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2020 Economic Study:

Sensitivity Results

Planning Advisory Committee

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Today's Presentation

- Background and assumptions
  - New sensitivities
- Step by step example of energy banking implementation in Gridview
- Sensitivity results for energy banking:
  - B_Redispatch (Renewable Energy Credit (REC) inspired threshold prices)
  - B_Track (import priority threshold prices)
- Sensitivity results for the removal of Battery Energy Storage Systems (BESS)
- Next Steps

BACKGROUND AND ASSUMPTIONS

2020 Economic Study Request

- ISO New England (ISO) received one request for an Economic Study
  - Request made by National Grid and presented to the PAC on April 23, 2020
- The goal of the National Grid request is to “Provide stakeholders analyses of potential pathways to best use the MWh of clean energy resources to meet state goals cost-effectively, leveraging transmission[1] and/or storage as needed”
  - Evaluate the potential economic benefits associated with the deployment of transmission(1) and/or storage under a range of assumed future resource portfolios
  - Use the existing and new ties to lower renewable build-out spillage by "energy banking"
  - Assess changes to thermal unit capacity factors, spillage and emissions as related to different resource and dispatch scenarios
  - The request is for a one-year study focusing on 2035

(1) Bi-directional transmission capability with neighbors

Changes to Timeline and Scope of the Study

- The ISO is reducing the study scope of the 2020 Economic Study to allow us to focus on the Future Grid Reliability Study (FGRS) Phase 1 Work. We will not conduct:
  - The detailed ancillary services simulations
    - Detailed ancillary services simulations for the FGRS will provide proxy results
  - Further scenario sensitivities
- This is the final presentation of the 2020 Economic Study results
  - We plan to issue a report in the second quarter of this year

2020 Economic Study Past Presentations

Presentation	Date (Link)
High-level draft scope of work and assumptions (1/3)	May 20, 2020
High-level draft scope of work and assumptions (2/3)	June 17, 2020
High-level draft scope of work and assumptions (3/3)	July 22, 2020*
Preliminary Results	November 19, 2020*
Modeling of Battery Storage in Economic Studies	December 16, 2020
Feedback on Preliminary Results & Proposed Sensitivities	December 16, 2020

** Link to revised presentation*

Summary of Sensitivities

All sensitivities are assumed without internal transmission constraints (unconstrained)

B_Redispatch

- Iterative case that prioritizes New England Renewables before imports (REC inspired threshold prices)

B_Track

- Iterative case that prioritizes imports before New England renewables (import priority threshold prices)

BESS

- Variation of prior sensitivities with BESS removed

Disclaimer:

- All results use the 2015 solar and wind profiles. The results are specific to the 2015 weather year. If a different weather year is used for profile shapes the results will differ – the trends would be similar but specific numeric results will change.
- Curtailment of specific resources is driven by the threshold prices. Therefore, different prices and/or order may result in different outcomes.
- Unconstrained transmission is modeled as a one-bus system

Changes in Assumptions for Sensitivities

<table>
<tr><th></th><th>Scenarios</th><th>Threshold Prices Used</th><th>Retirements</th><th>Must Run Units</th><th>Wind Additions (Nameplate)</th><th>New England System Load (Including EE)</th><th>EVs, Heat Pumps, Load Profiles</th><th>Number of Iterations</th><th>Nameplate Storage Additions</th><th>Bi-Directional External Tie(s)</th></tr>
<tr><td rowspan="2">Preliminary Scenarios</td><td>Bi-Directional Reference (B)</td><td rowspan="3">REC-Inspired</td><td rowspan="2">FCA 14, Mystic 8&9, Millstone 2, NE Coal, + 75% of conventional NE oil including dual-fuel based on age</td><td rowspan="3">Nuclear, Municipal Solid Waste, Landfill Gas, Wood</td><td rowspan="6">1,330 MW Onshore
8,000 MW Offshore</td><td rowspan="2">2035 load extrapolated from 2020 CELT Report (unchanged from Preliminary results)</td><td rowspan="2">Unchanged from National Grid 2020 Preliminary Results</td><td rowspan="4">One</td><td rowspan="6">2,000 MW Battery and Utilizing Hydro Quebec as Virtual Storage</td><td>None</td></tr>
<tr><td>Bi-Directional Legacy (B_HQNB)</td><td>HG, PHII NECEC, and NB</td></tr>
<tr><td rowspan="4">Sensitivity Scenarios</td><td>Bi-Directional Redispatch Reference (B_Redispatch_0)</td><td rowspan="4">Same as above except Millstone 2 in-service</td><td rowspan="4">2030 load extrapolated from 2019 CELT Report (From the NESCOE 2019 Economic Study)</td><td rowspan="4">NESCOE 2019 Economic Study</td><td rowspan="2">None</td></tr>
<tr><td>Bi-Directional Track & Iterate Reference (B_Track_0)</td><td>Import Priority</td><td>Nuclear, Municipal Solid Waste, Landfill Gas, Wood, Imports</td></tr>
<tr><td>Bi-Directional Redispatch 1T (B_Redispatch_1T)</td><td>REC-Inspired</td><td>Nuclear, Municipal Solid Waste, Landfill Gas, Wood</td><td rowspan="2">Two</td><td rowspan="2">One New 1,200 MW tie to facilitate energy banking, existing ties and NECEC only import</td></tr>
<tr><td>Bi-Directional Track & Iterate 1T (B_Track_1T)</td><td>Import Priority</td><td>Nuclear, Municipal Solid Waste, Landfill Gas, Wood, Imports</td></tr>
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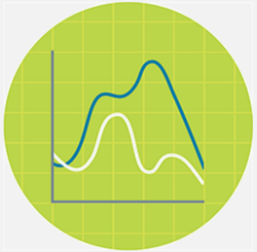
Significant Assumption Changes Reflected in the 2020 Economic Study Preliminary Results



187 TWh
In 2020 National Grid

LOAD

159 TWh
In 2019 NESCOE

16 TWh
In 2020 National Grid

Heat Pump & EVs

5 TWh
In 2019 NESCOE

IMPLEMENTATION OF BIDIRECTIONALITY & ENERGY BANKING

Iterative Simulations to Optimize Banked Energy

Iterative Simulations to Optimize Banked Energy:

Steps For Iterative Process

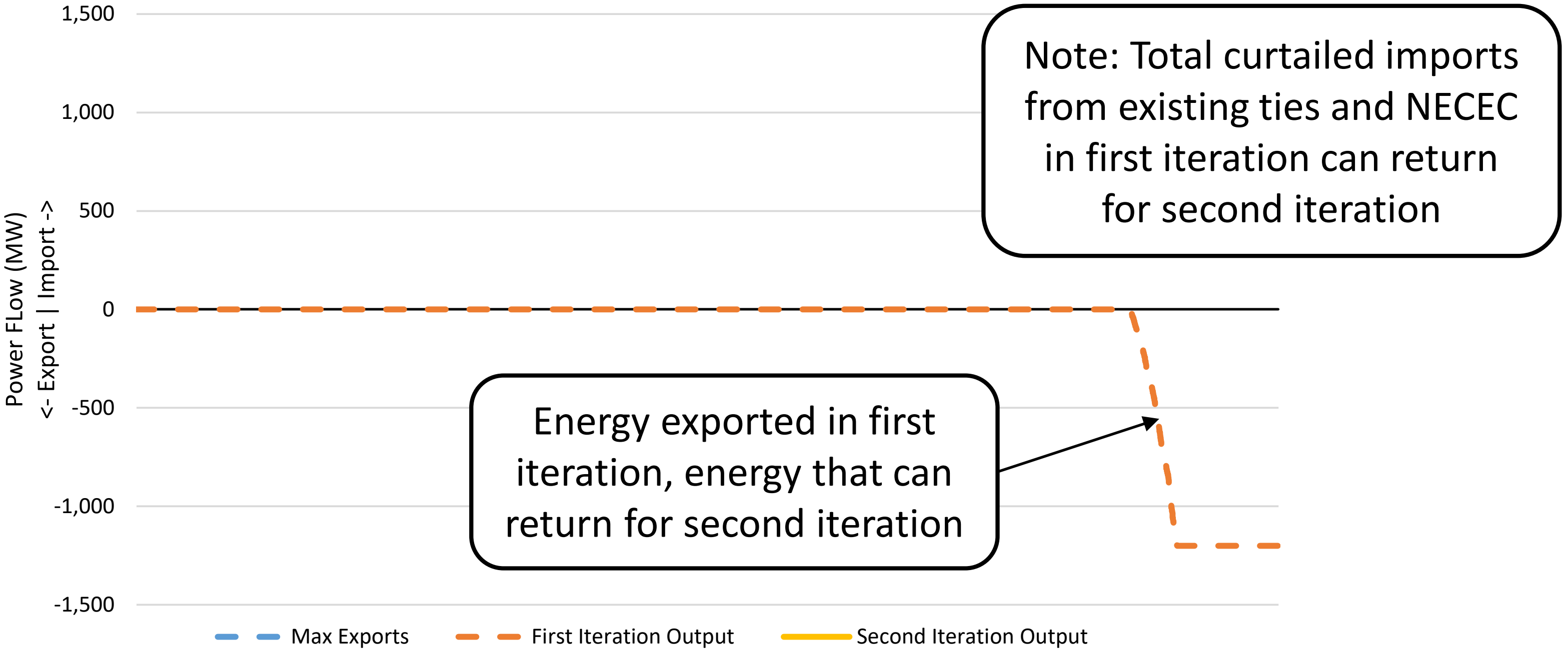
1. Run simulation with 1,200 MW tie from CMA NEMA to HQ with **only exports** allowed on this new tie line
   - Imports on existing ties and NECEC would continue in this run, curtailed energy on these tielines are considered bankable energy

2. From the output of that first iteration, tabulate total banked energy from curtailed imports and surplus renewable energy exported from NE to HQ

3. Create profile to return banked energy on the new 1,200 MW tie during times of high LMP
   - Surplus renewable energy sent to HQ from NE then later returned will include 12% round trip transmission loss factor to provide directional results
   - Curtailed energy on existing HQ imports do not need to reflect transmission loss
   - A threshold price is used to curtail this new profile during oversupply

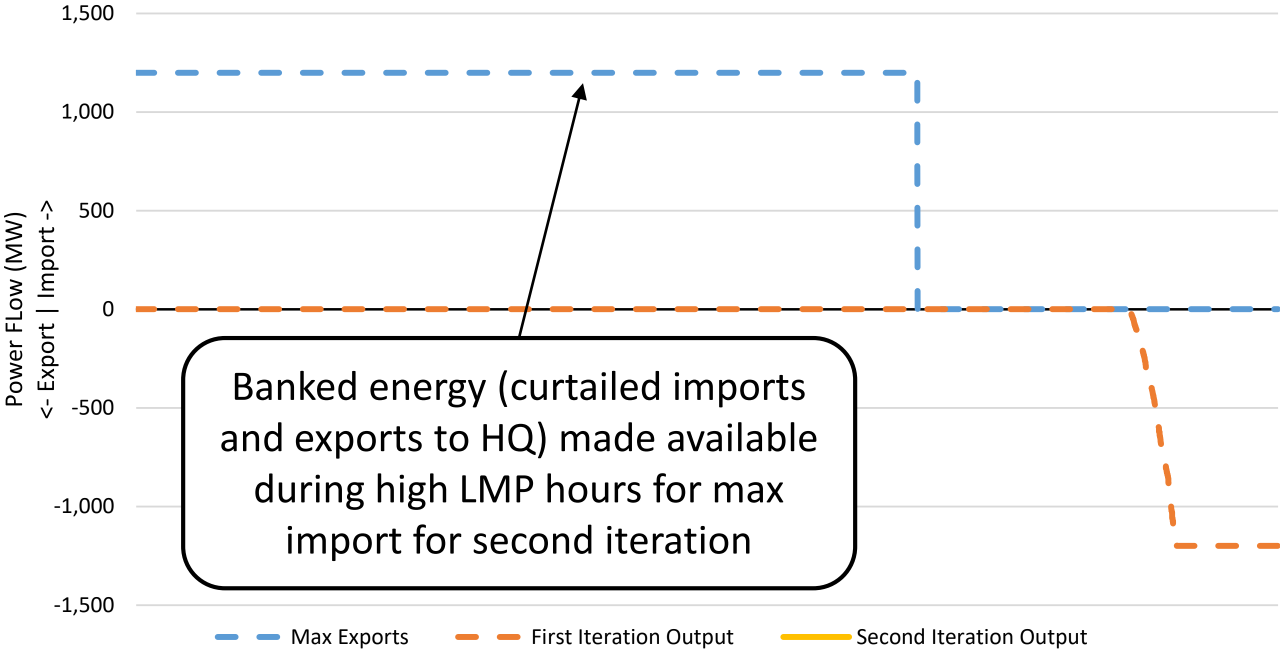
4. Create a profile to maximize the usability of the banked energy for importing across the new 1,200 MW tie and run second iteration

Steps 1 & 2: Example of Iterative Bidirectional Diurnal Flow Across New 1,200 MW Tieline



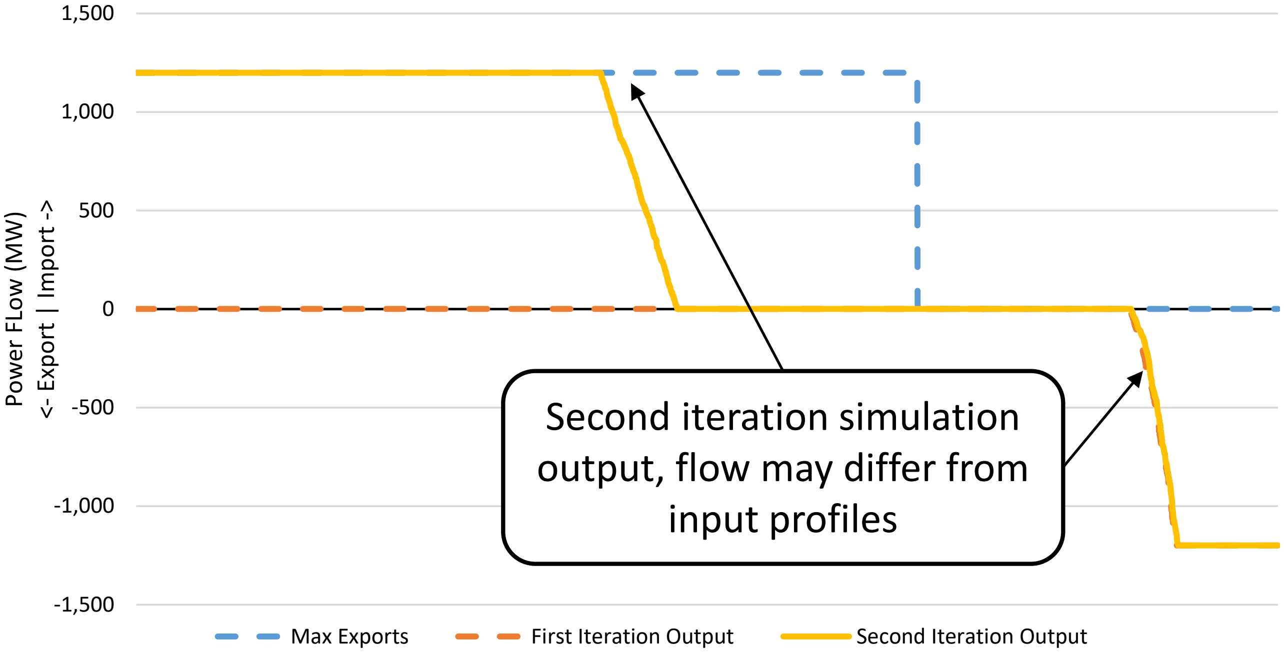
Illustrative example, not from simulation

Step 3: Example of Iterative Bidirectional Diurnal Flow Across New 1,200 MW Tieline



Illustrative example, not from simulation

Step 4: Example of Iterative Bidirectional Diurnal Flow Across New 1,200 MW Tieline



Illustrative example, not from simulation

METRICS AND RESULTS

Scenario: B_Redispatch (REC Inspired)

Threshold Prices B_Redispatch

Bi-directional threshold prices assumed to reflect the value of RECs:

- Same threshold prices as in the preliminary scenarios
- Curtail imports first, then trigger exports, and only curtail renewables when export capability is exhausted
- Referred to as "REC Inspired"

Price-Taking Resource	Threshold Price ($/MWh)
Behind-the-Meter PV	-100
FCM and Energy-only PV	-50
Offshore Wind	-40
Onshore Wind	-30
Trigger for Exports	-25
NECEC (1090 MW)	2
Imports from HQ (Including New Tie)	5
Imports from NB	10

Threshold prices are used to facilitate the analysis of load levels where the amount of $0/MWh resources exceeds the system load

- They are not indicative of "true" cost, expected bidding behavior or the preference for one type of resource over another
- Use of a different order for threshold prices than indicated will produce different outcomes, particularly curtailment by resource

Summary of Results

Scenario: B_Redispatch (REC Inspired)

- The return of energy banked, primarily from curtailed imports, results in the replacement of natural gas resources
  - Some dispatchable resources are still needed to provide reserves
  - New England natural gas resources are needed when renewables and imports are insufficient to serve load
- With energy banking there is a significant reduction in energy that would have gone unused
- A portion of banked energy from imports is not returned across the new tie because energy sent over the new tie is curtailed at $5/MWh

Total System-Wide Energy Production by Fuel Type (TWh)

Resource	B_Redispatch_0	B_Redispatch_1T	Change
Existing Imports + NECEC	16.3	15.4	-0.8
Returned Banked	-	4.6	**4.6**
Exports	-	-1.1	-1.1
Offshore Wind	30.9	31.4	**0.5**
Onshore Wind	6.2	6.6	**0.4**
NG	11.8	8.8	-3.0
Oil	0.0	0.0	0.0
Coal	0.0	0.0	0.0
LFG/MSW	2.8	2.6	-0.2
PV	20.1	20.2	**0.1**
Wood	4.2	4.2	0.0
Nuc	21.9	21.9	0.0
EE/DR	36.1	36.1	0.0
Hydro	6.4	6.5	**0.1**
Total	**156.7**	**157.3**	**0.6**

***Green values** denote fuel types with increased production due to energy banking*

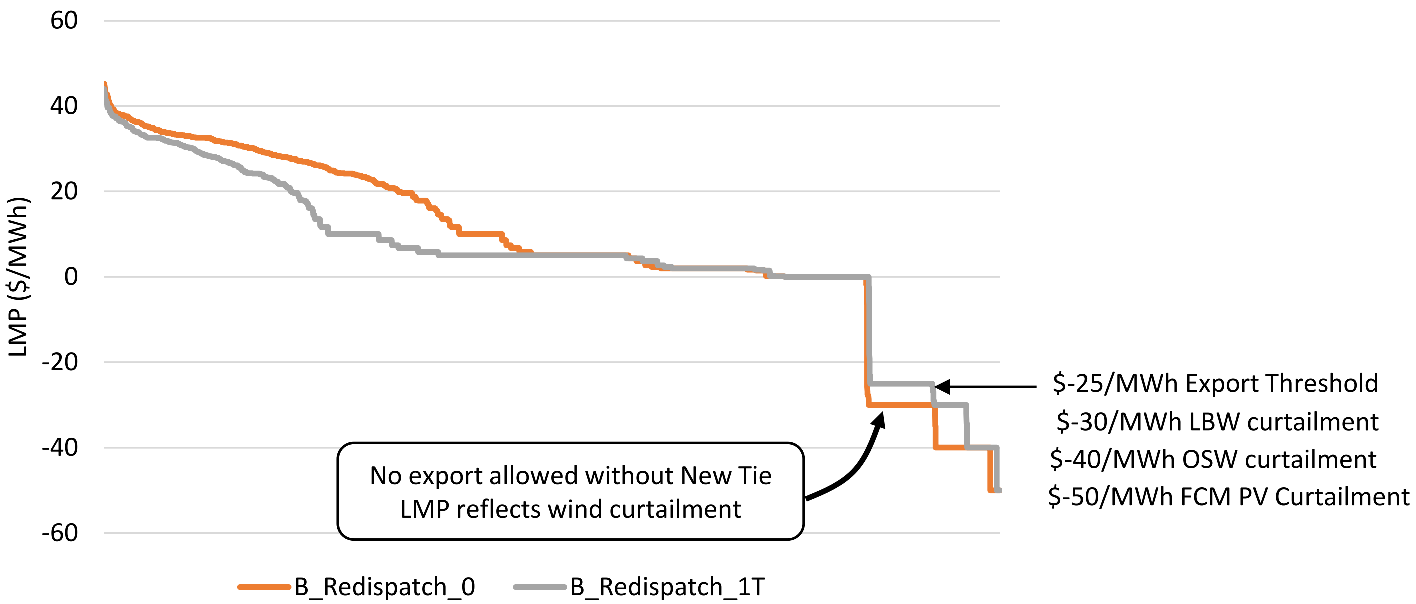
Banked energy from New England renewables are exported to HQ whereas banked energy from imports does not enter the New England system when stored

- Therefore returned banked energy is larger than exported energy

While the total energy flowing over existing imports + NECEC is reduced, a majority of banked energy is from these imports

The cumulative amount of energy coming from these imports increases with the introduction of energy banking

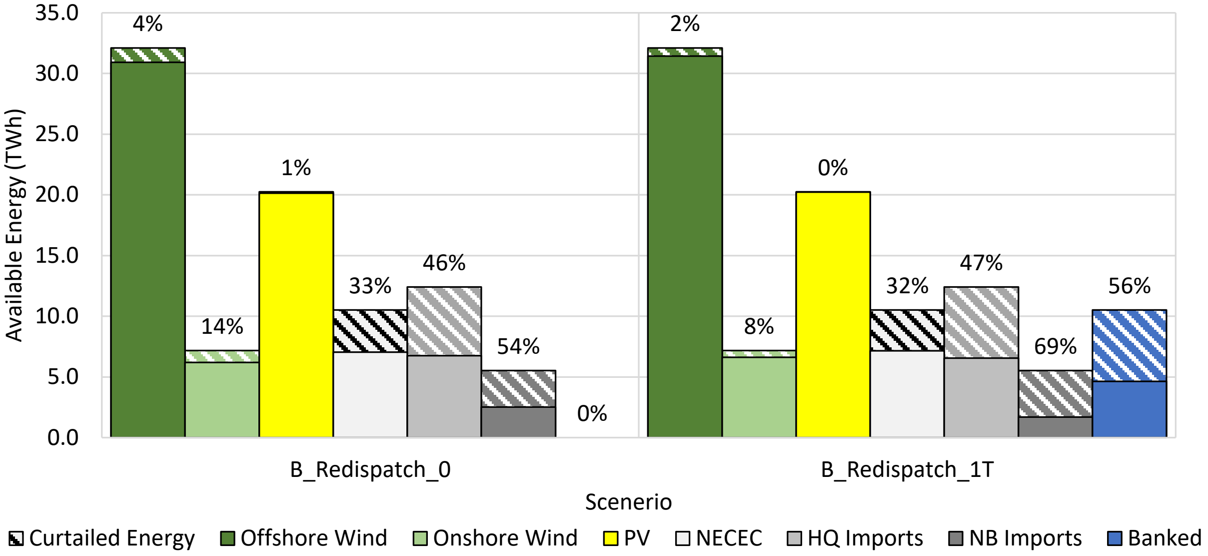
Average Locational Marginal Pricing for ISO-NE (LMP)



Annual average LMP drops by 33% from $7.22/MWh to $4.83/MWh with the introduction of energy banking

- During times in which exports would occur, average LMP increases by 15% from -$35.73/MWh to -30.72/MWh

System-Wide Energy Available and Percent of Energy Spilled from Threshold-Priced Resources (TWh)



Banked energy made available to New England primarily offsets import curtailment since little energy from New England renewables is curtailed with or without energy banking

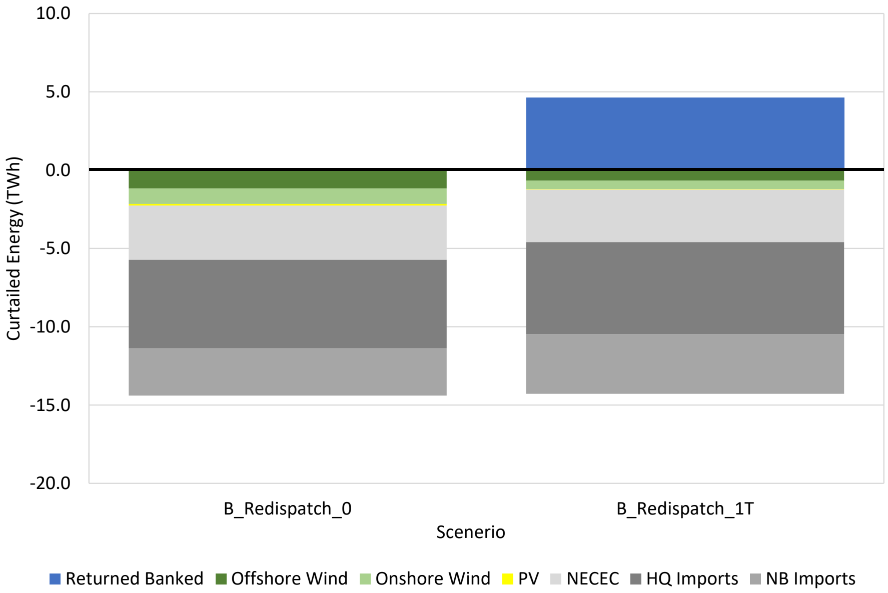
A total of 10.5 TWh of energy is banked, only 4.6 TWh of that energy is returned

- 10.5 TWh on the new tie would occur only if firm 1,200 MW occurs all 8760 hours, this did not occur since LMP fell below the threshold price of $5/MWh

Curtailed vs Returned Banked Energy (TWh)

Energy above 0 is banked energy that was returned. This is energy that would have gone unused

Energy below 0 is curtailed energy not committed to load



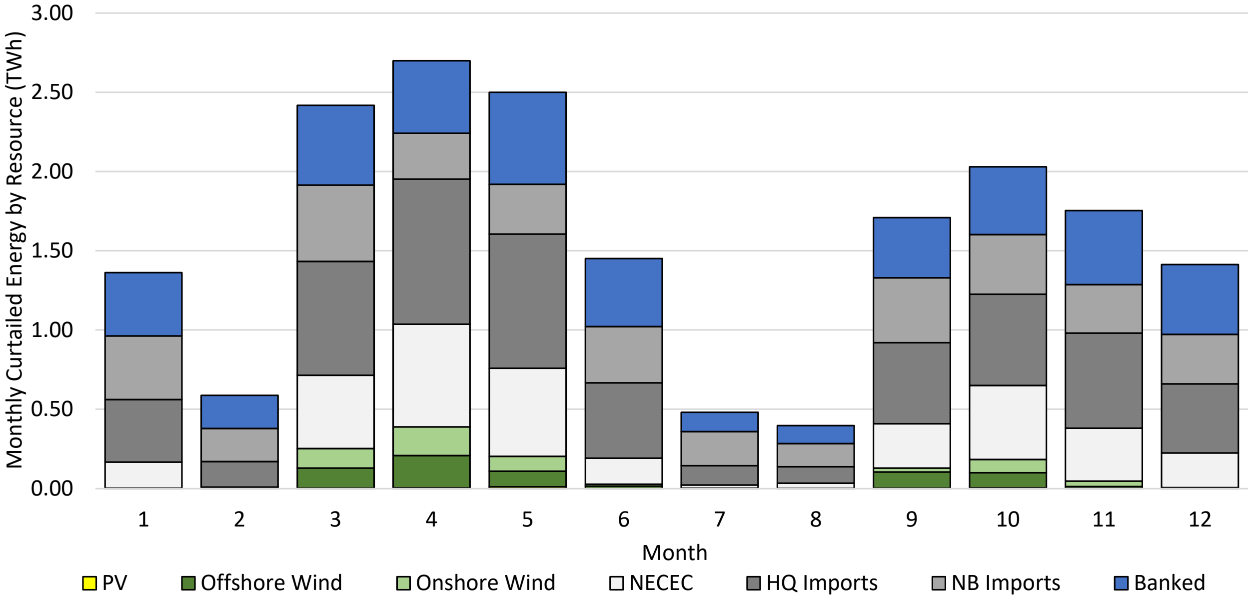
There is no way in the model to tell where a MWh of banked energy was originally generated. Energy sent to HQ can be accounted for, but the MWh sent back cannot necessarily be sourced. Therefore it appears that there is no reduction in curtailment of imports, when in actuality there a portion of the returned energy would subtract from the total curtailed energy from of imports.

A total of 14.4 TWh of energy is curtailed without energy banking and net 9.6 TWh of energy is curtailed with energy banking

- Curtailed banked energy is not counted in cumulative curtailed energy since it is accounted for in the curtailment of imports

Monthly Curtailment of Resources

B_Redispatch_1T

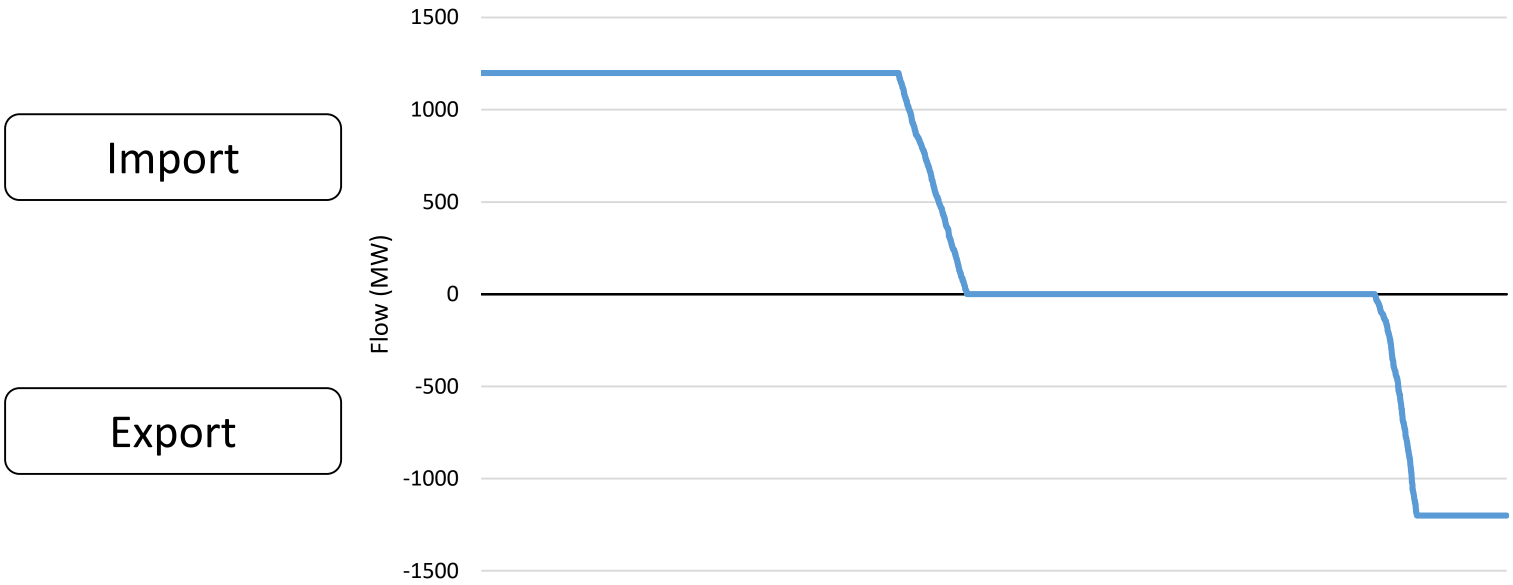


Import curtailment is driven primarily by oversupply during times of high renewable production

Only 1,200 MW can be exported during oversupply conditions, at it's peak 9,530 MW of New England renewables are curtailed and 3,003 MW of imports are curtailed or banked for future import

Duration Flow Across New 1,200 MW Tie

B_Redispatch_1T

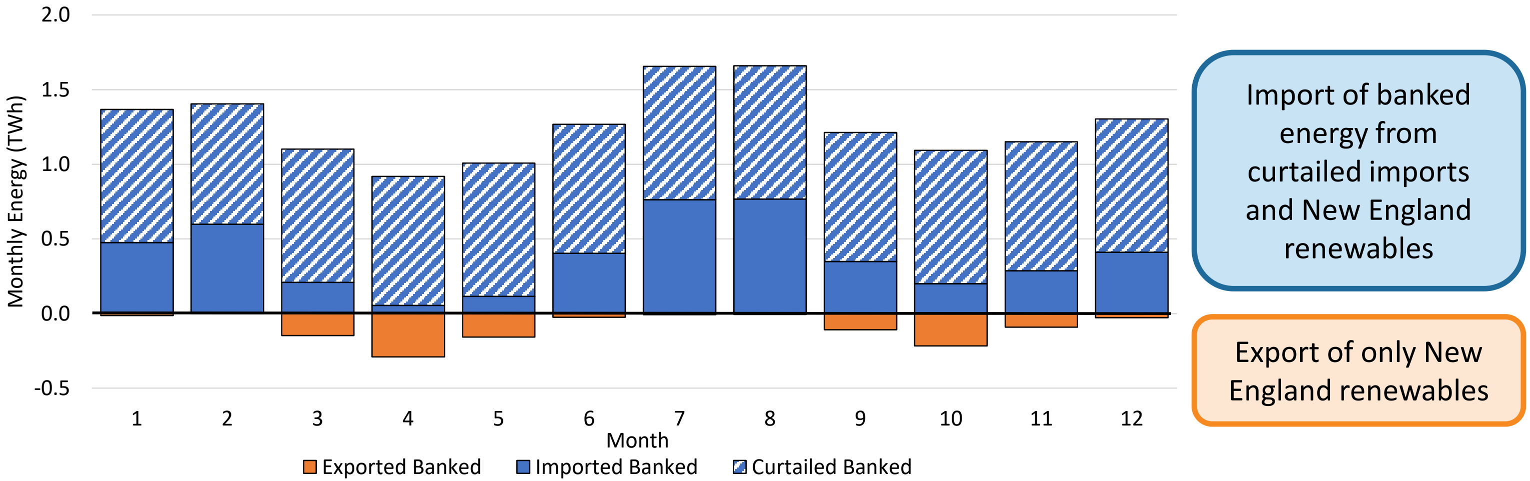


The tie is importing for 4,151 hours and exporting 1,126 hours

- Tie is at max import for 3,565 hour and max export 766 hours

Monthly Energy Across New 1,200 MW Bidirectional Tie

B_Redispatch_1T



A majority of banked energy is from curtailed imports that therefore never cross into New England; total imports on the new tie is greater than total exported energy

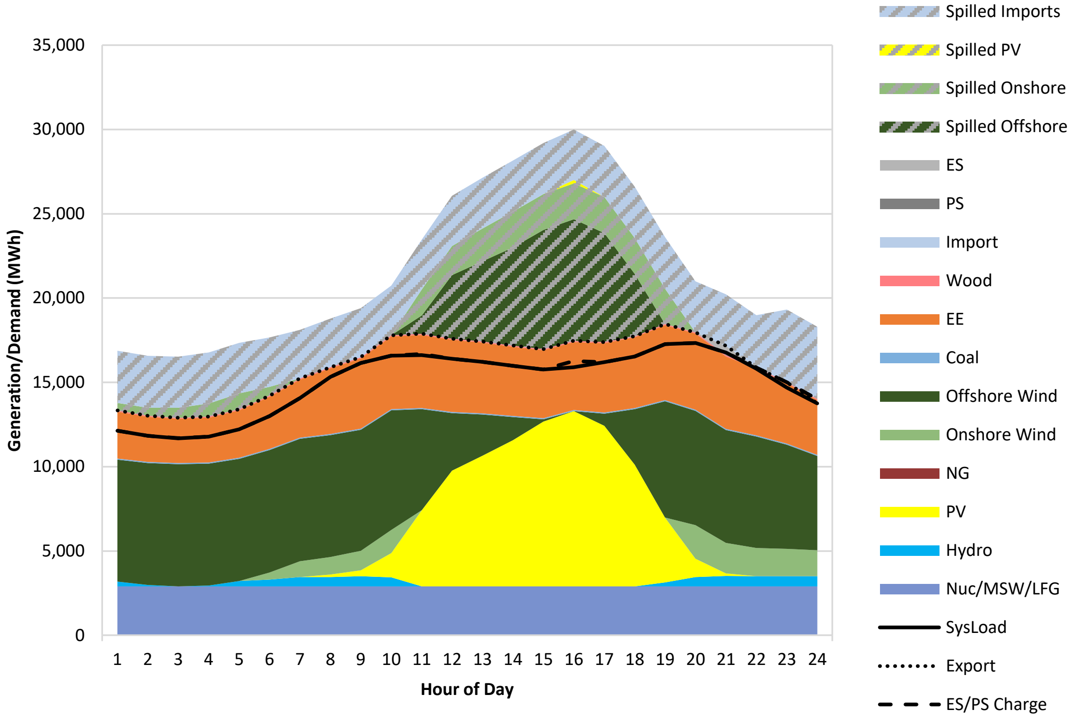
- Assuming that energy that is exported from New England is prioritized in the returned banked energy, 0.980 TWh of the energy reaching New England on this line would come from this source and the remaining 2.470 TWh would come from banked energy from imports

Highest Spill Day

B_Redispatch_1T - April 4th, 2035

High offshore wind and PV production lead to 12,533 MW of curtailment at hour 15

All imports are curtailed on this day, exports occur almost the entire day

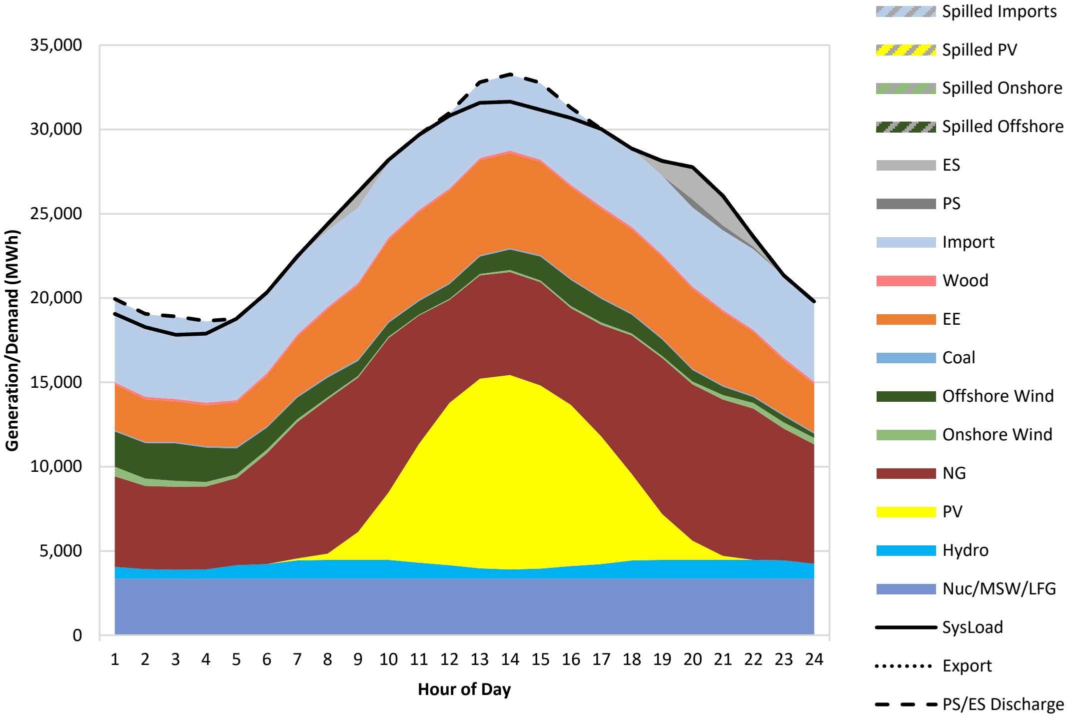


Highest Load Day

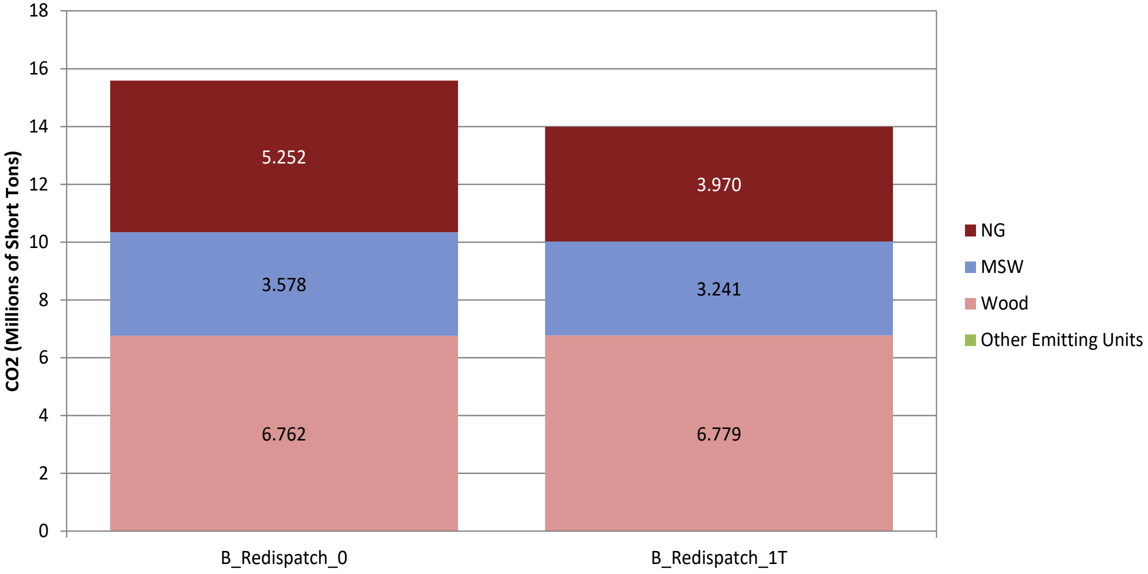
B_Redispatch_1T - August 18th, 2035

High natural gas production occurs since wind production is low on this particular day

High amounts of solar mid-day displaces some natural gas production

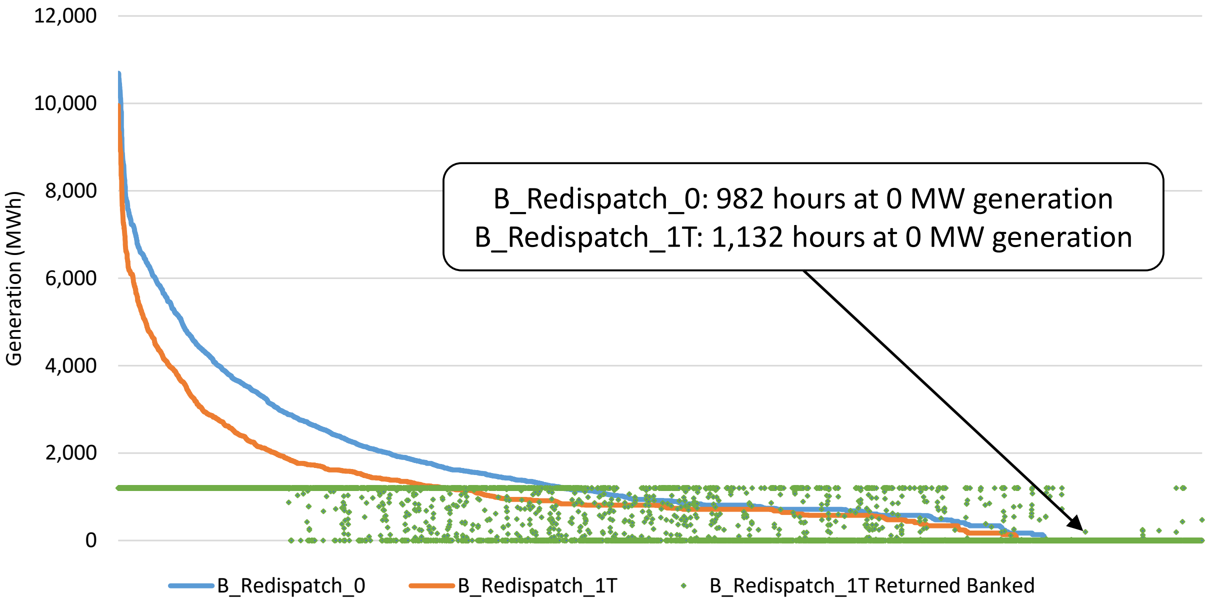


Native New England Resource CO_2 Emissions by Fuel Type (Million Short Tons)



The replacement of natural gas resource energy with banked energy results in a 24% reduction of CO_2 emissions from natural gas resources

Generation Duration Curve of Natural Gas Units



There is a total of 25% less energy annually from Natural Gas units when energy banking is introduced

When online, the natural gas fleet often exceeds the 812.5 MW total spinning reserve requirement within Gridview

- Natural gas units are dispatched primarily for generation, not reserves

Banked energy is sent into the New England system during times of high NG production, thereby offsetting further NG production

METRICS AND RESULTS

Scenario: B_Track (Import Priority)

Threshold Prices B_Track

Threshold Prices Prioritizing Imports:

- Triggers exports, curtail renewables when export capability is exhausted. Imports are must run
- Referred to as “Import Priority”
- A new threshold price order

Price-Taking Resource	Threshold Price ($/MWh)
Behind-the-Meter PV	-100
NECEC	-99
Imports from Canada over Existing Lines	-50
FCM and Energy-only PV	-45
Offshore Wind	-40
Onshore Wind	-35
Trigger for Exports on New Line	-25
Imports on New Tie Line	-5

Threshold prices are used to facilitate the analysis of load levels where the amount of $0/MWh resources exceeds the system load

- They are not indicative of “true” cost, expected bidding behavior or the preference for one type of resource over another
- Use of a different order for threshold prices than indicated will produce different outcomes, particularly curtailment by resource

Summary of Results

Scenario: B_Track (Import Priority)

- Energy banking reduces the amount of curtailed New England renewables by 3.5 TWh
  - Imports on existing ties and NECEC are not spilled with or without energy banking
  - Returned banked energy is not curtailed
- Returned banked energy primarily replace natural gas production resulting in reduced CO_2 emissions

Total System-Wide Energy Production by Fuel Type (TWh)

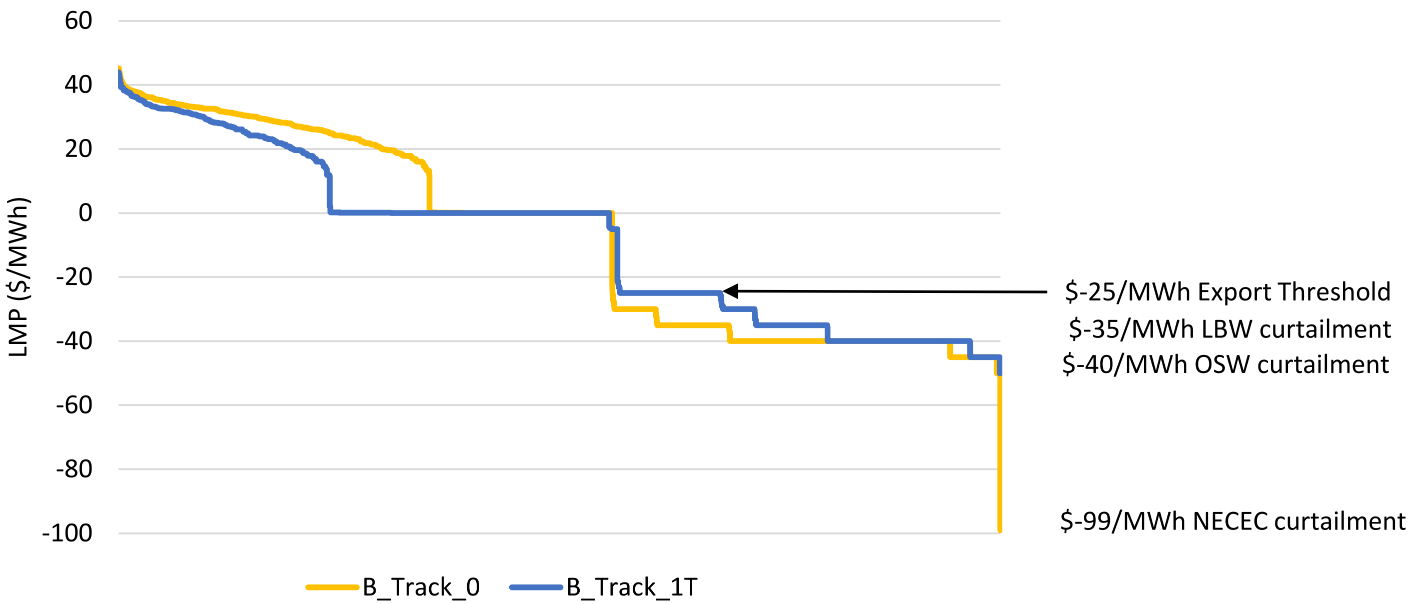
Resource	B_Track_0	B_Track_1T	Change
Existing Imports + NECEC	28.4	28.4	0.0
Returned Banked	-	3.6	**3.6**
Exports	-	-3.9	-3.9
Offshore Wind	26.4	28.6	**2.2**
Onshore Wind	4.2	5.0	**0.4**
NG	10.2	7.8	-3.4
Oil	0.0	0.0	0.0
Coal	0.0	0.0	0.0
LFG/MSW	2.6	2.4	-0.2
PV	19.1	19.6	**0.5**
Wood	3.4	3.2	0.2
Nuc	21.9	21.9	0.0
EE/DR	36.1	36.1	0.0
Hydro	4.3	4.7	**0.4**
Total	**156.7**	**157.3**	**0.6**

Green values denote fuel types with increased production due to energy banking

Because the priority of imports squeeze out New England resources, there is a 4.5 TWh decrease in NG, LFG/MSW, wood, and hydro production in B_Track_0 vs B_Redispatch_0

In addition, there is a 7 TWh decrease in wind energy between the aforementioned sensitivities

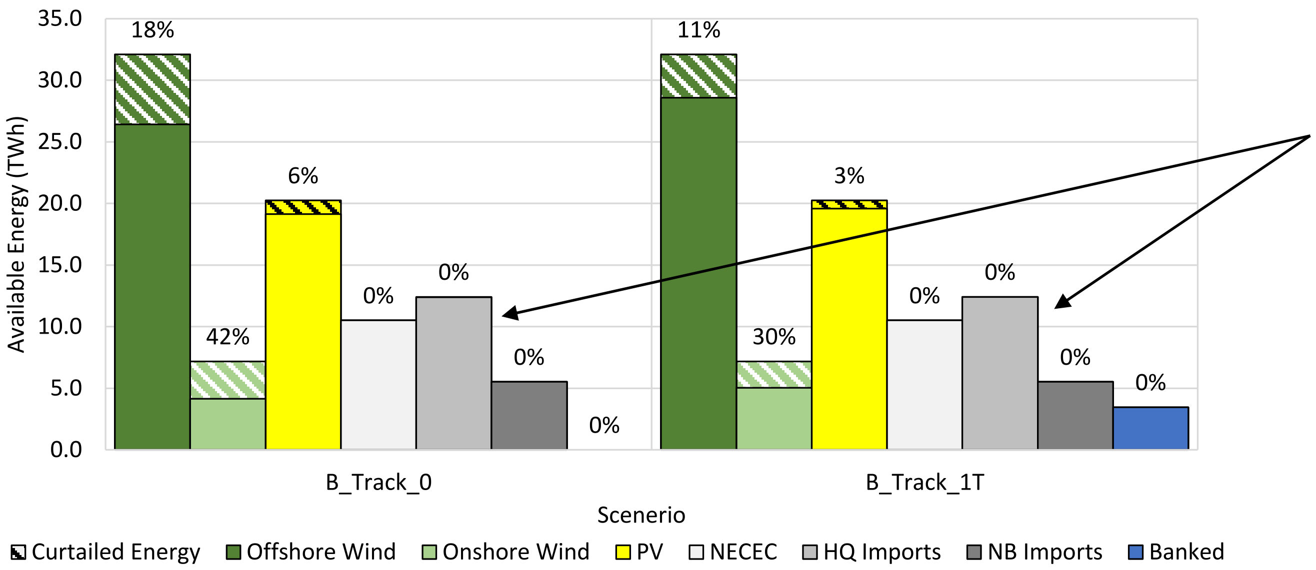
Average Locational Marginal Pricing for ISO-NE (LMP)



Because positive LMPs decrease while negative LMPs increase, the annual average LMP drops by 20% from -$7.08/MWh to -$8.51/MWh with the introduction of energy banking

- During times in which exports would occur, average LMP increases by 11% from -$38.83/MWh to -$34.59/MWh

System-Wide Energy Available and Percent of Energy Spilled from Threshold-Priced Resources (TWh)



Since imports were *not* curtailed, banked energy is entirely from New England renewables

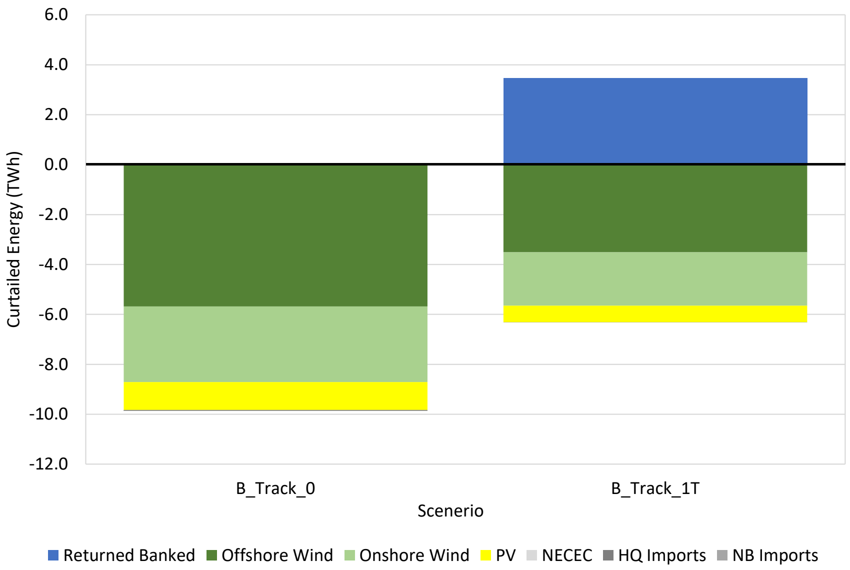
Unlike in the previous sensitivity, due to threshold prices no banked energy returned to New England is curtailed

With the ability to bank energy, New England renewables generate 7% more energy

Curtailed vs Returned Banked Energy (TWh)

Energy above 0 is banked energy that was returned. This is energy that would have gone unused

Energy below 0 is curtailed energy not committed to load

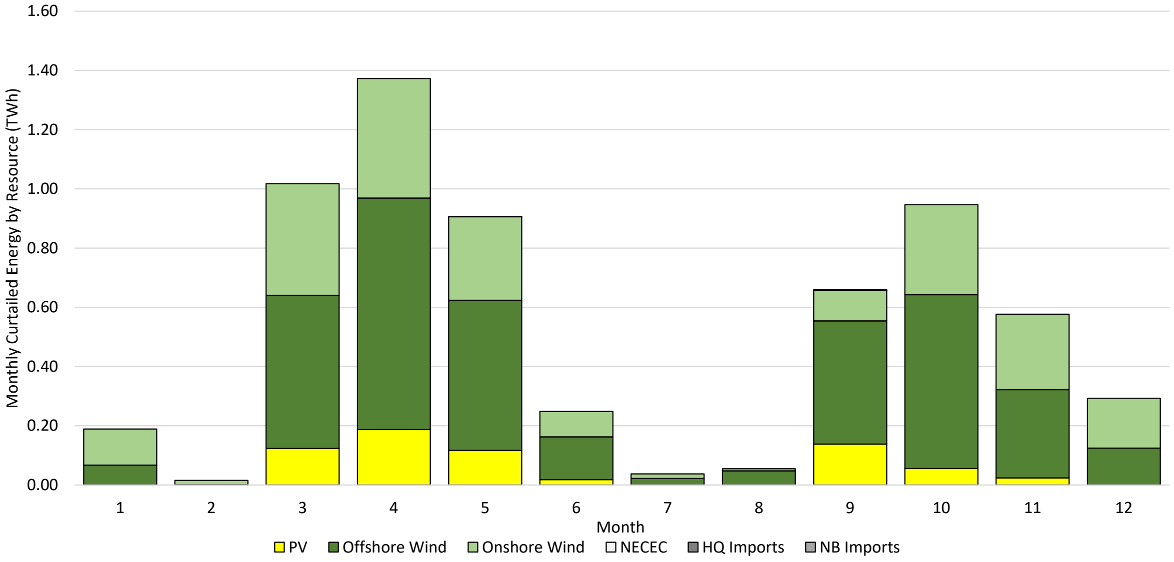


Only New England renewables are curtailed/banked. Since the model can track renewable energy that was exported to HQ then returned at a later date, you can visualize the reduction in curtailed resources.

A total of 9.9 TWh of energy is curtailed without energy banking and a cumulative 6.3 TWh of energy is curtailed with energy banking

Monthly Curtailment of Resources (TWh)

B_Track_1T



Large oversupply of New England renewables saturate export capabilities of the 1,200 MW energy banking tie

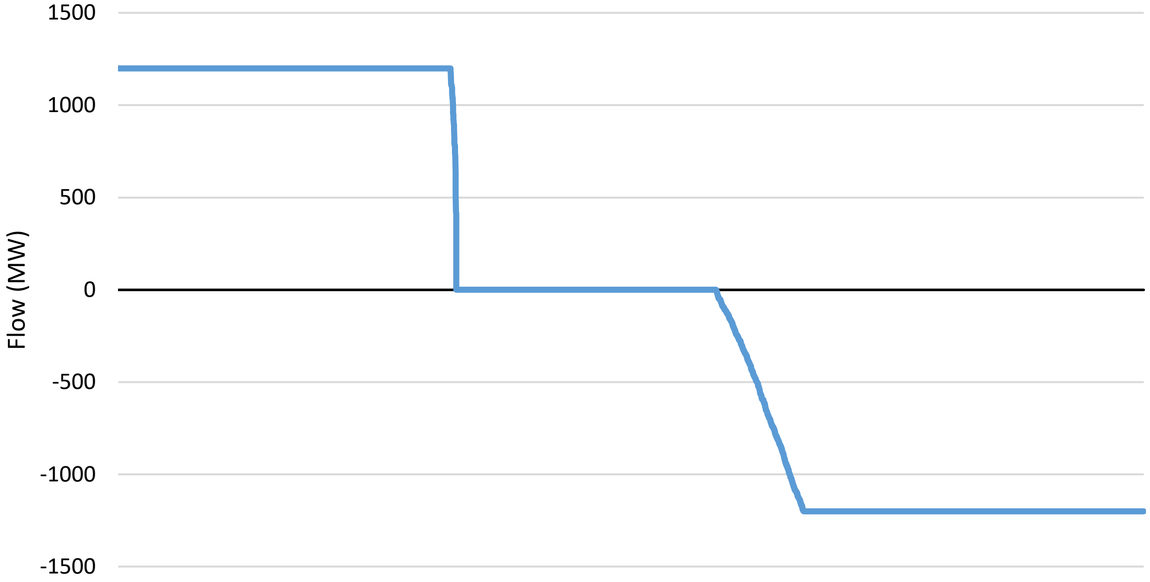
At the hour of peak oversupply of New England renewable energy, only 1,200 MW is exported and 14,925 MW is curtailed

Duration Flow Across New 1,200 MW Tie

B_Track_1T

Import

Export

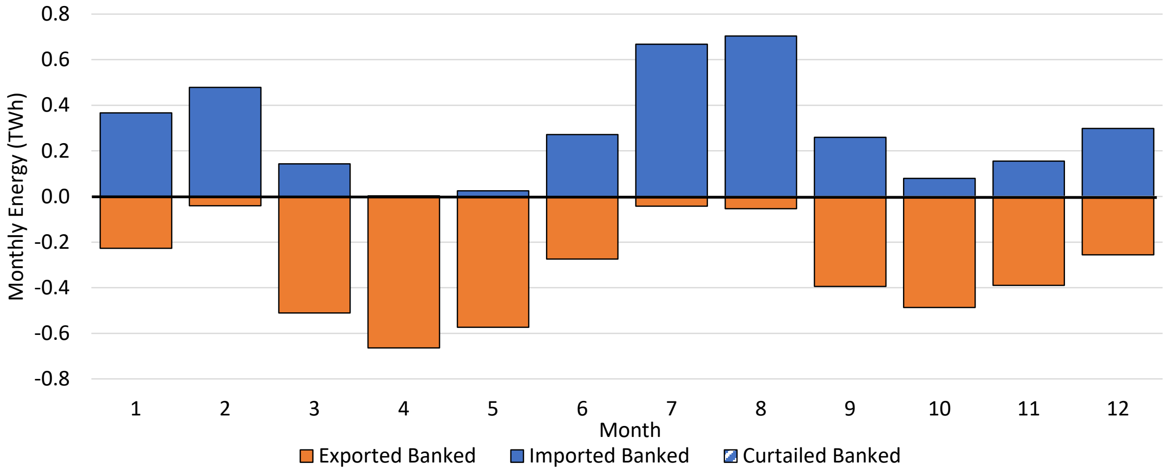


The tie is importing for 2,888 hours and exporting 3,653 hours

- Tie is at max import for 2,839 hour and max export 2,905 hours

Cumulative Monthly Energy Across New 1,200 MW Bidirectional Tie

B_Track_1T



Import of banked energy from curtailed imports and New England renewables

Export of only New England renewables

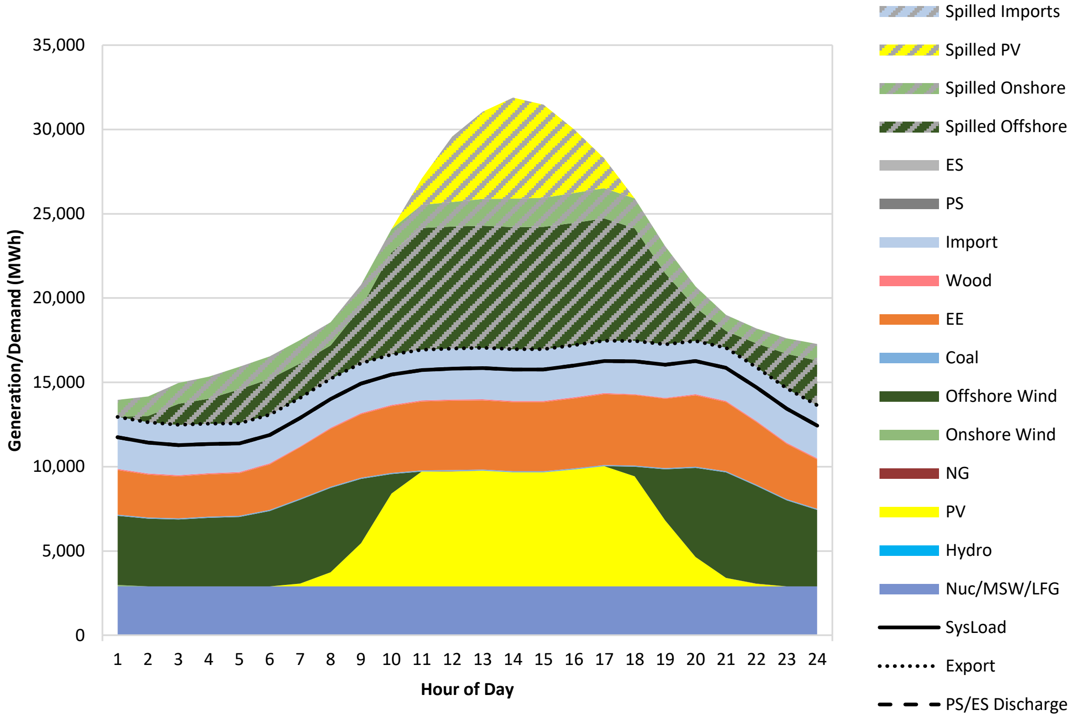
Since only New England renewables are banked, 3.6 TWh of banked energy imported on this line is from the energy exported from New England

Highest Spill Day

May 24th, 2035

Oversupply of wind and solar leads to 14,925 MW of curtailment (47% of energy production) at hour 14

Simultaneous import and export occur since imports are not curtailed while the trigger to export is achieved

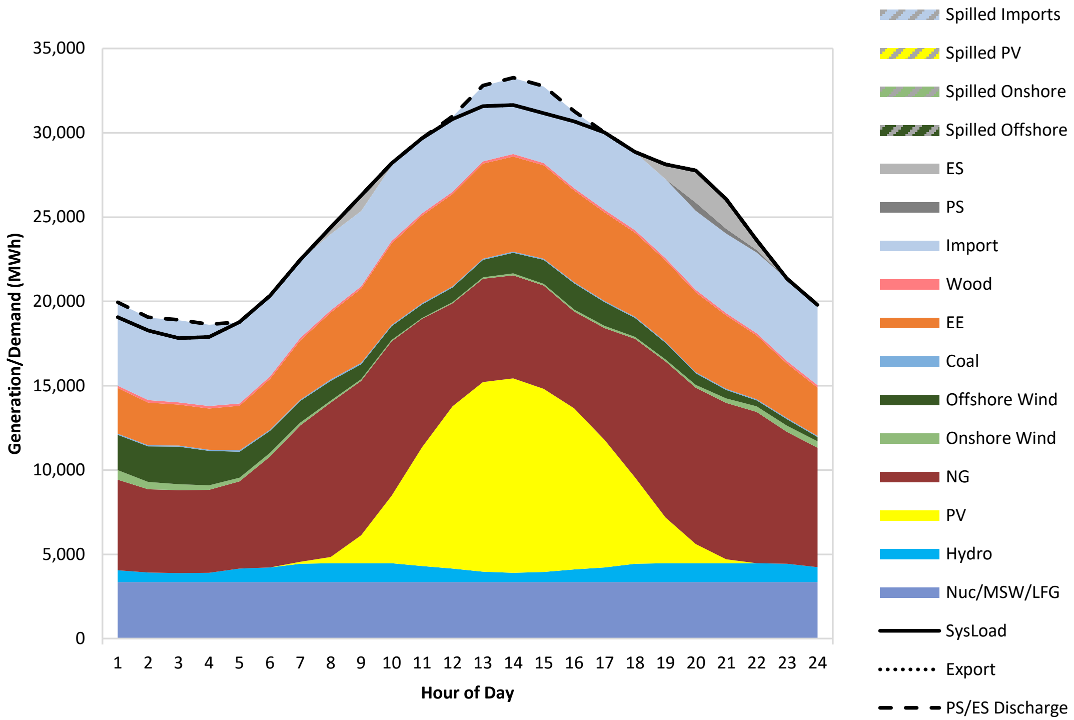


Highest Load Day

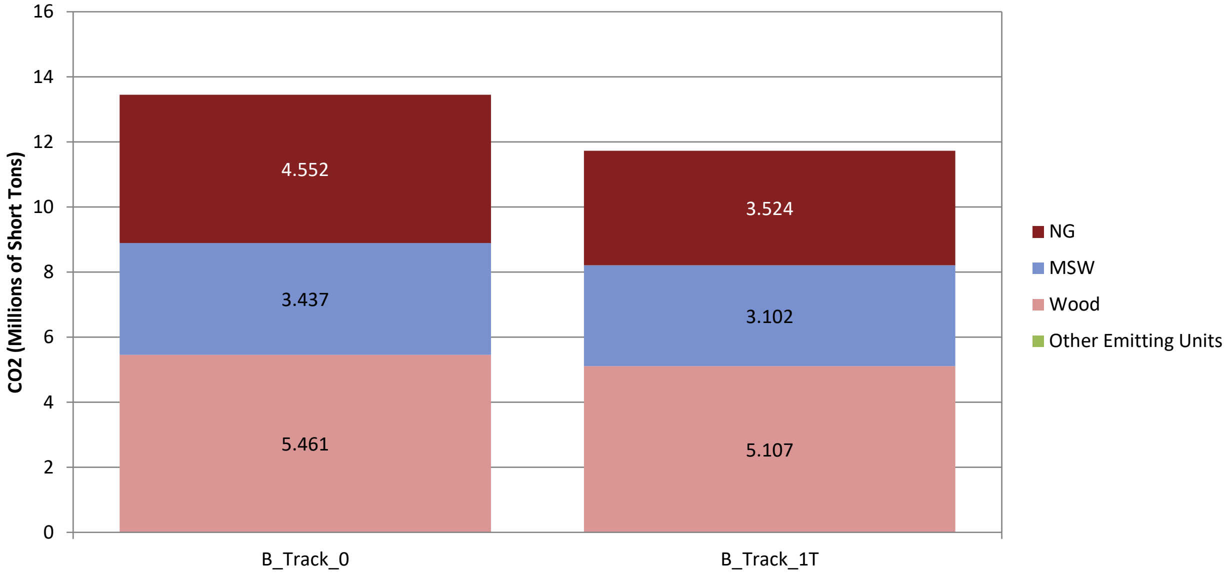
August 18th, 2035

High natural gas production occurs since wind production is low on this particular day

High amounts of solar mid-day displaces some natural gas production

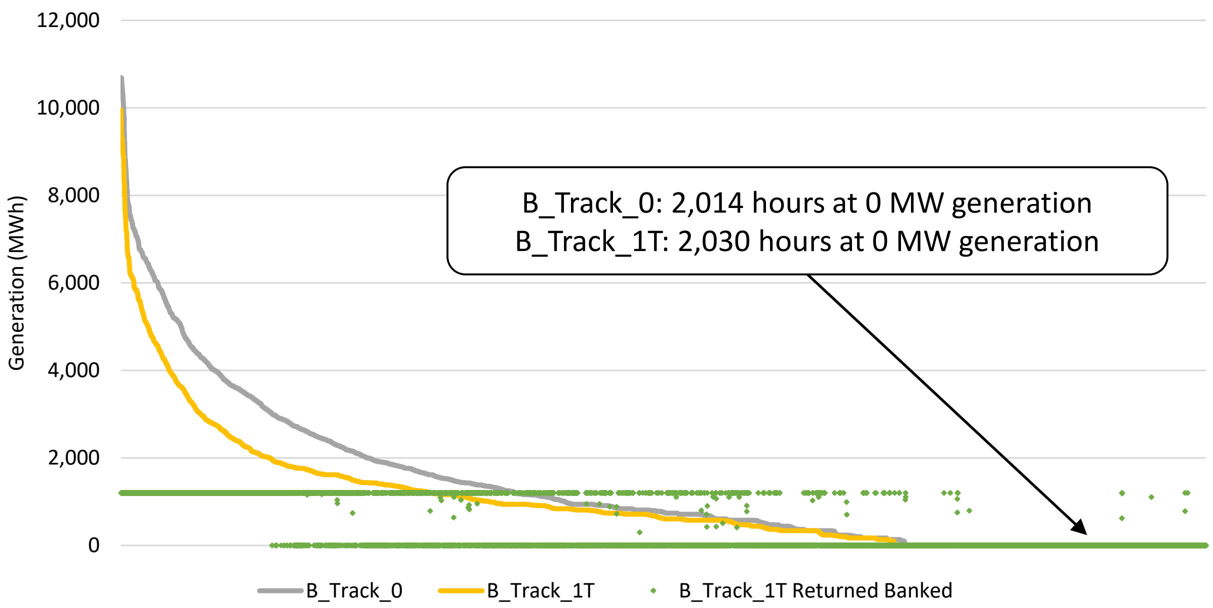


Native New England Resource CO_2 Emissions by Fuel Type (Million Short Tons)



The replacement of natural gas production with banked energy results in a 23% reduction in CO_2 emissions

Generation Duration Curve of Natural Gas Units



There is a total of 33% less energy annually from natural gas units when energy banking is introduced

When online, the natural gas fleet often exceeds the 812.5 MW spinning reserve requirement within Gridview

- Natural gas units are put online primarily for generation, not reserves

Banked energy is sent into the New England system during times of high natural gas production, thereby offsetting further natural gas production

METRICS AND RESULTS

Scenario: BESS Sensitivities

Summary of Results

- Removal of BESS results in two primary changes:
  - A increase in curtailment of New England renewables
  - Higher utilization of pumped storage facilities
- "**_BESS**" denotes cases in which BESS have been **removed**

Total System-Wide Energy Production by Fuel Type (TWh)

Resource	B_Redispatch_0	B_Redispatch_0_BESS	B_Redispatch_1T	B_Redispatch_1T_BESS	B_Track_0	B_Track_0_BESS	B_Track_1T	B_Track_1T_BESS
Existing Imports + NECEC	16.3	16.7	15.4	16.0	28.4	28.4	28.4	28.4
Returned Banked	-	-	4.6	4.6	-	-	3.6	3.3
Exports	-	-	-1.1	-1.4	-	-	-3.9	-4.1
Offshore Wind	30.9	30.4	31.4	31.0	26.4	25.9	28.6	28.1
Onshore Wind	6.2	6.0	6.6	6.5	4.2	4.0	5.0	4.8
NG	11.8	12.2	8.8	9.1	10.2	11.0	7.8	8.6
Oil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Coal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LFG/MSW	2.8	2.8	2.6	2.6	2.6	2.6	2.4	2.5
PV	20.1	19.9	20.2	20.1	19.1	18.5	19.6	19.2
Wood	4.2	4.2	4.2	4.2	3.4	3.5	3.2	3.4
Nuc	21.9	21.9	21.9	21.9	21.9	21.9	21.9	21.9
EE/DR	36.1	36.1	36.1	36.1	36.1	36.1	36.1	36.1
Hydro	6.4	6.3	6.5	6.4	4.3	4.3	4.7	4.7
Total	**156.7**	**156.5**	**157.3**	**157.2**	**156.7**	**156.4**	**157.3**	**157.0**

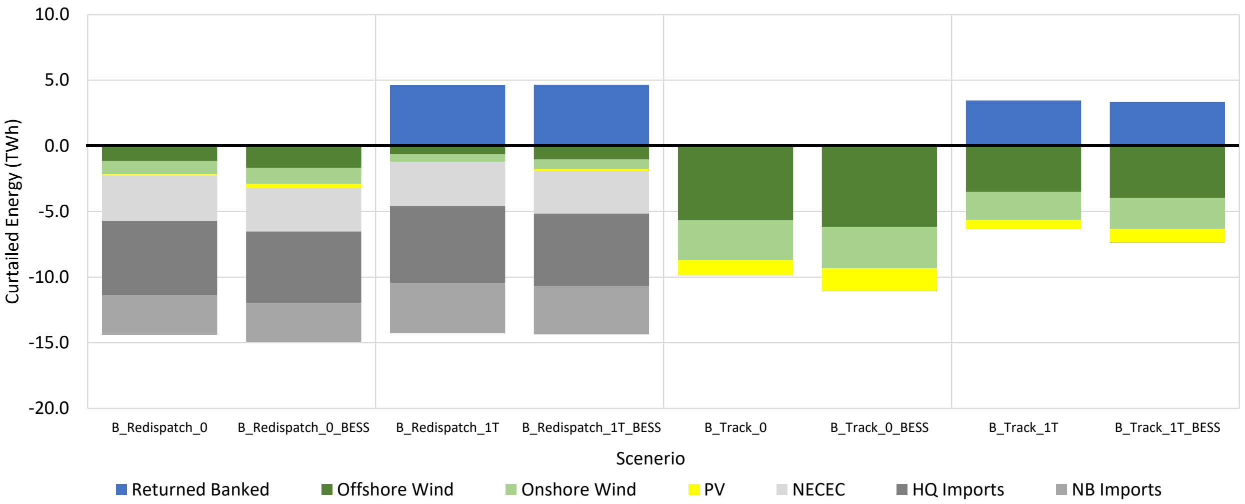
Red values denote fuel types with decreased production due to the removal of BESS

The removal of BESS leads to a decrease in New England renewables production and increased production by natural gas units across all sensitivities

Curtailed vs Returned Banked Energy (TWh)

Energy above 0 is banked energy that was returned. This is energy that would have gone unused

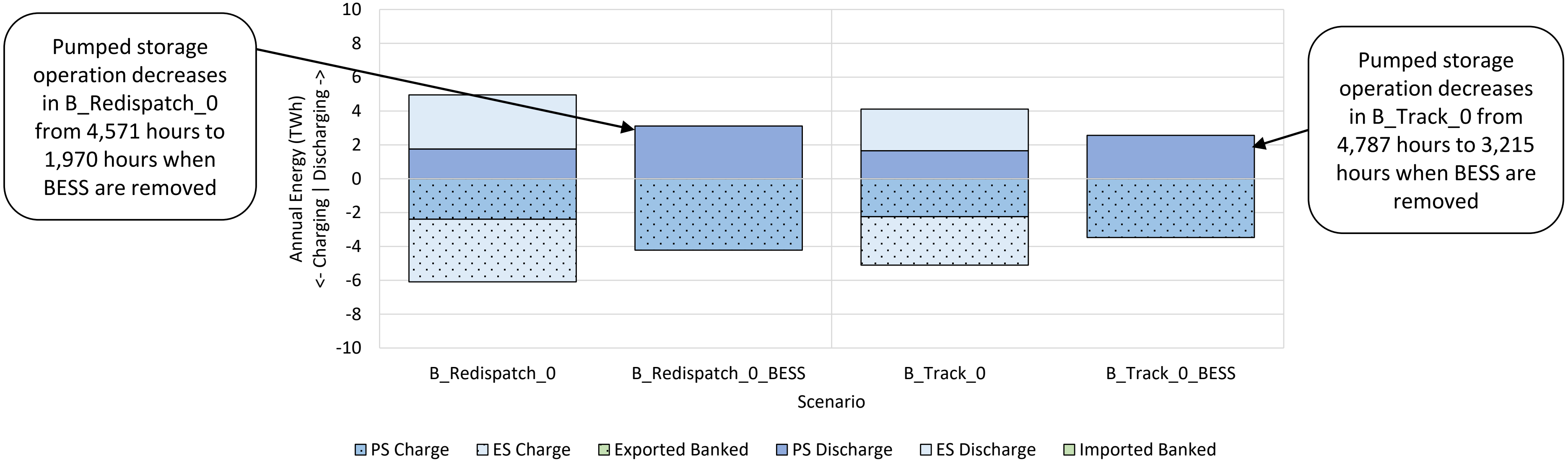
Energy below 0 is curtailed energy not committed to load



BESS reduce the amount of curtailed of New England renewables; whereas returned banked energy and imports are mostly unaffected by the change

Energy Storage Utilization

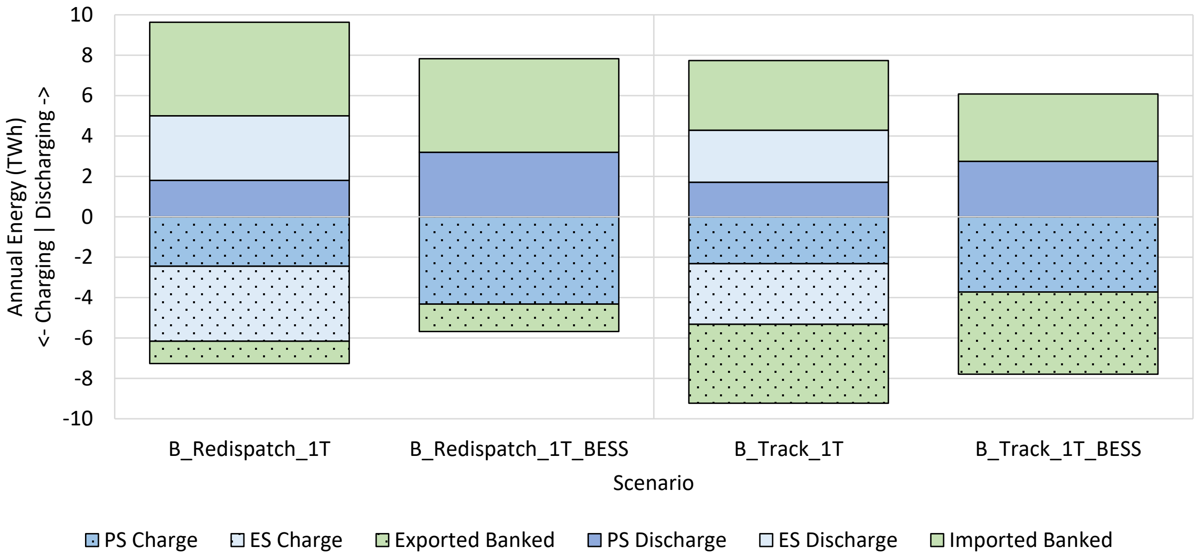
Without Energy Banking



The removal of BESS leads to a much higher utilization of pumped resources

Energy Storage Utilization

With Energy Banking



The introduction of energy banking to the sensitivities does not have an effect on the storage and dispatch of pumped storage and BESS

- Energy banking operates on a multi-month timeframe whereas the pumped storage/BESS cycle closer to a 24 hour schedule

NEXT STEPS

Next Steps for the 2020 Economic Study

- Publish final report Q2 2021

Questions

APPENDIX I

Charts and Data

2020 National Grid Economic Study Preliminary Scenarios

<table>
<tr><th>Scenarios</th><th>Threshold Prices Used</th><th>Retirements</th><th>Must Run Units</th><th>Wind Additions (Nameplate)</th><th>Peak Demand from Heat Pumps</th><th>Peak Demand from Electric Vehicles</th><th>Nameplate Storage Additions</th><th>Bi-Directional External Tie(s)</th></tr>
<tr><td>Bi-Directional Reference
(B)</td><td rowspan="4">REC-Inspired</td><td rowspan="4">FCA 14, Mystic 8&9,
Millstone 2,
NE Coal,
+ 75% of conventional NE oil including dual-fuel based on age</td><td rowspan="7">Nuclear,
Municipal Solid Waste,
Landfill Gas, Wood</td><td rowspan="7">1,330 MW
Onshore

8,000 MW
Offshore[1]</td><td rowspan="7">5,214 MW</td><td rowspan="7">1,817 MW
(2.2 million vehicles)</td><td rowspan="4">2,000 MW
Battery[1] and Utilizing Hydro Quebec as Virtual Storage</td><td>None</td></tr>
<tr><td>Bi-Directional Legacy
(B_HQNB)</td><td>NECEC, PHII, HG, and NB</td></tr>
<tr><td>Bi-Directional New Transmission 1
(B_HQNB_1T)</td><td>NECEC, PHII, NB, HG, One New 1,200 MW Tie[3]</td></tr>
<tr><td>Bi-Directional New Transmission 2[2]
(B_HQNB_2T)</td><td>NECEC, PHII, NB, HG, Two New 1,200 MW Tie[3]</td></tr>
<tr><td>Incremental_8000
(I)</td><td rowspan="3">Positive Threshold Prices</td><td>FCA 14, Mystic 8&9,
Millstone 2,
NE Coal</td><td rowspan="3">2,000 MW
Battery[1]</td><td rowspan="3">None</td></tr>
<tr><td>Incremental_8000
with Oil retirements
(I_Oil)</td><td>Same as (I) plus all of the oil resources</td></tr>
<tr><td>Incremental_8000 Oil and NG Retirements
(I_Oil_NG)</td><td>Same as (I_Oil) plus 50% of the remaining NG units including dual-fuel units</td></tr>
</table>

(1) Other magnitudes of these resources may be considered as sensitivities
*(2) **May** be performed depending on utilization of the scenario where a single 1,200 MW transmission line is added*
(3) New ties added are from Hydro Québec to CMA/NEMA

Annual Curtailed Energy (TWh)

Scenario	Offshore Wind	Onshore Wind	PV	NECEC	HQ Imports	NB Imports	Banked Energy
B_Redispatch_0	30.929	6.190	20.146	7.050	6.757	2.513	0.000
B_Redispatch_0_BESS	30.425	5.974	19.922	7.184	6.982	2.550	0.000
B_Redispatch_1T	31.436	6.623	20.226	7.159	6.555	1.706	5.877
B_Redispatch_1T_BESS	31.046	6.459	20.116	7.249	6.893	1.843	5.870
B_Track_0	26.411	4.151	19.135	10.512	12.393	5.519	0.000
B_Track_0_BESS	25.911	4.027	18.548	10.512	12.390	5.518	0.000
B_Track_1T	28.579	5.046	19.585	10.512	12.415	5.522	0.000
B_Track_1T_BESS	28.109	4.848	19.208	10.512	12.414	5.522	0.000

Monthly Imports and Exports Across New 1,200 MW Tie (TWh)

Scenario	Im/Ex	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
B_Redispatch_1T	Export	-0.014	0.000	-0.148	-0.291	-0.158	-0.025	-0.008	-0.006	-0.109	-0.217	-0.092	-0.028
	Import	0.475	0.598	0.209	0.055	0.115	0.403	0.763	0.767	0.348	0.200	0.286	0.410
B_Redispatch_1T_BESS	Export	-0.029	-0.004	-0.176	-0.309	-0.224	-0.046	-0.017	-0.018	-0.125	-0.248	-0.124	-0.038
	Import	0.456	0.574	0.217	0.063	0.137	0.406	0.737	0.750	0.355	0.236	0.297	0.409
B_Track_1T	Export	-0.227	-0.041	-0.510	-0.664	-0.574	-0.274	-0.043	-0.054	-0.394	-0.487	-0.389	-0.256
	Import	0.367	0.478	0.143	0.002	0.025	0.272	0.667	0.704	0.259	0.079	0.155	0.299
B_Track_1T_BESS	Export	-0.246	-0.073	-0.513	-0.628	-0.546	-0.292	-0.079	-0.075	-0.398	-0.497	-0.429	-0.304
	Import	0.354	0.467	0.134	0.002	0.025	0.258	0.646	0.678	0.248	0.079	0.144	0.293

Energy Storage Utilization (TWh)

Scenario	BESS Charge	BESS Discharge	PS Charge	PS Discharge	Bank Export	Bank Import
B_Redispatch_0	-3.707	3.190	-2.387	1.763	0.000	0.000
B_Redispatch_0_BESS	0.000	0.000	-4.216	3.119	0.000	0.000
B_Redispatch_1T	-3.718	3.200	-2.445	1.807	-1.096	4.630
B_Redispatch_1T_BESS	0.000	0.000	-4.322	3.198	-1.358	4.636
B_Track_0	-2.861	2.460	-2.244	1.655	0.000	0.000
B_Track_0_BESS	0.000	0.000	-3.467	2.563	0.000	0.000
B_Track_1T	-2.999	2.579	-2.324	1.712	-3.910	3.451
B_Track_1T_BESS	0.000	0.000	-3.721	2.751	-4.077	3.330

APPENDIX II

Acronyms

Acronyms

ACDR	Active Demand Capacity Resource	EFORd	Equivalent Forced Outage Rate demand
ACP	Alternative Compliance Payments	EIA	U.S. Energy Information Administration
AGC	Automatic Generator Control	EPECS	Electric Power Enterprise Control System
BESS	Battery Energy Storage Systems	FCA	Forward Capacity Auction
BTM PV	Behind the Meter Photovoltaic	FCM	Forward Capacity Market
BOEM	Bureau of Ocean Energy Management	FGRS	Future Grid Reliability Study
CCP	Capacity Commitment Period	FOM	Fixed Operation and Maintenance Costs
CELT	Capacity, Energy, Load, and Transmission Report	HDR	Hydro Daily, Run of River
CSO	Capacity Supply Obligation	HDP	Hydro Daily, Pondage
Cstr.	Constrained	HQ	Hydro-Québec
DR	Demand-Response	HY	Hydro Weekly Cycle
EE	Energy Efficiency	LBW	Land Based Wind

Acronyms, *continued*

LFR	Load Following Reserve
LMP	Locational Marginal Price
LSE	Load-Serving Entity
MSW	Municipal Solid Waste
NECEC	New England Clean Energy Connect
NESCOE	New England States Committee on Electricity
NG	Natural Gas
NICR	Net Installed Capacity Requirement
NREL	National Renewable Energy Laboratory
OSW	Offshore Wind
O&M	Operation and Maintenance
PHII	Phase II line between Radisson and Sandy Pond

PV	Photovoltaic
PS	Pumped Storage
RECs	Renewable Energy Credits
RFP	Request for Proposals
RGGI	Regional Greenhouse Gas Initiative
RPS	Renewables Portfolio Standards
SCC	Seasonal Claimed Capability
Uncstr.	Unconstrained