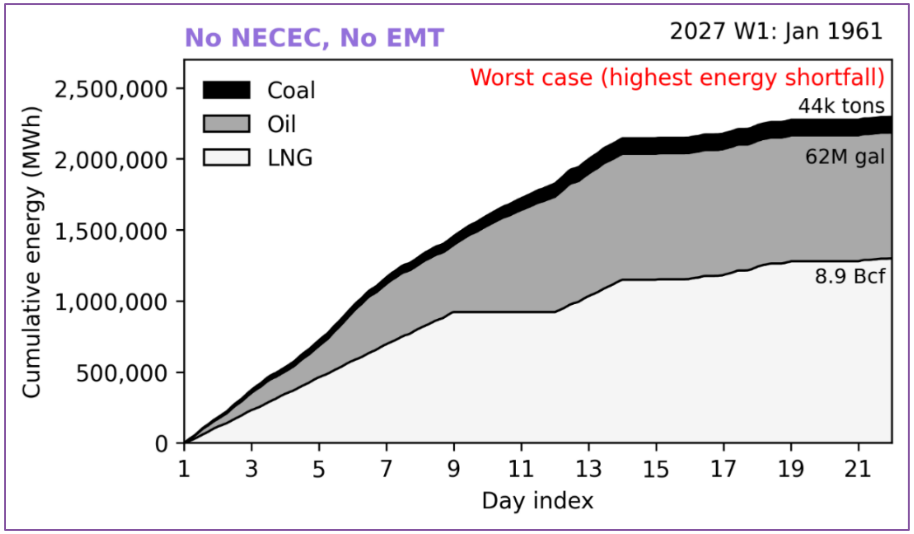
Energy Shortfall – FEEA3 (MWh)	111,353
10-Min Reserve Shortfall – FEEA2 (MWh)	135,892
30-Min Reserve Shortfall – FEEA1 (MWh)	87,332
Starting Inventory – LNG (Bcf)	6.5
LNG Replenishment (Bcf), on days 12 & 13	4.1
LNG Usage (Bcf)	9.0
Fuel Oil Starting Inventory (gal)	~96.5 M
Fuel Oil Replenishment (gal), as needed	~39.0 M
Fuel Oil Usage (gal)	~60.4 M

In Worst Case Energy Shortfalls, Increases in Stored Fuel Usage Are Notable



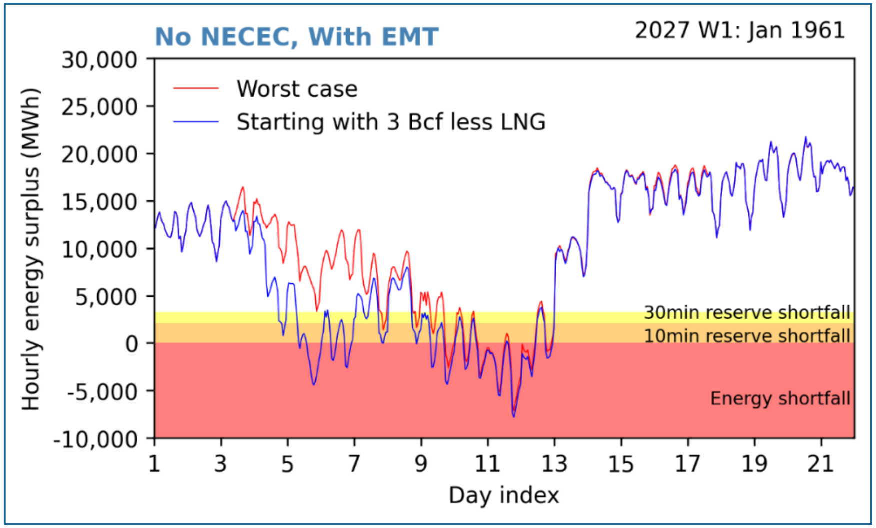


In the figure above, the expected energy from stored fuel is the weighted avg. quantity of stored fuels used across all cases in a given scenario and the figures to the right are for the worst case

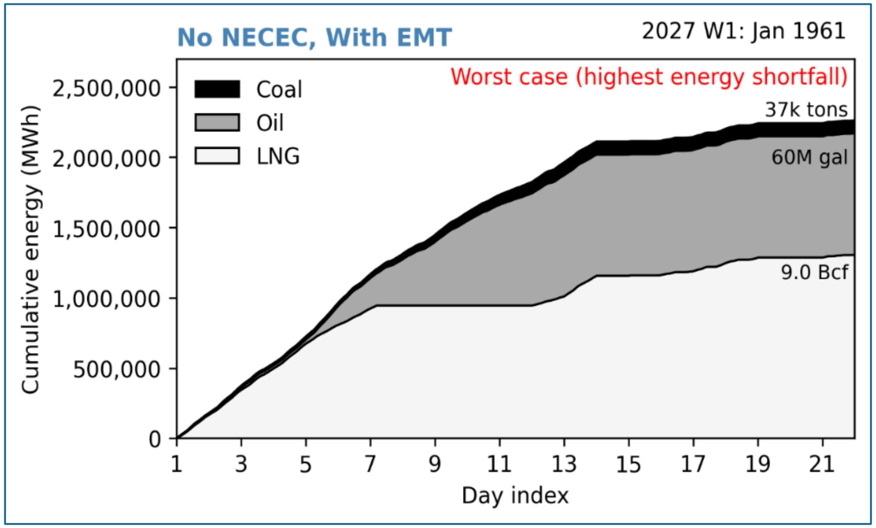


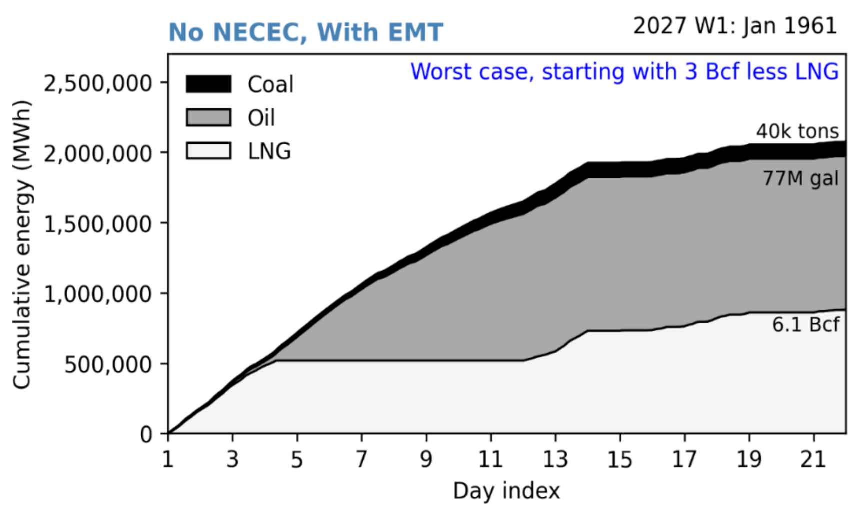
Sensitivity to Starting LNG inventory

Jan 22, 1961 Event; Scenario: no NECEC, with EMT; Case: Low LNG, Low Oil, NG Price < Oil Price, Low Imports



- To illustrate the sensitivity of total energy shortfall to LNG inventories, ISO studied a sensitivity case* with a 3 Bcf lower starting LNG inventory
  - In this sensitivity case, the starting LNG inventory of ~6.5 Bcf is reduced to ~3.5 Bcf
  - Similar to the un-adjusted case, LNG replenishment of ~2.4 Bcf and ~1.7 Bcf occurs on days 12 and 13, respectively
- Worst case energy shortfall increases to ~200K MWh (~80%); results were similar in a sensitivity case run on the No NECEC, No EMT scenario

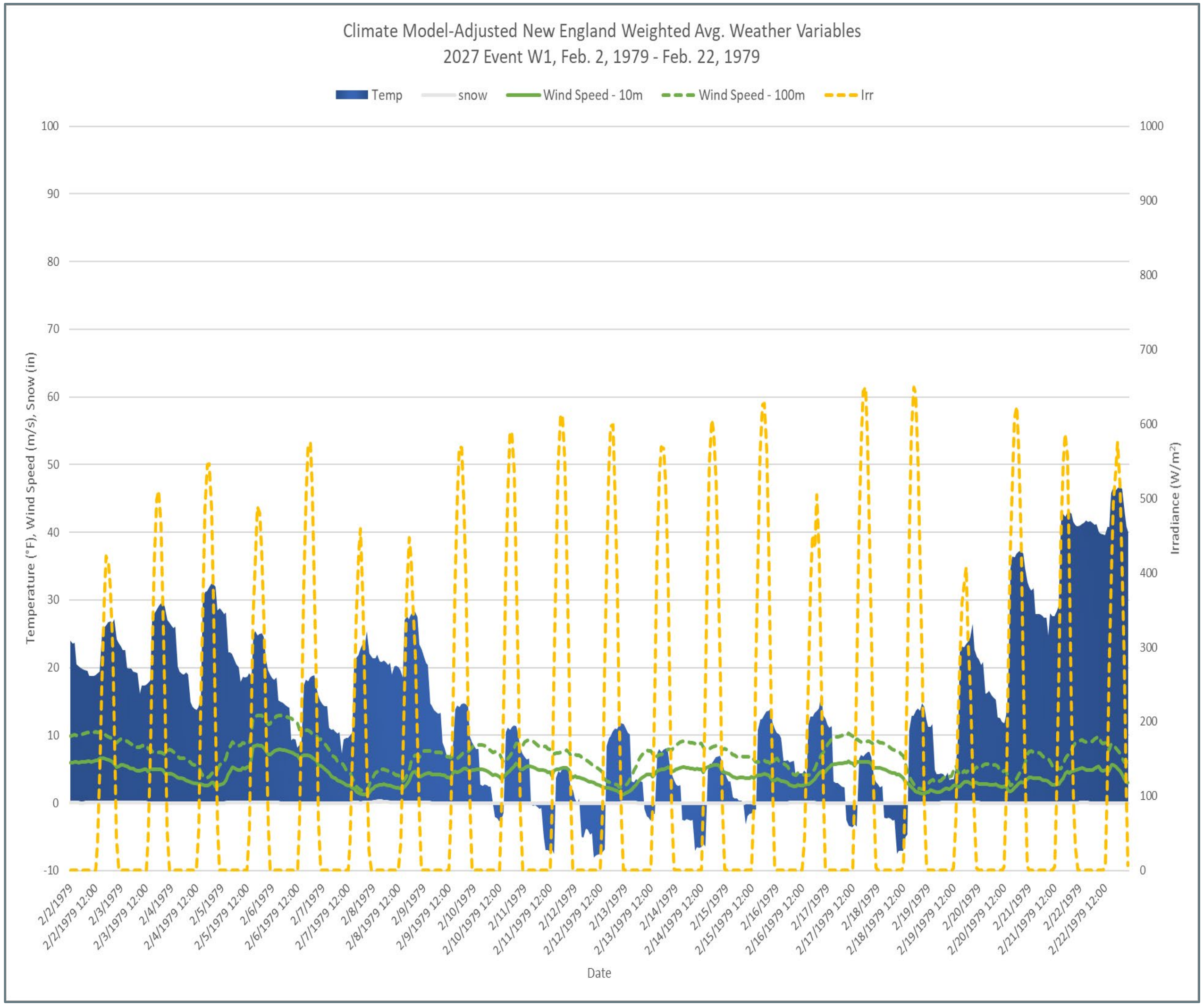


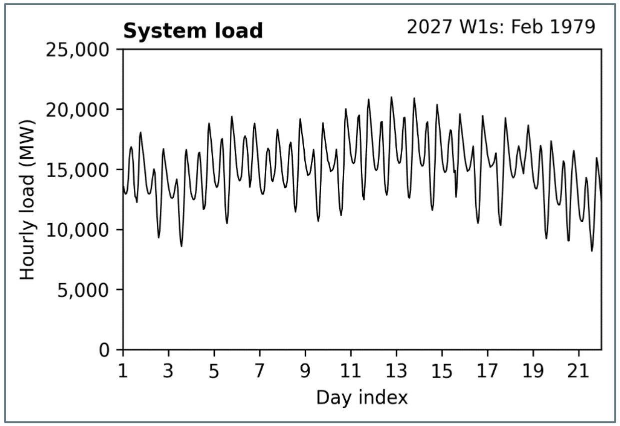


*no probability is associated with this sensitivity case

Feb 2, 1979 Winter Event Overview

~10-Day Cold Wave Coincident With Low Winds and Low Solar



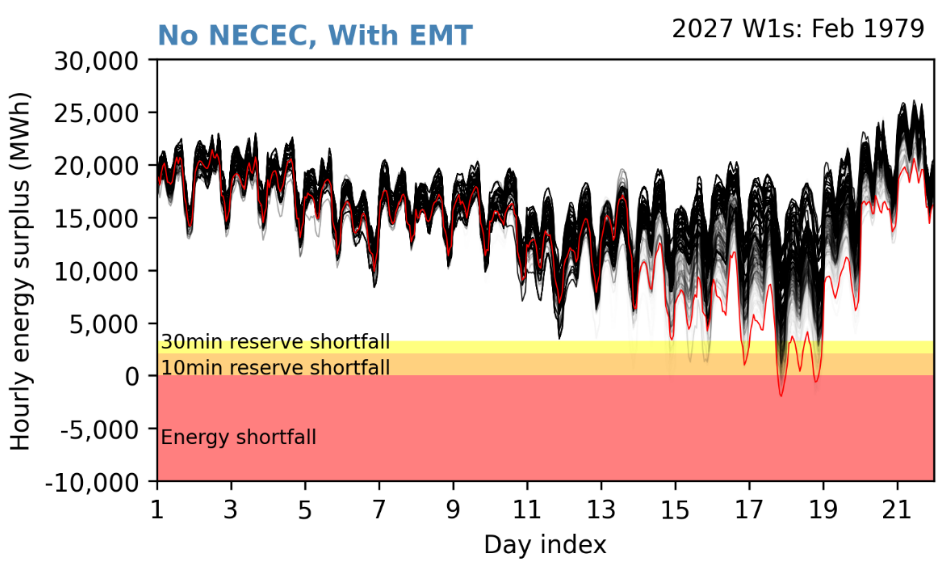


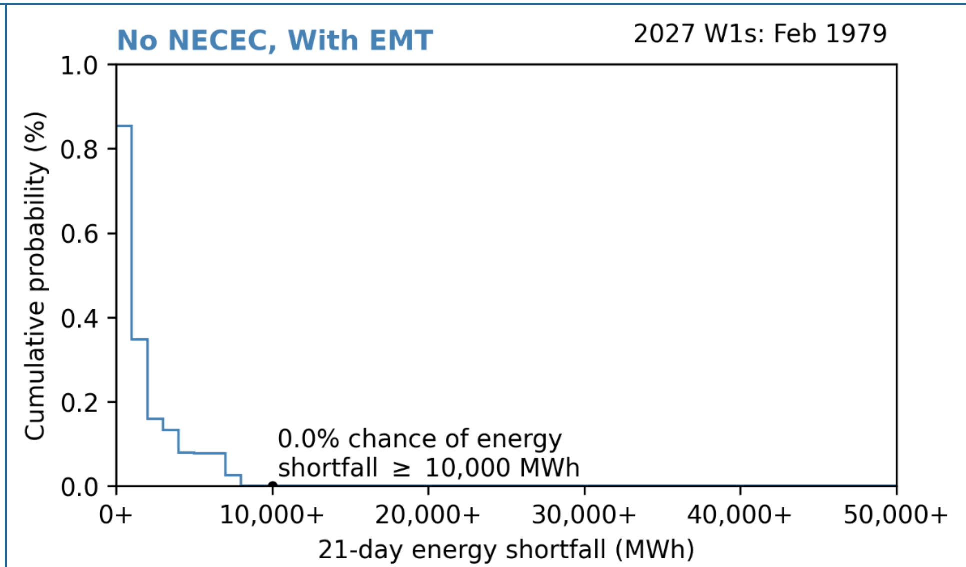
- **Min/Mean/Max (°F):** -8.1/14.3/46.6
- **Mean 100m Wind Speed (m/s):** 7.1
  - Offshore Wind avg. 1,120MW/hr
  - Onshore Wind avg. 580 MW/hr
- **Mean Irradiance (W/m²):** 142.0
  - Utility Scale PV avg. 280 MW/hr
  - BTM PV avg. ~2,200 MW/hr
- **Avg. Energy From Renewables:** ~4,180 MW/hr
- **Peak Load:** 20,994 MW (day 11)
- **Peak Energy Demand:** ~403,000 MWh (day 12)
- **Total 21-Day Energy Demand:** 7.59 TWh
- **Historical Relevance:** The actual weather during this stretch included the coldest 5-day and 10-day period since 1950

*temperatures, wind speeds, and irradiance are based on a New England ten-city weighted average

Summary of 21-Day Energy Analysis Results

Feb 2, 1979 Event; Scenario: no NECEC, with EMT

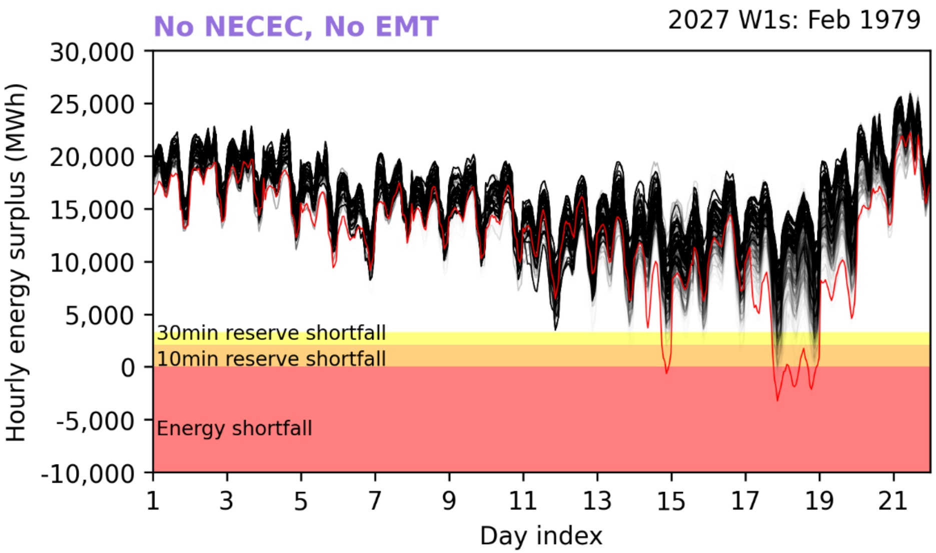


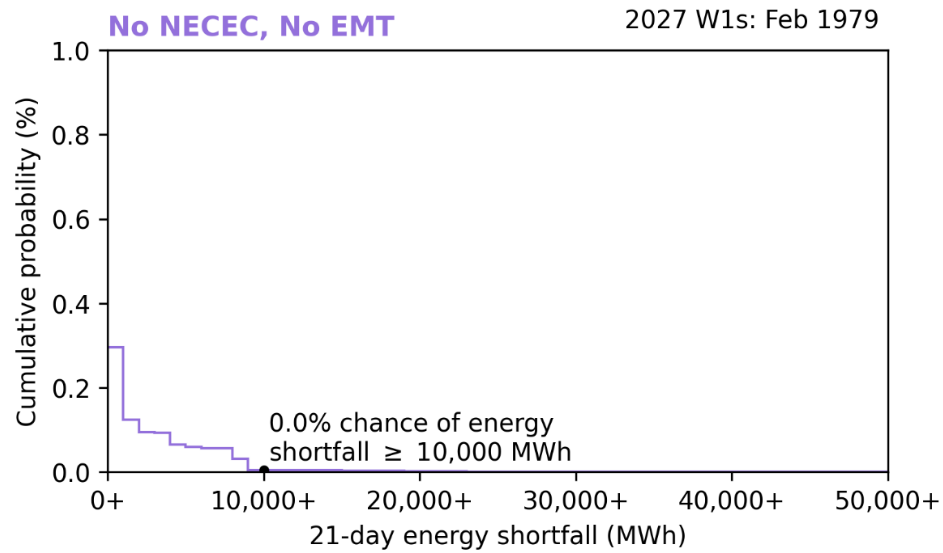


# of cases having energy shortfall (of 720)	Max 21-day total energy shortfall in a case (MWh)	Min 21-day total energy shortfall in a case (MWh)	Expected avg. 21-day total energy shortfall per case with energy shortfall (MWh)	Probability of energy shortfall occurring	Probability of the case with max 21-day total energy shortfall
48	7,545	74	13	0.85%	0.026%

Summary of 21-Day Energy Analysis Results

Feb 2, 1979 Event; Scenario: no NECEC, no EMT

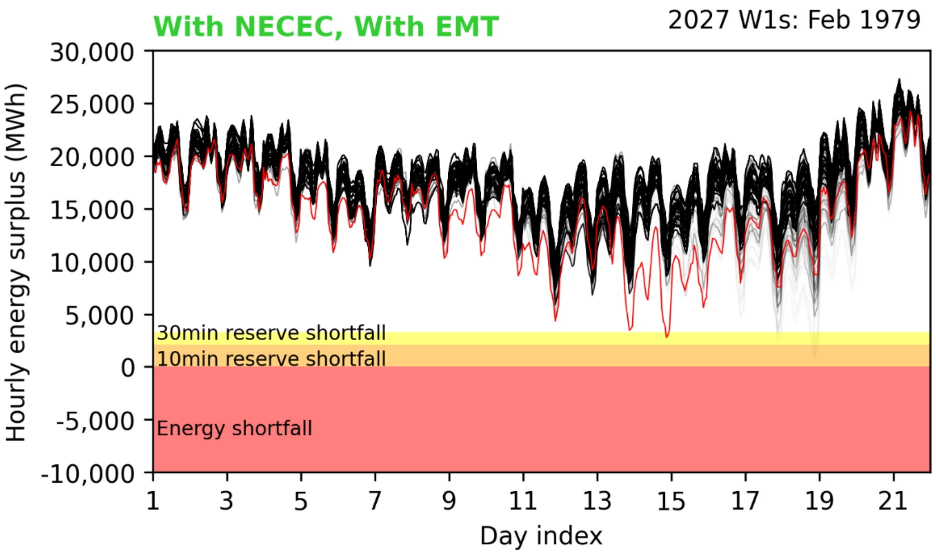


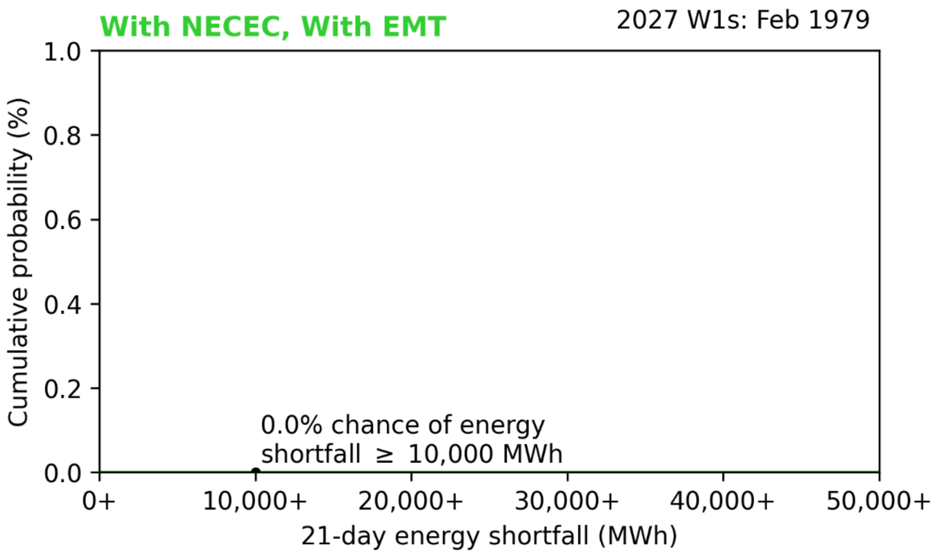


# of cases having energy shortfall (of 720)	Max 21-day total energy shortfall in a case (MWh)	Min 21-day total energy shortfall in a case (MWh)	Expected avg. 21-day total energy shortfall per case with energy shortfall (MWh)	Probability of energy shortfall occurring	Probability of the case with max 21-day total energy shortfall
67	28,348	18	7	0.30%	0.0006%

Summary of 21-Day Energy Analysis Results

Feb 2, 1979 Event; Scenario: with NECEC, with EMT

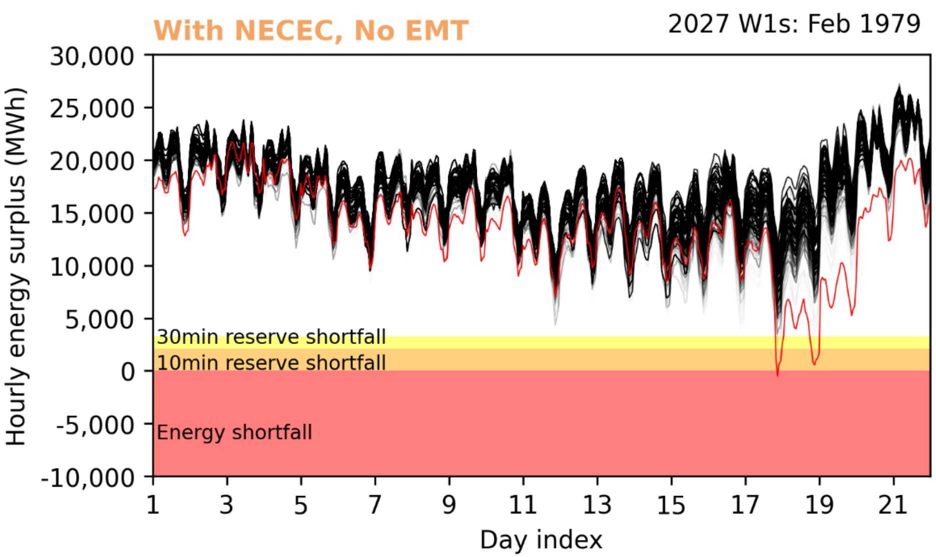


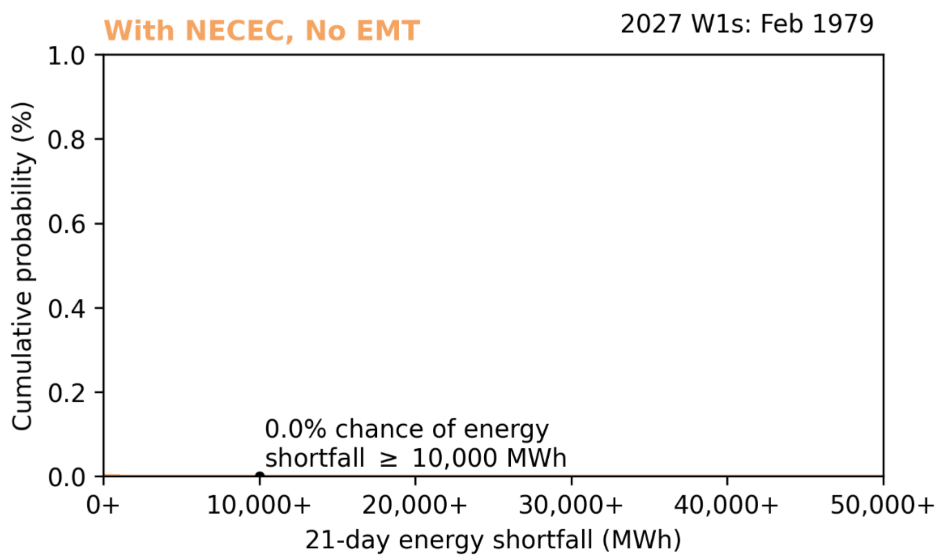


# of cases having energy shortfall (of 720)	Max 21-day total energy shortfall in a case (MWh)	Min 21-day total energy shortfall in a case (MWh)	Expected avg. 21-day total energy shortfall per case with energy shortfall (MWh)	Probability of energy shortfall occurring	Probability of the case with max 21-day total energy shortfall
0	0	0	0	0.0%	0.0%

Summary of 21-Day Energy Analysis Results

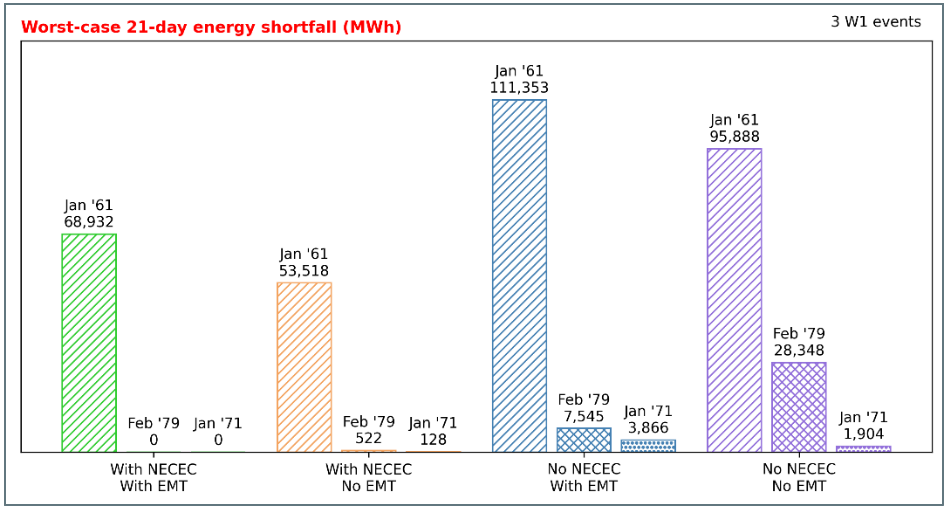
Feb 2, 1979 Event; Scenario: with NECEC, no EMT

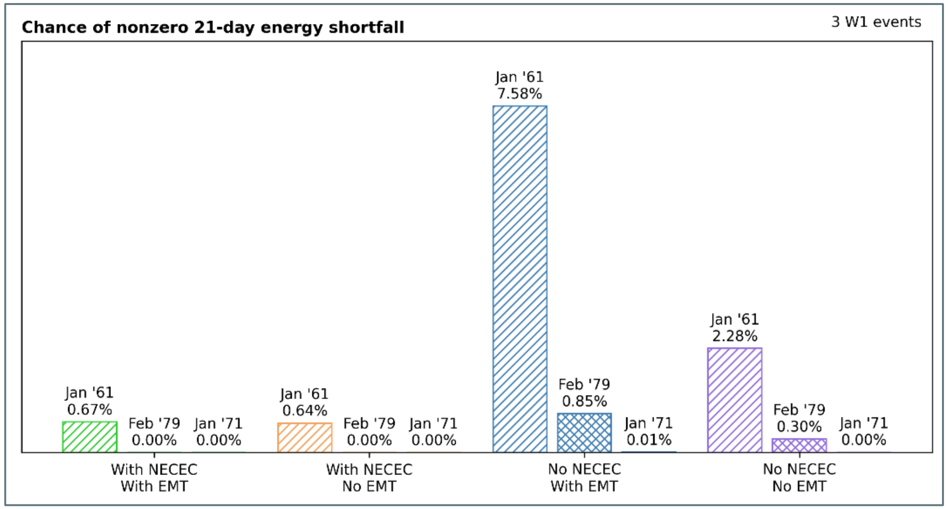




# of cases having energy shortfall (of 720)	Max 21-day total energy shortfall in a case (MWh)	Min 21-day total energy shortfall in a case (MWh)	Expected avg. 21-day total energy shortfall per case with energy shortfall (MWh)	Probability of energy shortfall occurring	Probability of the case with max 21-day total energy shortfall
2	522	10	0	0.001%	0.0006%

2027 Winter Cluster 1
Energy Shortfall Quantities and Probabilities





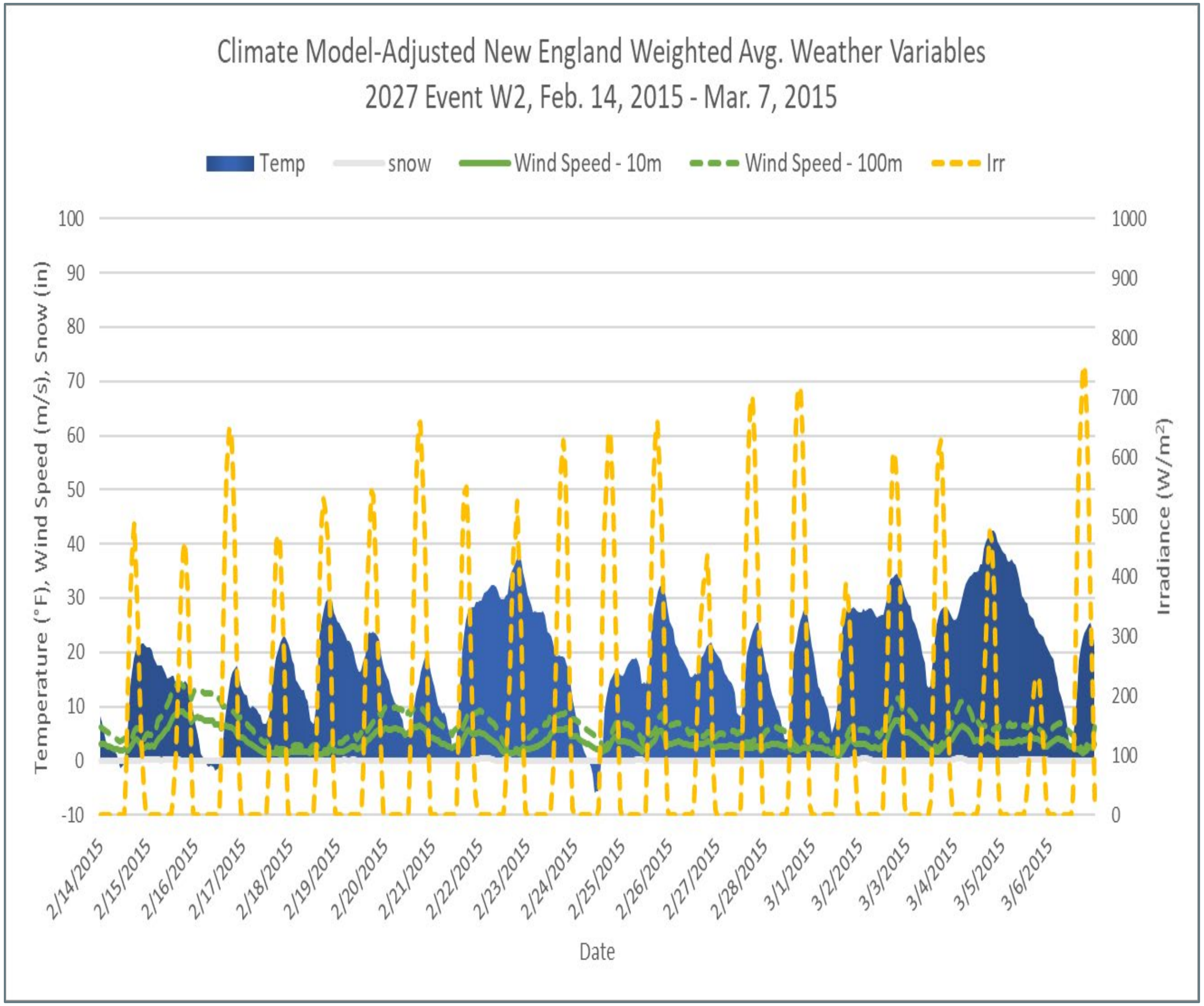
- Results of the Winter Cluster 1 medoid event (Jan 15, 1971) are included in the figures above; energy shortfall in the medoid event cases is negligible
- Results of Winter Cluster 1 studies reveal:
  - Similar energy adequacy risk with and without EMT in-service; as noted, results with and without EMT are highly dependent on the characteristics of a given event
  - Risks are mitigated by incremental imports from NECEC

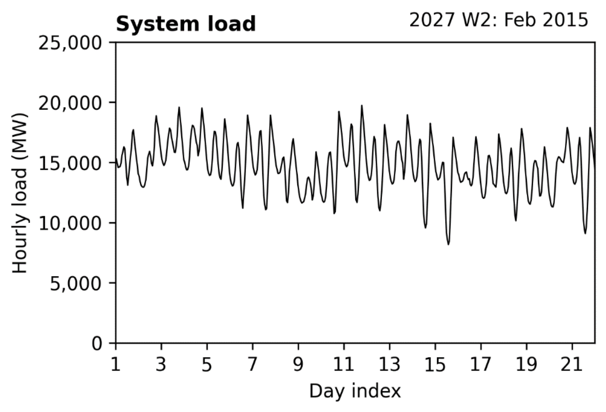
STEP 3: 2027 WINTER CLUSTER 2 (W2) PRELIMINARY RESULTS

Feb 14, 2015 (highest average system risk event) &
Jan 14, 1982 (highest severity index event)

Feb 14, 2015 Winter Event Overview

Multiple Short-Duration Cold Waves Coincident With Low Wind and Low Solar



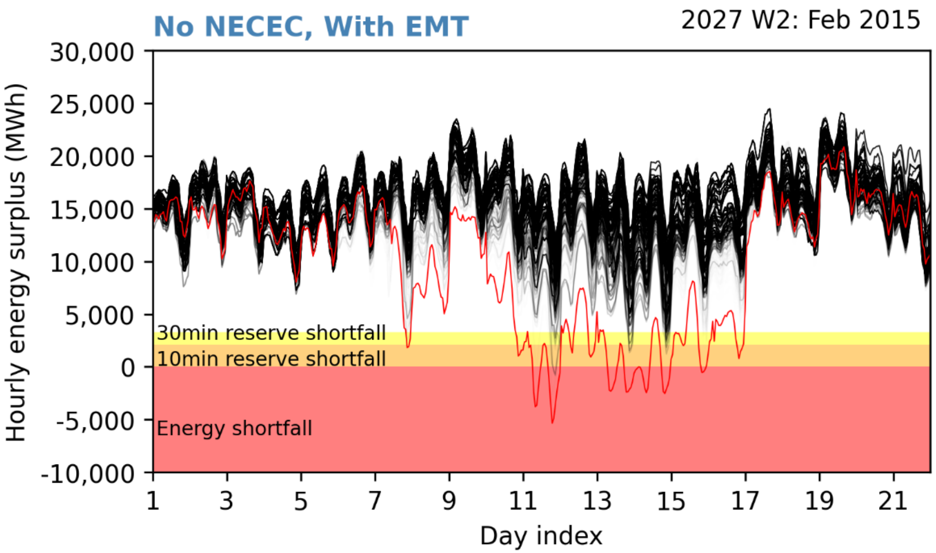


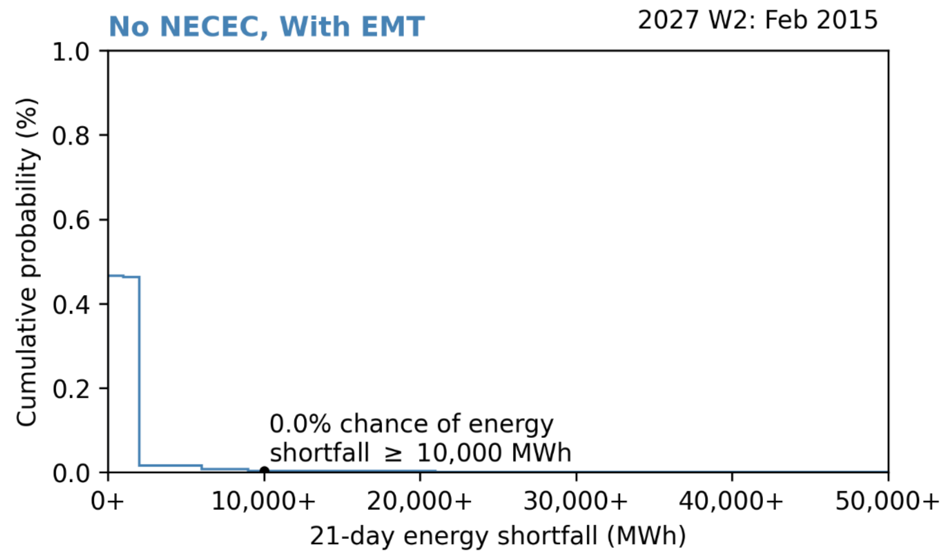
- **Min/Mean/Max (°F):** -5.8/19.0/42.5
- **Mean 100m Wind Speed (m/s):** 6.0
  - Offshore Wind avg. 740 MW/hr
  - Onshore Wind avg. 410 MW/hr
- **Mean Irradiance (W/m²):** 147.6
  - Utility Scale PV avg. 280 MW/hr
  - BTM PV avg. ~2,200 MW/hr
- **Avg. Energy From Renewables:** ~3,630 MW/hr
- **Peak Load:** 19,730 MW (day 11)
- **Peak Energy Demand:** ~399,000 MWh (day 3)
- **Total 21-Day Energy Demand:** 7.43 TWh
- **Historical Relevance:** One of Top 10 coldest 21-day periods since 1950

*temperatures, wind speeds, and irradiance are based on a New England ten-city weighted average

Summary of 21-Day Energy Analysis Results

Feb 14, 2015 Event; Scenario: no NECEC, with EMT

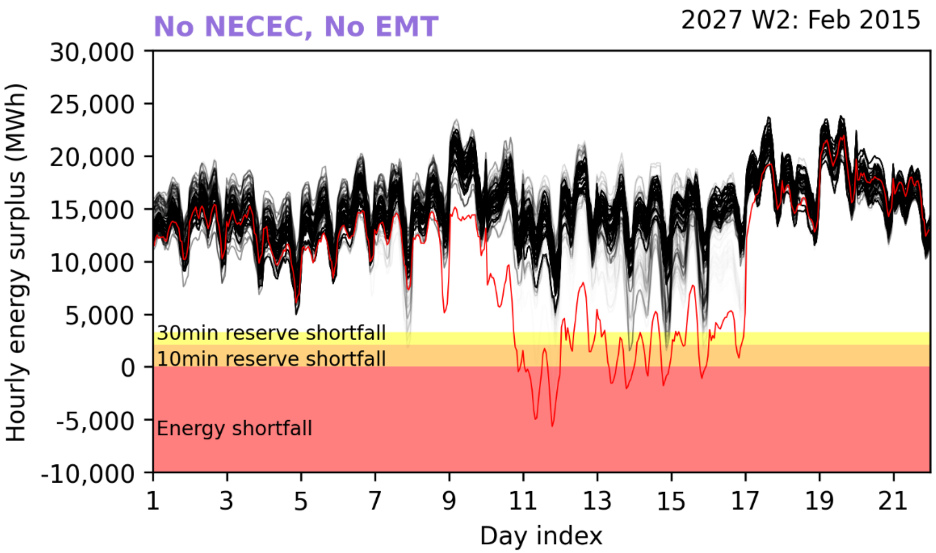


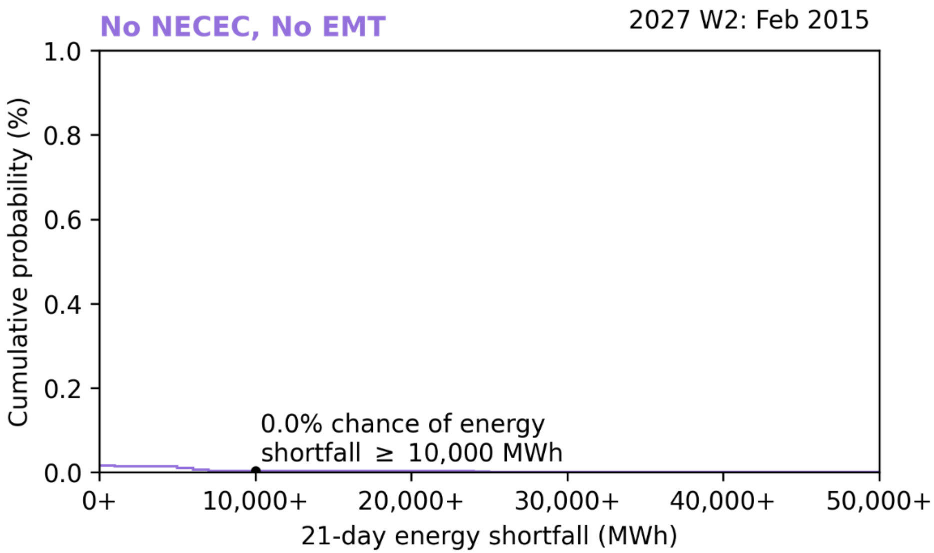


# of cases having energy shortfall (of 720)	Max 21-day total energy shortfall in a case (MWh)	Min 21-day total energy shortfall in a case (MWh)	Expected avg. 21-day total energy shortfall per case with energy shortfall (MWh)	Probability of energy shortfall occurring	Probability of the case with max 21-day total energy shortfall
33	78,148	18	7	0.47%	0.000005%

Summary of 21-Day Energy Analysis Results

Feb 14, 2015 Event; Scenario: no NECEC, no EMT

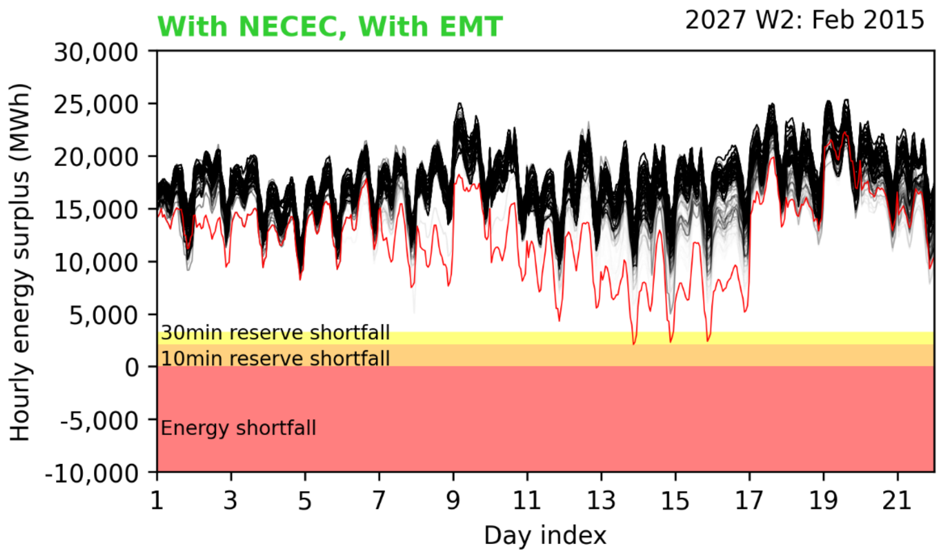


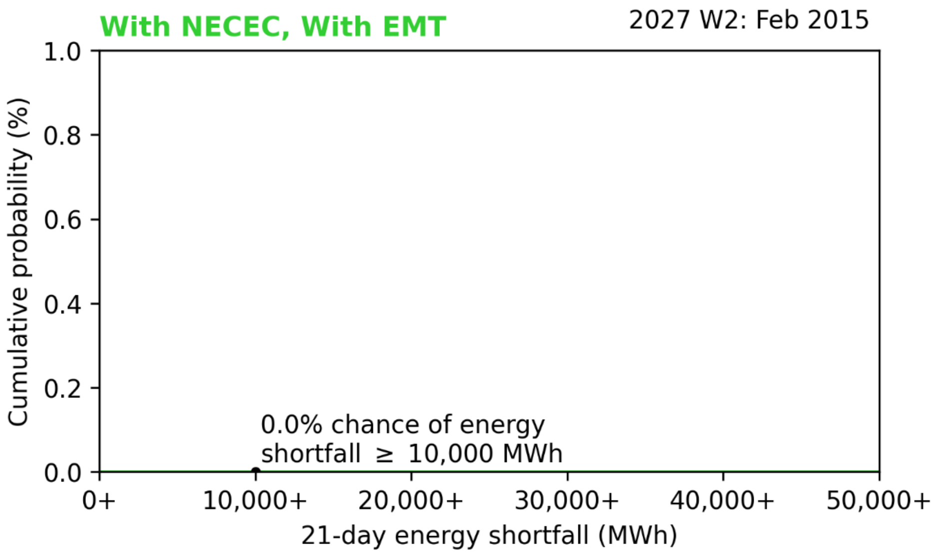


# of cases having energy shortfall (of 720)	Max 21-day total energy shortfall in a case (MWh)	Min 21-day total energy shortfall in a case (MWh)	Expected avg. 21-day total energy shortfall per case with energy shortfall (MWh)	Probability of energy shortfall occurring	Probability of the case with max 21-day total energy shortfall
18	71,255	10	1	0.02%	0.000005%

Summary of 21-Day Energy Analysis Results

Feb 14, 2015 Event; Scenario: with NECEC, with EMT





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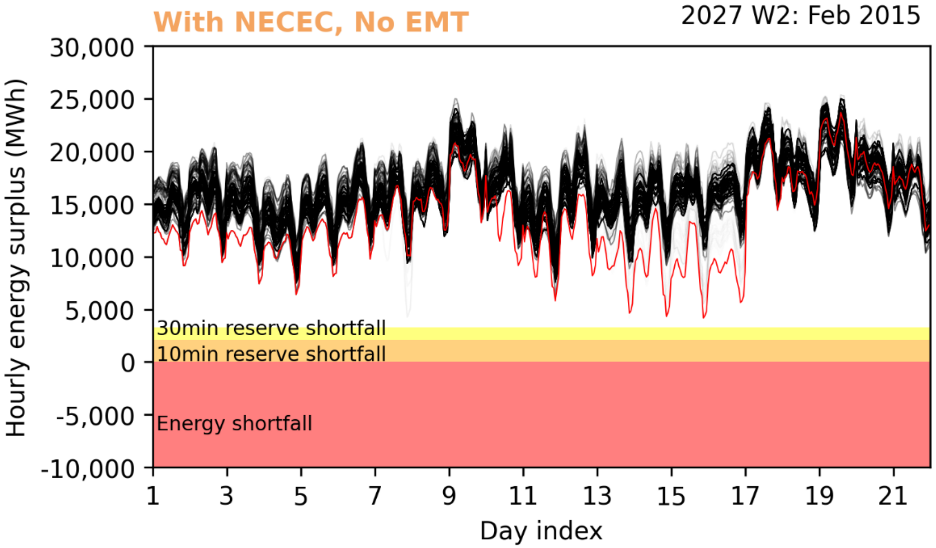
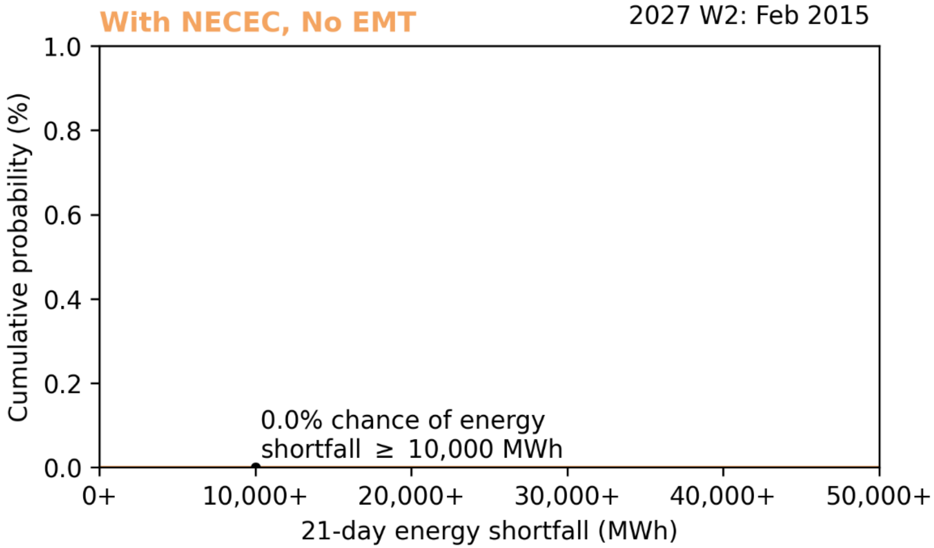
0	0	0	0	0.0%	0.0%

Summary of 21-Day Energy Analysis Results

Feb 14, 2015 Event; Scenario: with NECEC, no EMT





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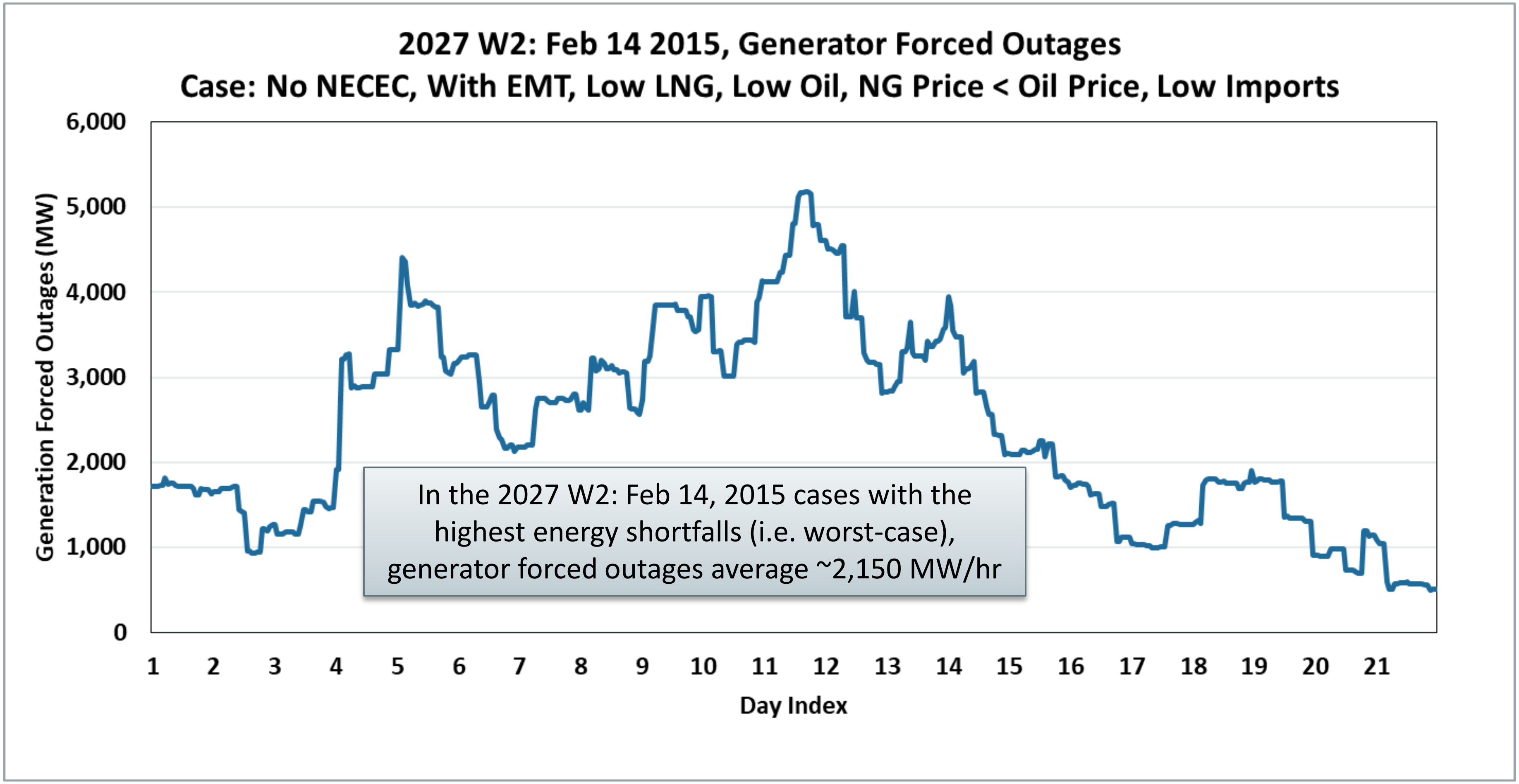
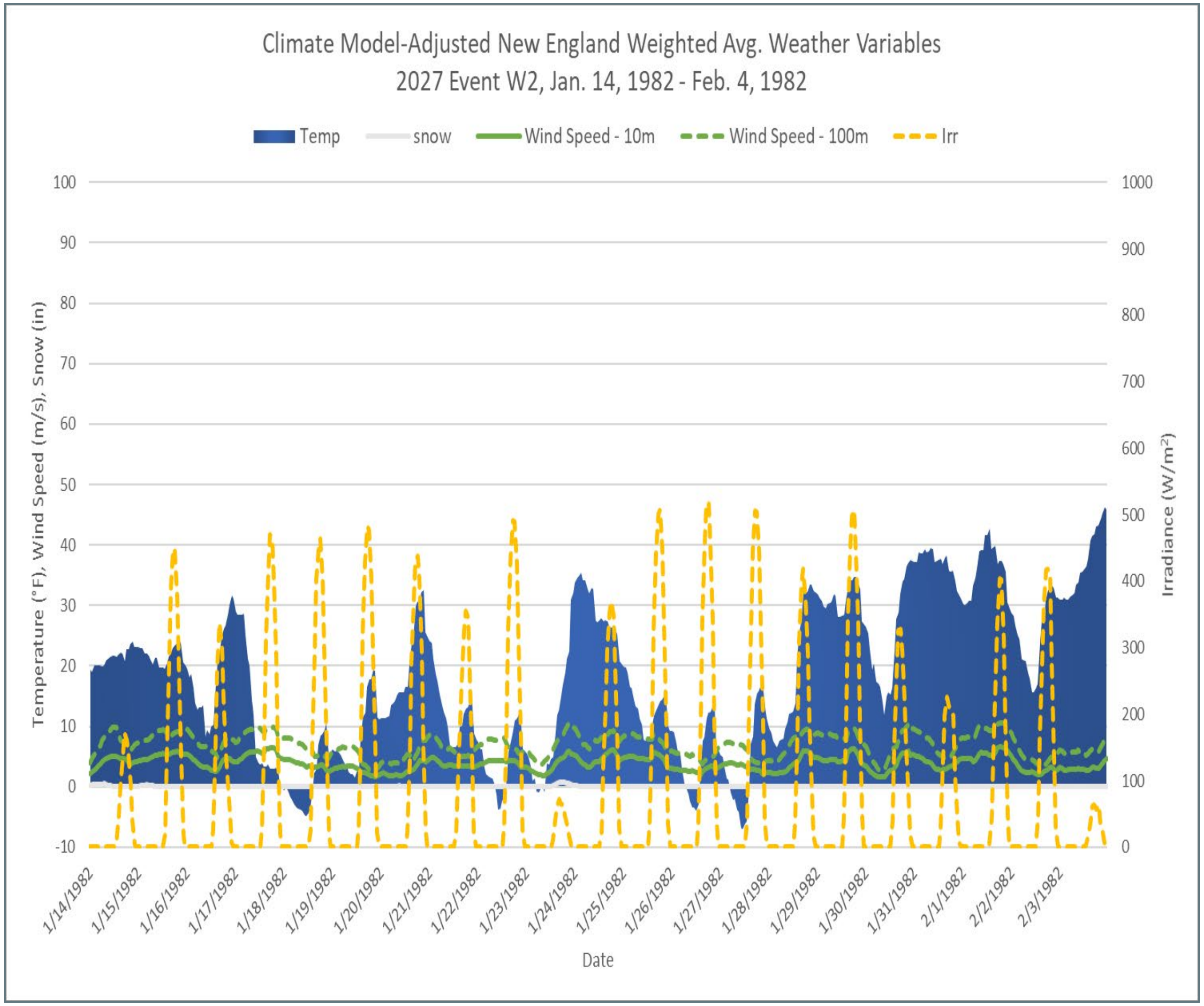
0	0	0	0	0.0%	0.0%

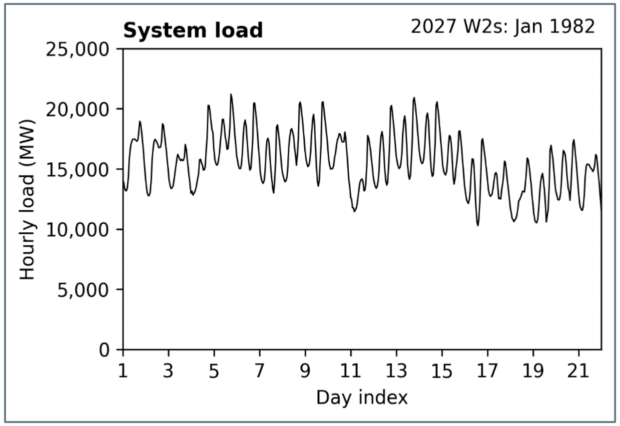
In Worst-Case Energy Shortfalls, Generator Forced Outages Range From ~500 MW/hr to ~5,100 MW/hr



Jan 14, 1982 Winter Event Overview

Multiple Short-Duration Cold Waves Coincident With Low Wind and Very Low Solar



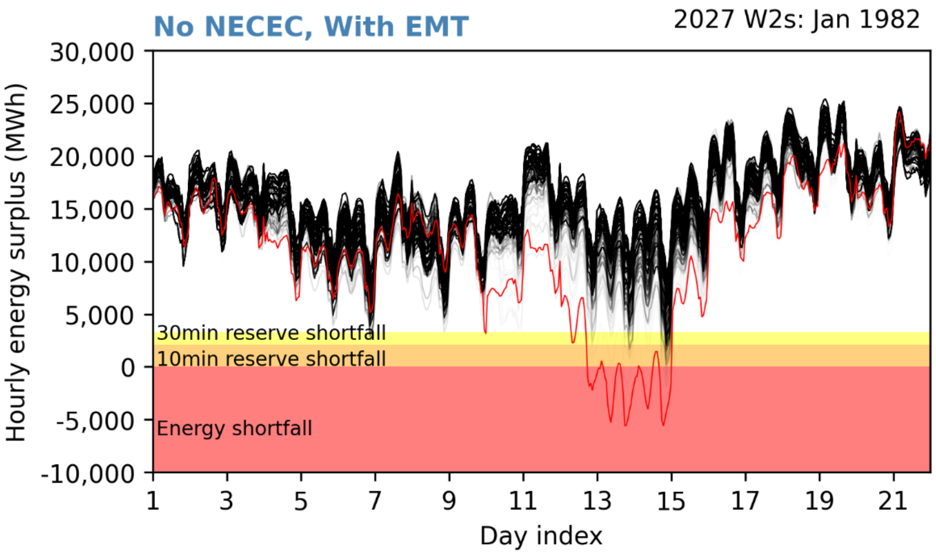


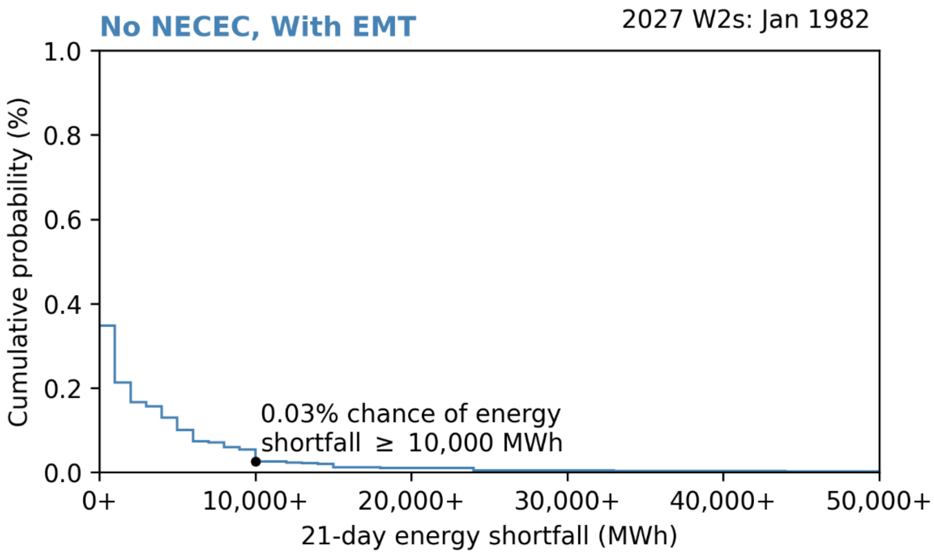
- **Min/Mean/Max (°F):** -7.0/18.4/46.2
- **Mean 100m Wind Speed (m/s):** 6.9
  - Offshore Wind avg. 1,090MW/hr
  - Onshore Wind avg. 510 MW/hr
- **Mean Irradiance (W/m²):** 91.0
  - Utility Scale PV avg. 160 MW/hr
  - BTM PV avg. ~1,250 MW/hr
- **Avg. Energy From Renewables:** ~3,010 MW/hr
- **Peak Load:** 21,195 MW (day 5)
- **Peak Energy Demand:** ~423,000 MWh (day 5
- **Total 21-Day Energy Demand:** 7.84 TWh
- **Historical Relevance:** One of Top 10 coldest 21-day periods since 1950

*temperatures, wind speeds, and irradiance are based on a New England ten-city weighted average

Summary of 21-Day Energy Analysis Results

Jan 14, 1982 Event; Scenario: no NECEC, with EMT

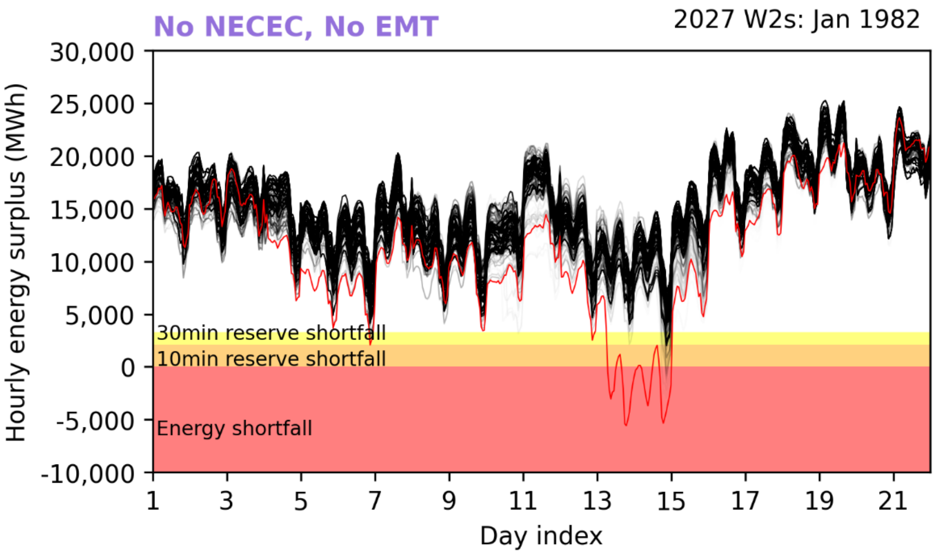


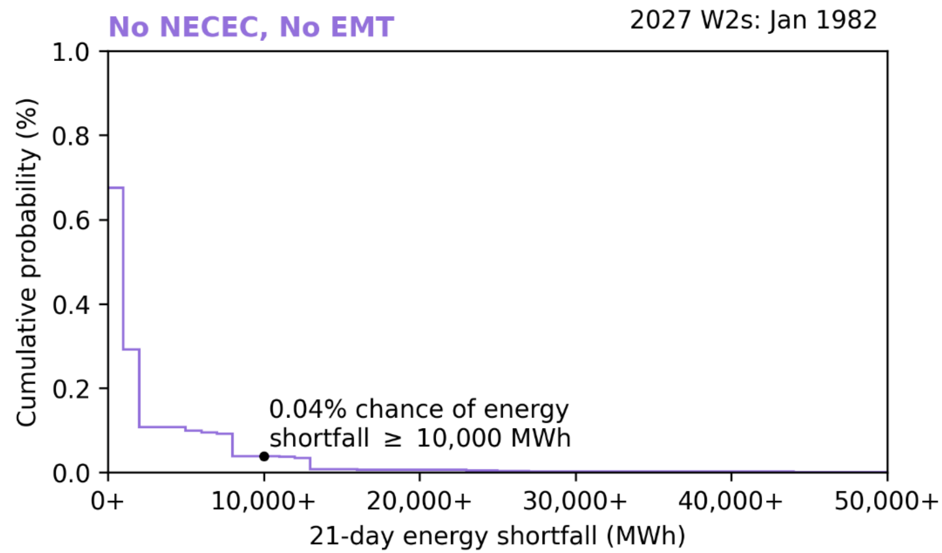


# of cases having energy shortfall (of 720)	Max 21-day total energy shortfall in a case (MWh)	Min 21-day total energy shortfall in a case (MWh)	Expected avg. 21-day total energy shortfall per case with energy shortfall (MWh)	Probability of energy shortfall occurring	Probability of the case with max 21-day total energy shortfall
139	114,715	32	15	0.35%	0.00004%

Summary of 21-Day Energy Analysis Results

Jan 14, 1982 Event; Scenario: no NECEC, no EMT

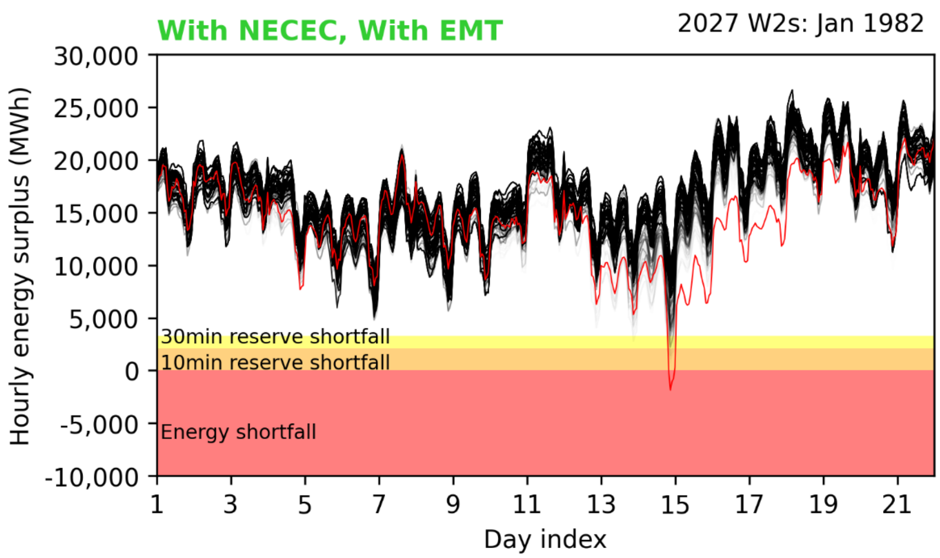


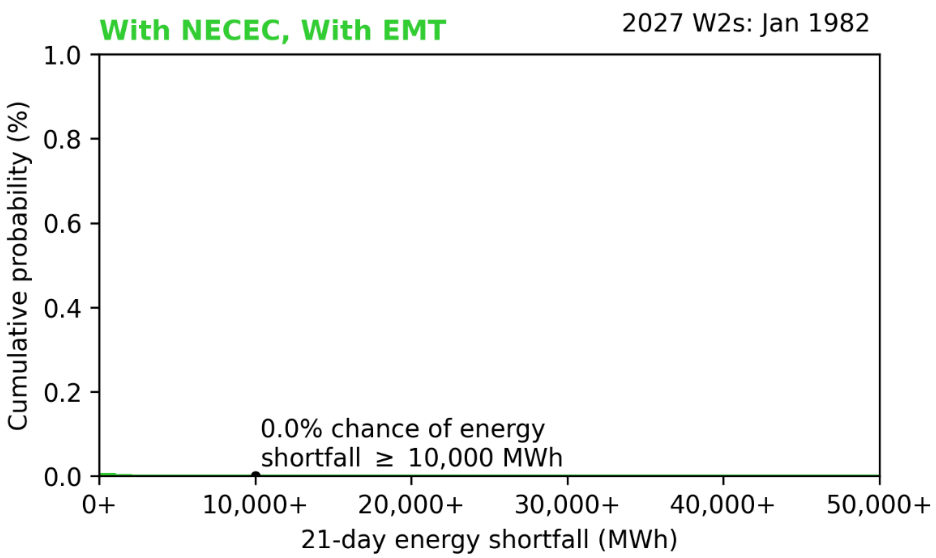


# of cases having energy shortfall (of 720)	Max 21-day total energy shortfall in a case (MWh)	Min 21-day total energy shortfall in a case (MWh)	Expected avg. 21-day total energy shortfall per case with energy shortfall (MWh)	Probability of energy shortfall occurring	Probability of the case with max 21-day total energy shortfall
95	82,540	72	16	0.68%	0.0006%

Summary of 21-Day Energy Analysis Results

Jan 14, 1982 Event; Scenario: with NECEC, with EMT

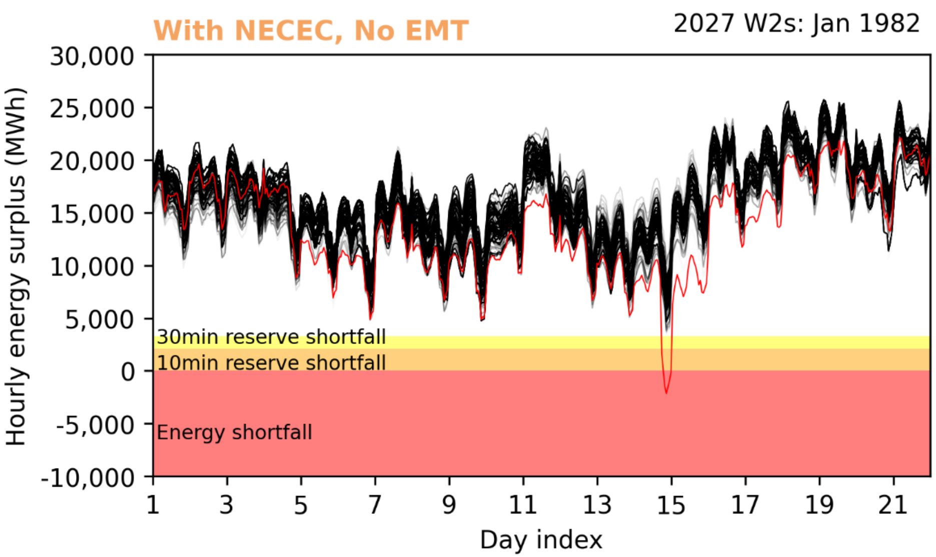


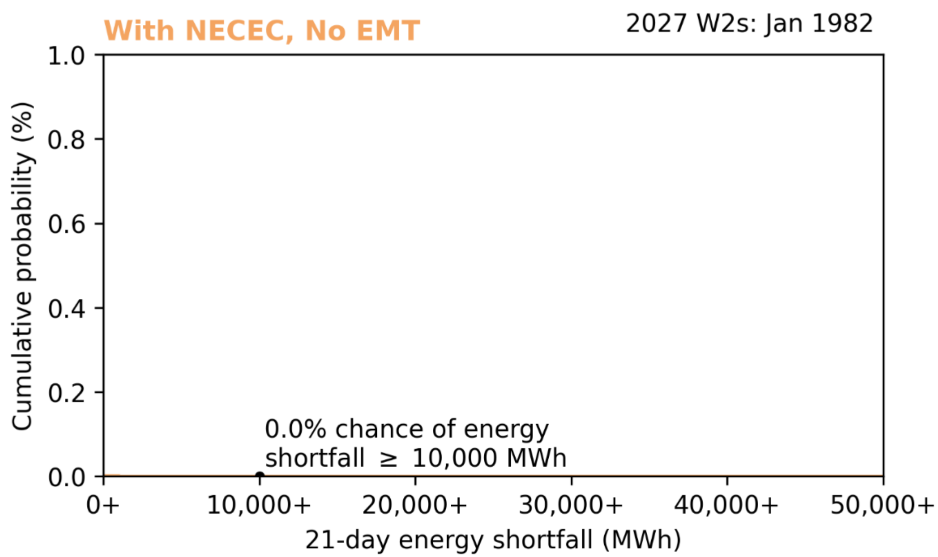


# of cases having energy shortfall (of 720)	Max 21-day total energy shortfall in a case (MWh)	Min 21-day total energy shortfall in a case (MWh)	Expected avg. 21-day total energy shortfall per case with energy shortfall (MWh)	Probability of energy shortfall occurring	Probability of the case with max 21-day total energy shortfall
7	3,987	320	0	0.004%	0.0006%

Summary of 21-Day Energy Analysis Results

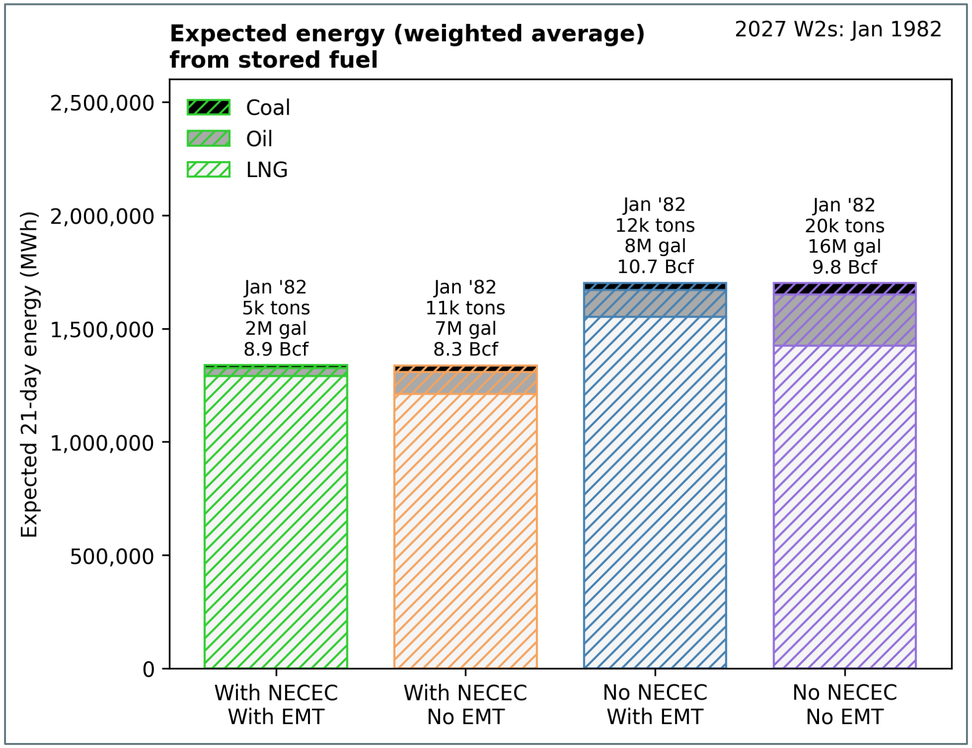
Jan 14, 1982 Event; Scenario: with NECEC, no EMT



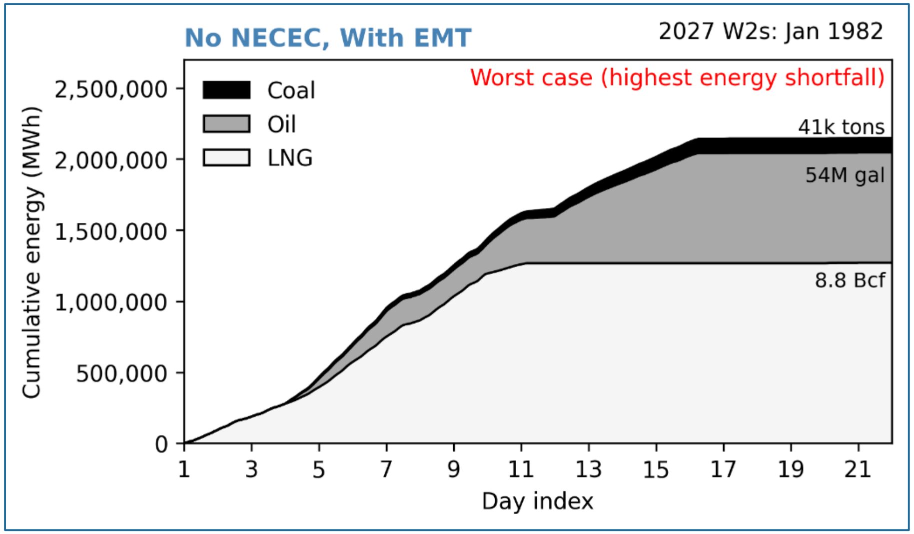


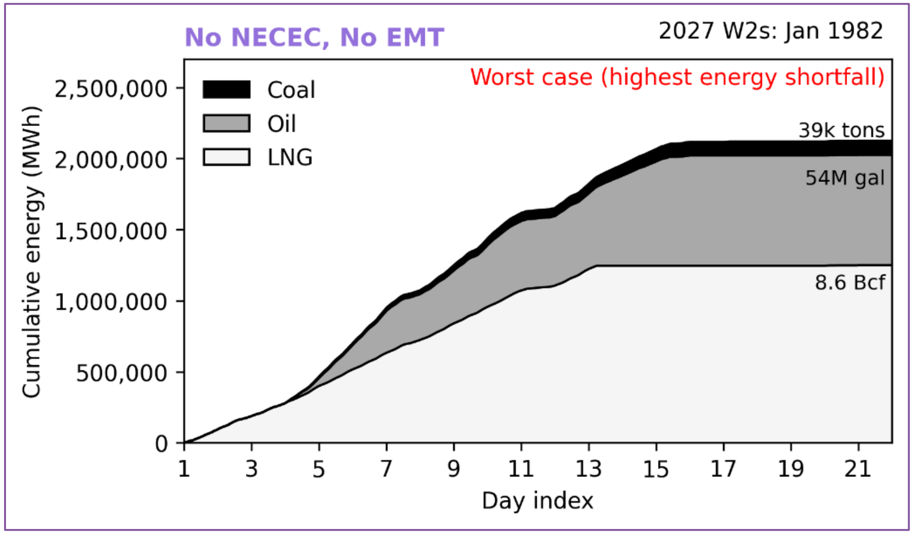
# of cases having energy shortfall (of 720)	Max 21-day total energy shortfall in a case (MWh)	Min 21-day total energy shortfall in a case (MWh)	Expected avg. 21-day total energy shortfall per case with energy shortfall (MWh)	Probability of energy shortfall occurring	Probability of the case with max 21-day total energy shortfall
3	6,356	610	0	0.0016%	0.0006%

Expected Energy From Stored Fuels is Less Than in the Jan 1961 Event, Though Increase in Stored Fuel Usage Is Still Notable In Worst Cases

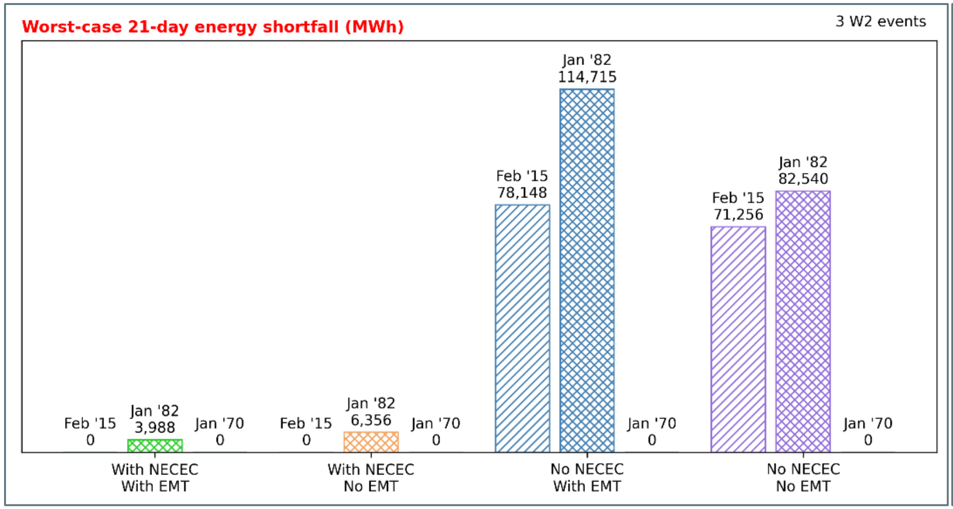


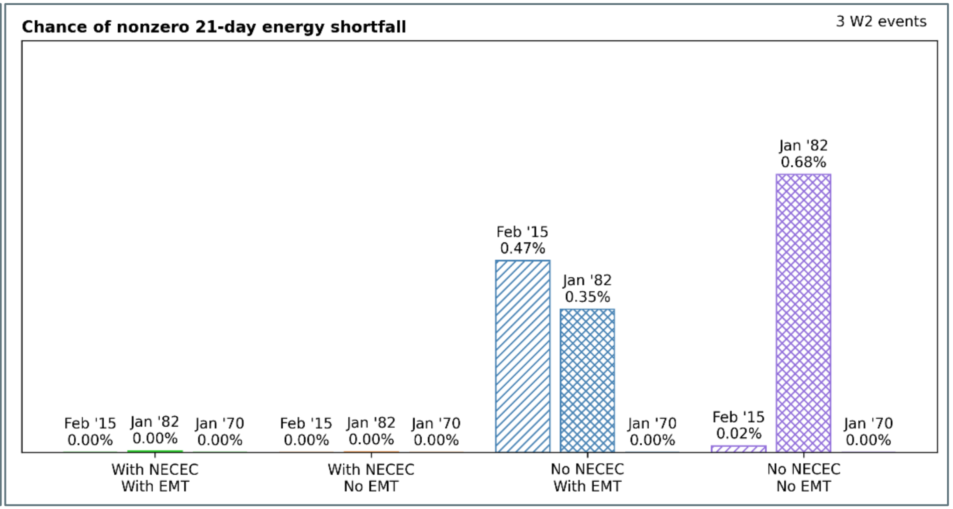
In the figure above, the expected energy from stored fuel is the weighted avg. quantity of stored fuels used across all cases in a given scenario and the figures to the right are for the worst case





2027 Winter Cluster 2
Energy Shortfall Quantities and Probabilities





- Results of the Winter Cluster 2 medoid event (Jan 11, 1970) are included in the figures above; energy shortfall in medoid events is negligible
- Magnitude of energy adequacy risk similar to that of Winter Cluster 1, though probabilities appear significantly lower
- Similar to Winter Cluster 1 findings, preliminary results of Winter Cluster 2 studies reveal:
  - Similar energy adequacy risk with and without EMT in-service; as noted, results with and without EMT are highly dependent on the characteristics of a given event
  - Risks are mitigated by incremental imports from NECEC

Key Takeaways

- Results reveal the ranges of energy shortfall risk and associated probabilities
  - In the near-term, the energy shortfall risk appears manageable over a 21-day period
  - These results are consistent with the significant quantities of PV (BTM and utility scale), offshore wind, and storage expected while experiencing minimal load growth
  - Risks are mitigated by incremental imports from New England Clean Energy Connect
- Results of preliminary studies reveal similar energy adequacy risk with and without EMT in-service
  - Increases in fuel oil and coal burn are notable in cases without EMT in-service
  - The ISO has previously stated the qualitative factors that may warrant the need for EMT in the mid-term
- The energy adequacy risk profile is dynamic and will be a function of the evolution of both supply and demand profiles
- This energy adequacy study framework provides a much needed foundation to study the system as it continues to evolve
  - The ISO will continually monitor the energy adequacy risk, particularly as the changes in the regional supply and demand profiles ramp up

Next Steps

- ISO intends to continue reviewing the outputs of the 2027 winter events while completing studies of summer 2027 and both winter and summer events for 2032
- To the extent that 2027 summer studies are completed before the June 20th FERC Technical Conference, preliminary results will be distributed to stakeholders before the meeting
- It is not expected that 2032 study results will be ready in advance of the June 20th FERC Technical Conference
- The 2027 summer results and the 2032 study results will continue to be shared and discussed at a future RC meeting

Stakeholder Schedule

***Schedule is subject to change based on modeling progress**

Stakeholder Committee and Date	Scheduled Project Milestone
Reliability Committee February 15, 2022	Initial presentation
Reliability Committee March 15, 2022	Summary of EPRI's historical weather analysis deliverables and discussion of macro assumptions
Reliability Committee May 17, 2022	Share results of Step 1 (Extreme Weather Modeling) report. Review and discuss Step 2 (Risk Model Development and Scenario Generation) activities
Reliability Committee July 19, 2022	Review progress on Step 2 activities
Reliability Committee September 20, 2022	Continue to gather feedback with respect to Step 2 activities
Reliability Committee November 16, 2022	Continue to gather feedback with respect to Step 2 activities
Reliability Committee January 18, 2023	Discuss preliminary results of Step 2 Risk Screening Model
Reliability Committee February 14, 2023	Continued discussion of Step 2 Risk Screening Model results

Stakeholder Schedule

**Schedule is subject to change based on modeling progress*

Stakeholder Committee and Date	Scheduled Project Milestone
Reliability Committee March 14, 2023	Review outage draw and categorical branching methodologies (including LNG, fuel inventory, imports, etc.)
Reliability Committee April 18, 2023	Review 21-day energy assessment simulator, review return period methodology, and follow-up on stakeholder questions regarding modeling
Reliability Committee May 16, 2023	Review Step 3 preliminary results
Reliability Committee TBD	Review Step 3 remaining results

Questions