Block Island Utility District

Power Supply 101

December 12, 2020

Agenda

- ISO-NE
- Electricity Markets
- Electricity Products
- Integrating Intermittent Resources
- Managing Risk
- Current Contracts and Supply
- NextEra Seabrook and Bellingham Capacity

Why ISO-NE Exists

- Purpose: Ensure that transportation of traded power is open and fair for all parties.
- ISO-NE is a tight power pool, which means that
  - There are specific agreements between all members.
  - Central control center that directs member utilities' control centers

Primary Functions

- Grid Operation – coordinate and direct the flow of electricity over high-voltage transmission system
- Market Administration – Oversees the markets to buy and sell electricity
- Power System Planning – Study, Analyze and Plan to make sure that New England's electricity needs are met in the future.

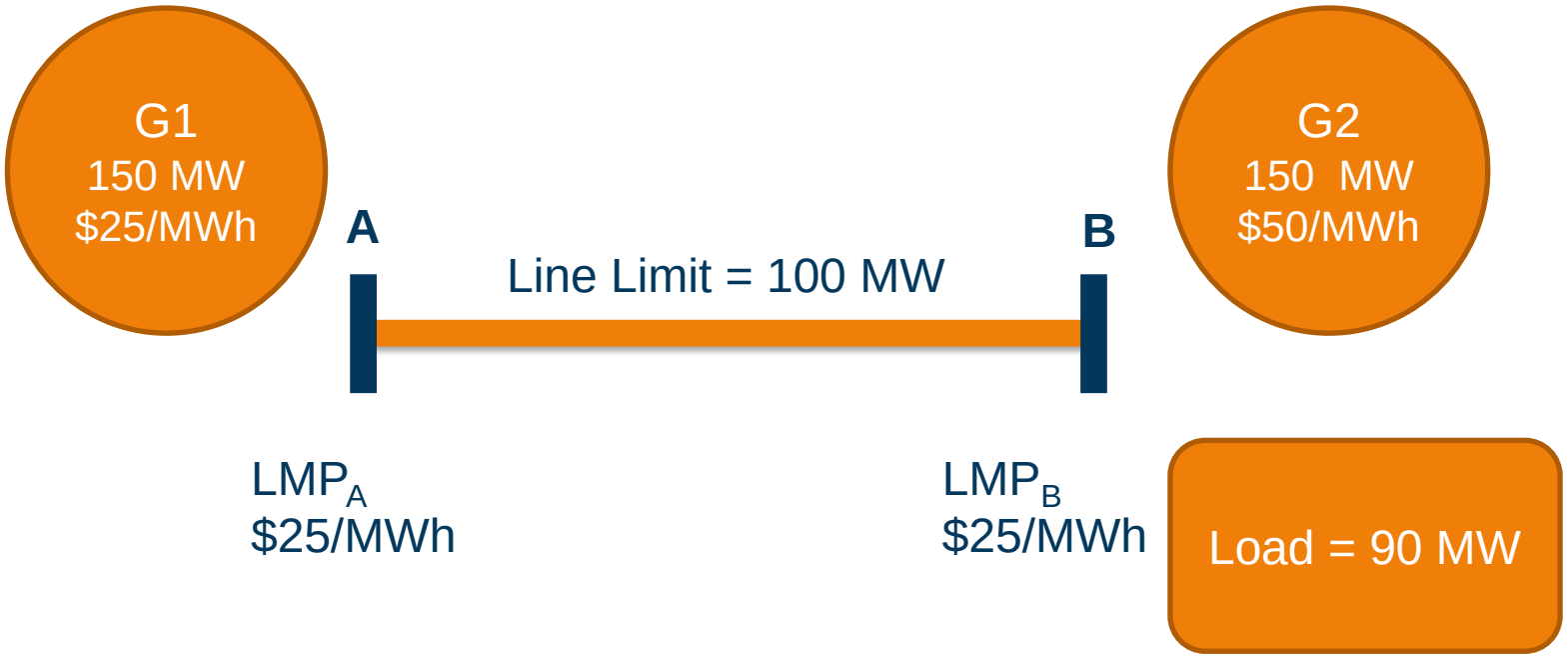
Market Administration

- Powerplants bid their generation into the ISO with specific requirements
- ISO calculates LMP (locational Marginal Price) based on these bids and forecast of load.
- Due to transmission constraints and losses prices can vary based on the location of the generator or load.

What is LMP

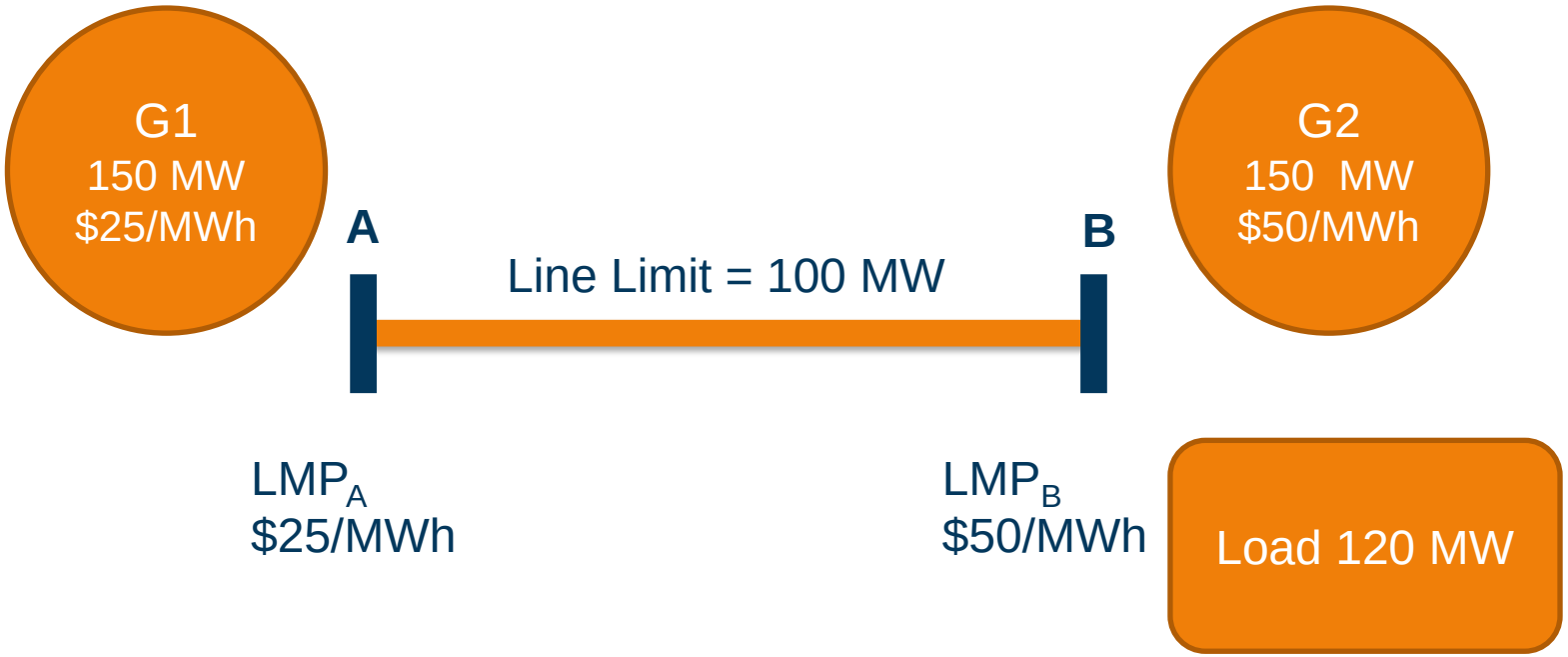
- Price for electric energy at each node.
- If the system were entirely unconstrained and had no losses, all LMPs would be the same and would reflect the cost of serving the next increment of load.
- The generator with the lowest-cost energy offer available would serve that incremental megawatt of load.
- If constrained, the price of electricity can vary greatly within New England

No Congestion



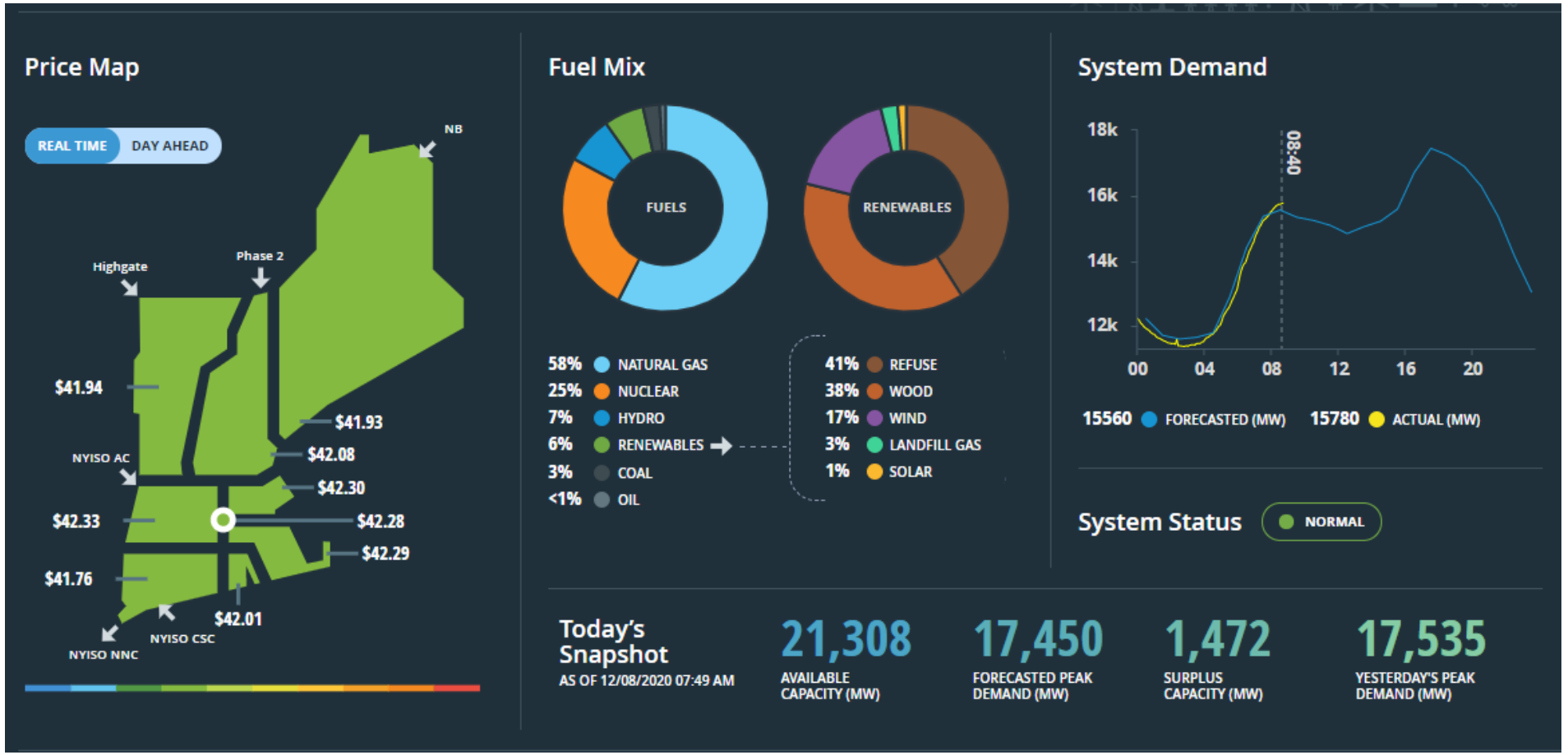
G1 is the marginal asset
- since there is space on the line it would set the incremental MW at location A and B

Binding Congestion



Both Generators are marginal asset
- G1 would supply the next increment at location A
- G2 would supply it for location B

ISO-NE Dashboard



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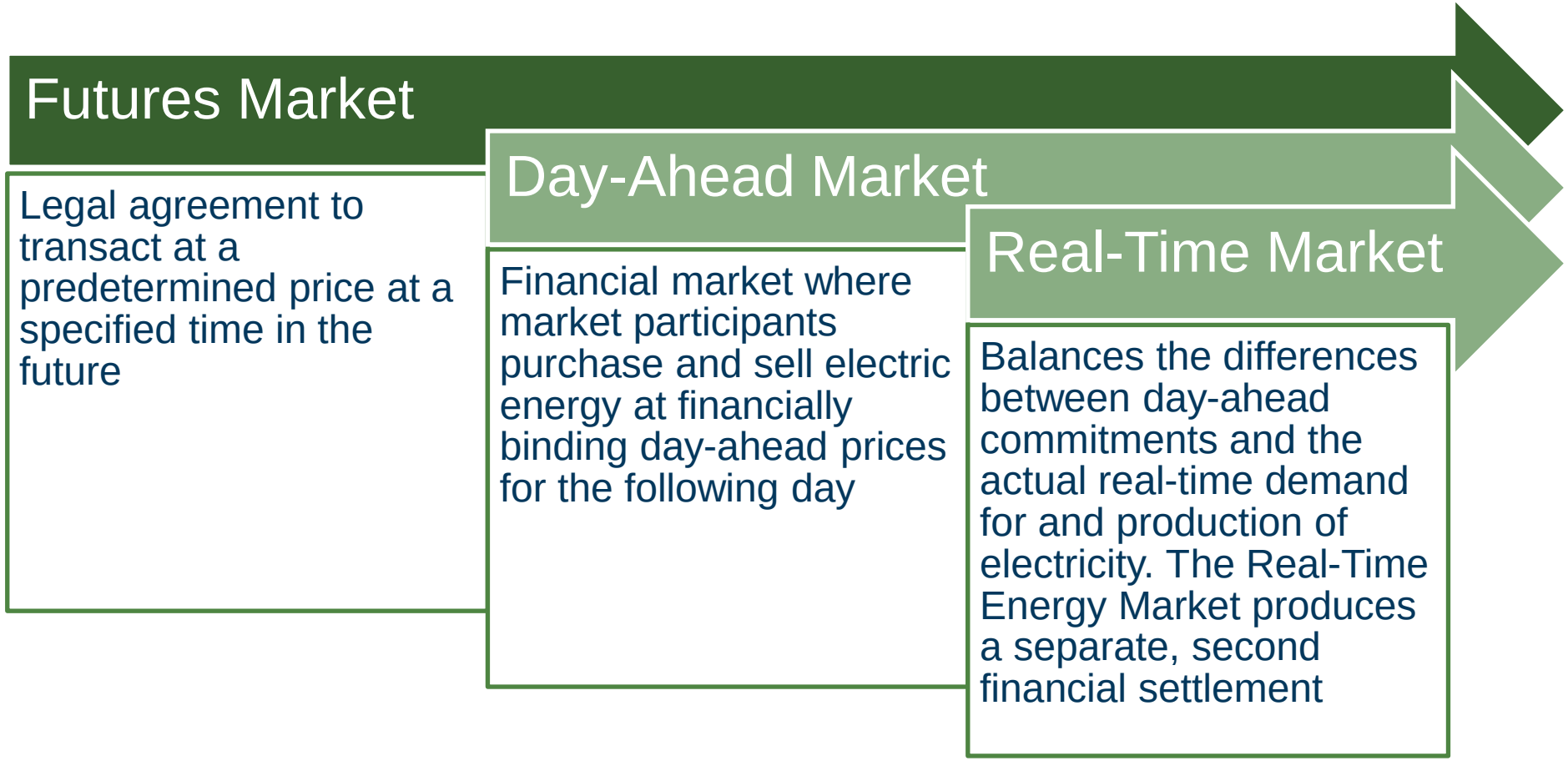
Various Markets for Electricity



Products

- Blocks – Firm, Liquidated Damages
  - 5x16 (On-Peak)
  - 2x24, 5x8 (Off-Peak)
  - Variations such as ATC, 2x16…

Sun	Mon	Tue	Wed	Thu	Fri	Sat
2x16 Off Peak	5x16 On Peak					2x16 Off Peak
2x8 Off Peak	5x8 Off Peak					2x8 Off Peak

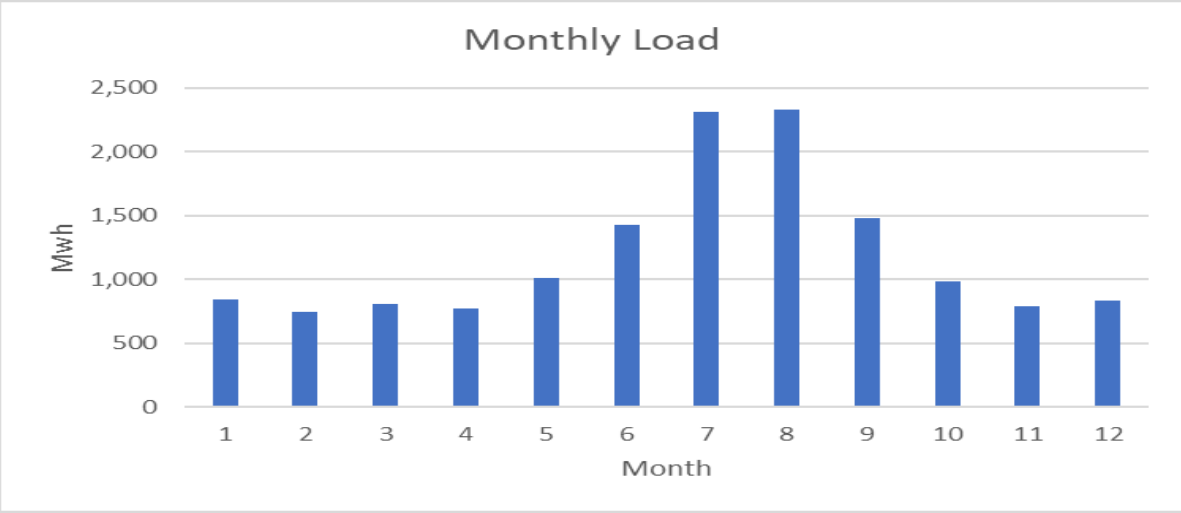
- Load Following
  - Supplier delivers a % of the Buyer's requirement
- Unit Contingent
  - Generating resources have unique characteristics

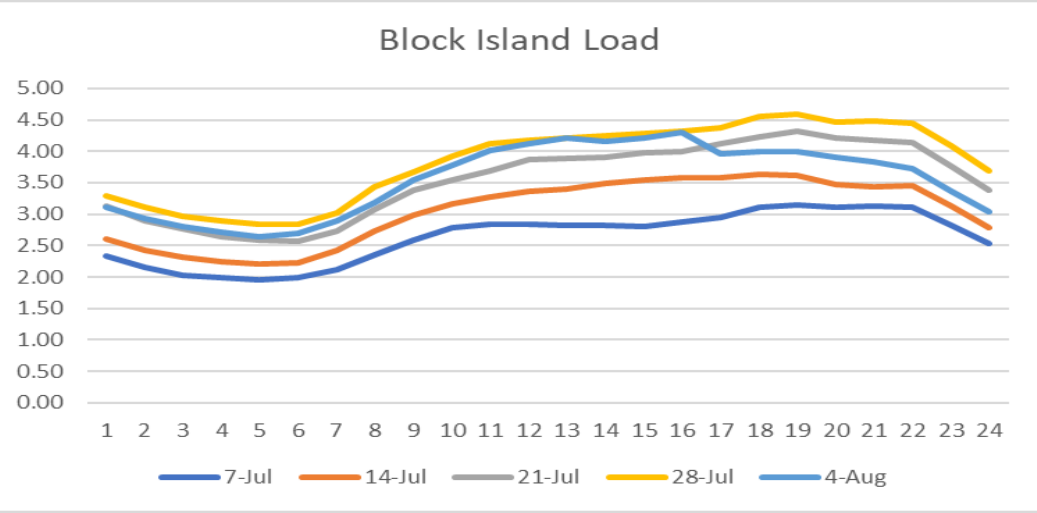
Blocks

- Liquid market
- Price transparency
  - Several services that publish prices
- Marketers willing to do odd-lot sizes
  - Odd-lots are volumes that are not standard (25MW)
- Master Service Agreements with sales confirmations

Load Following

- The supplier assumes the price risk of the buyer's load profile due to weather
- Buyer can request less than 100% of load
- More difficult to determine fair value

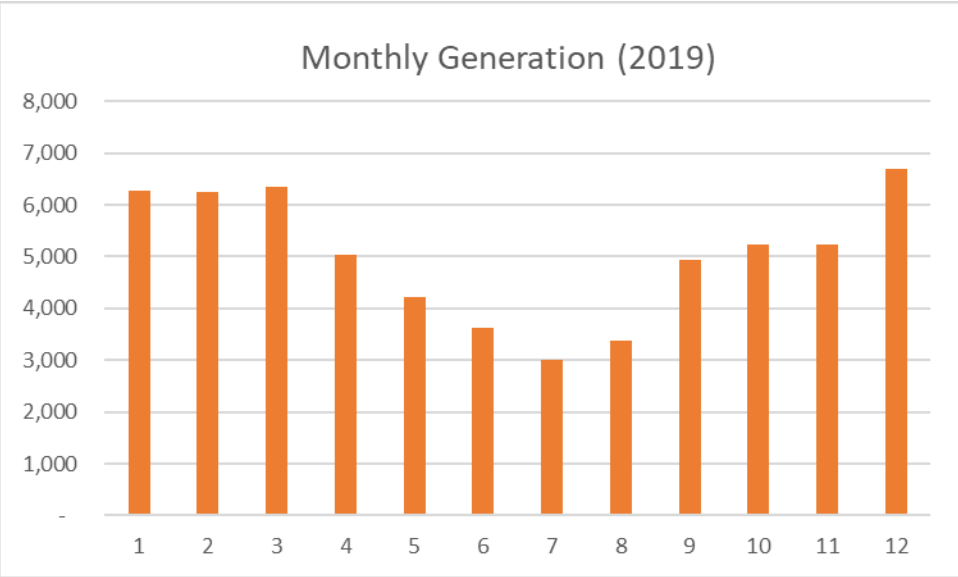


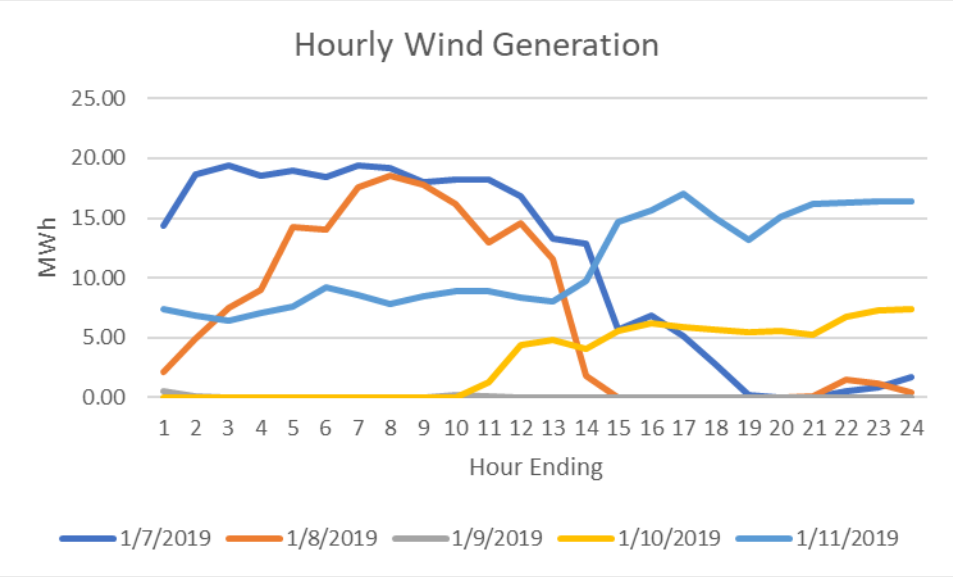


Unit Contingent/Entitlements

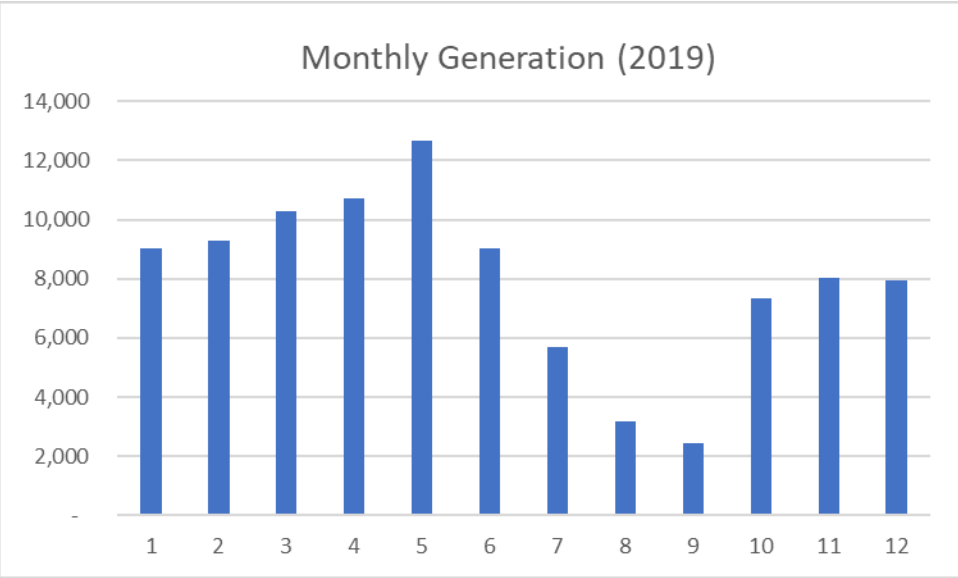
- Only get the power when the asset is generating
- With intermittent resources there is a level of uncertainty on a daily/hourly basis not dependent on price.

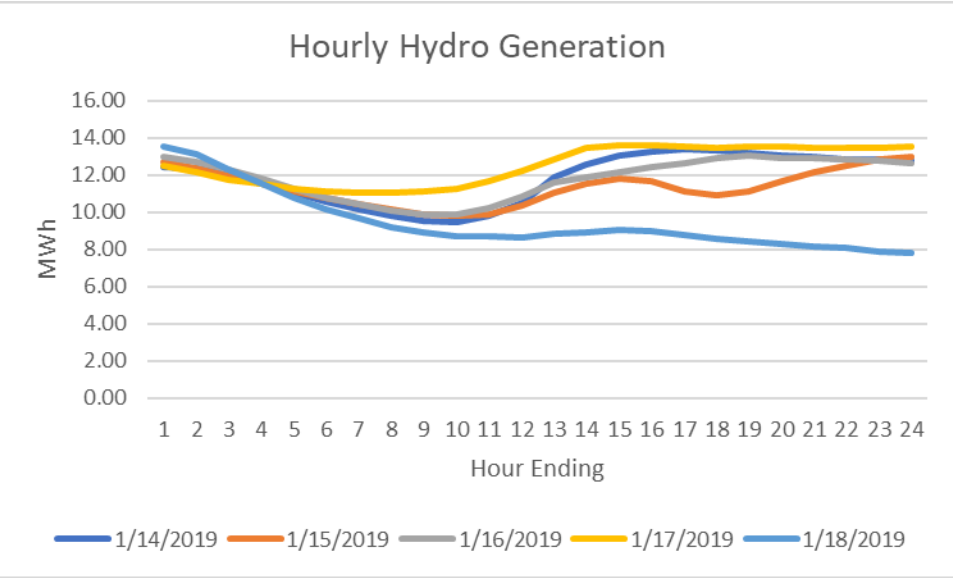
Wind Generation



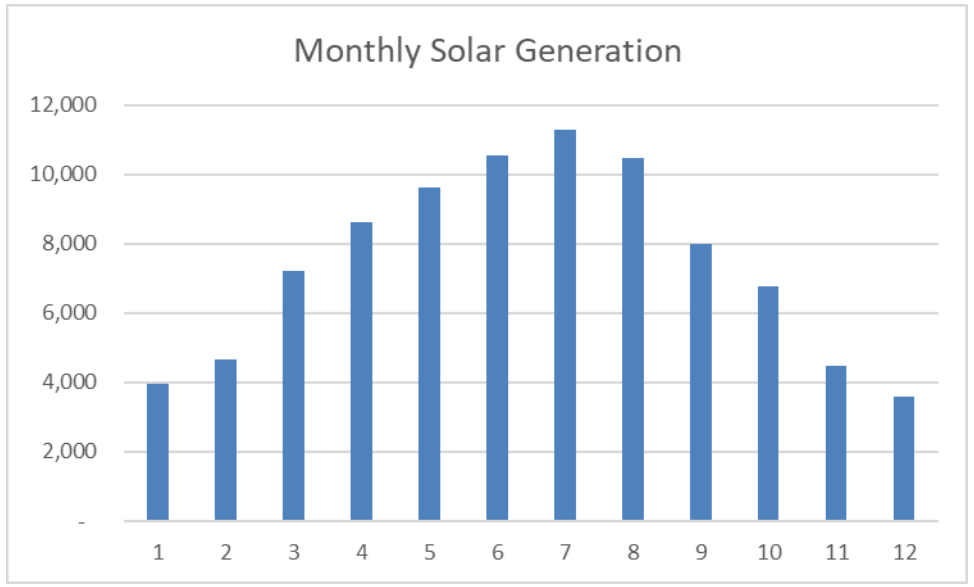


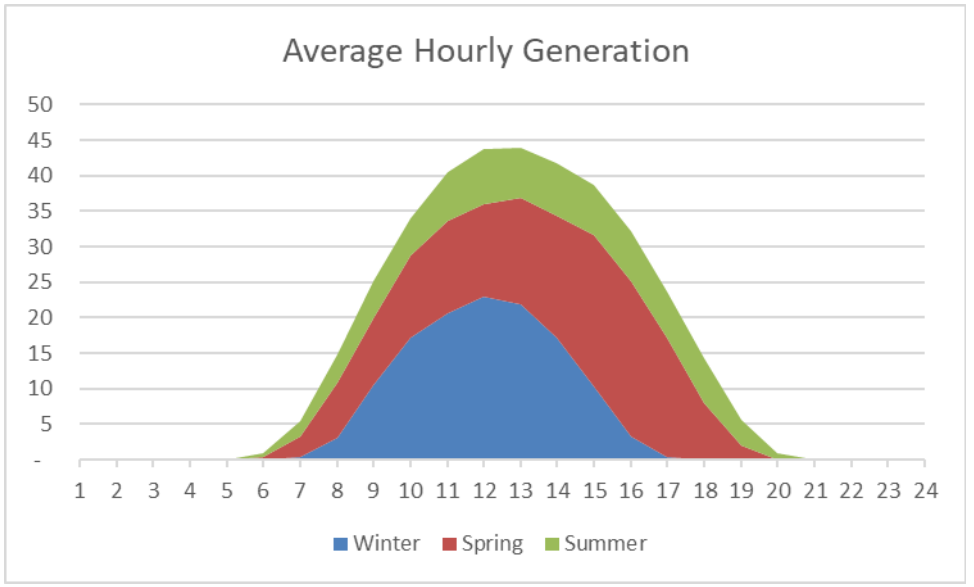
Hydro Electric Generation





Solar Generation



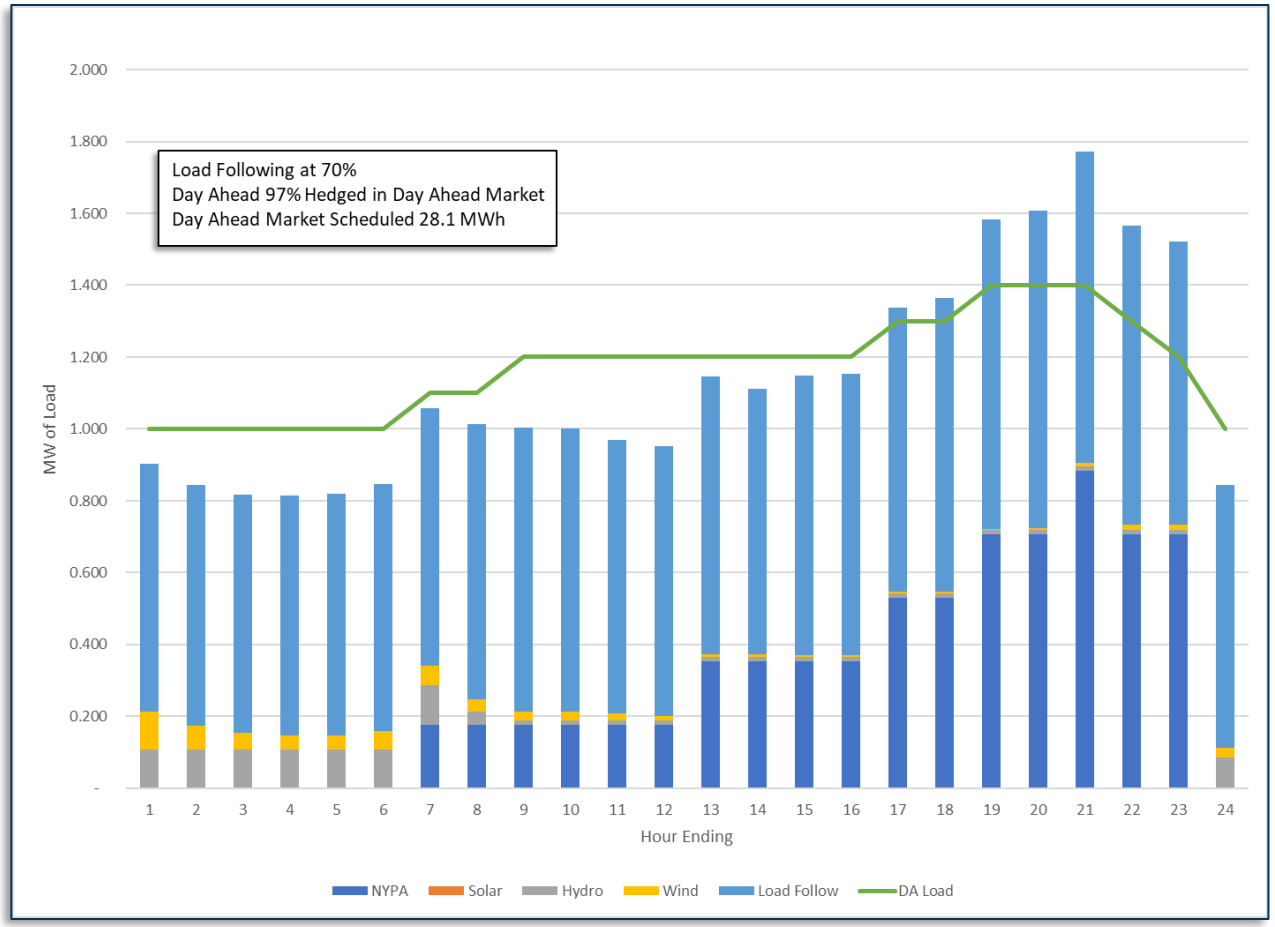


Building a Portfolio with Renewable Resources

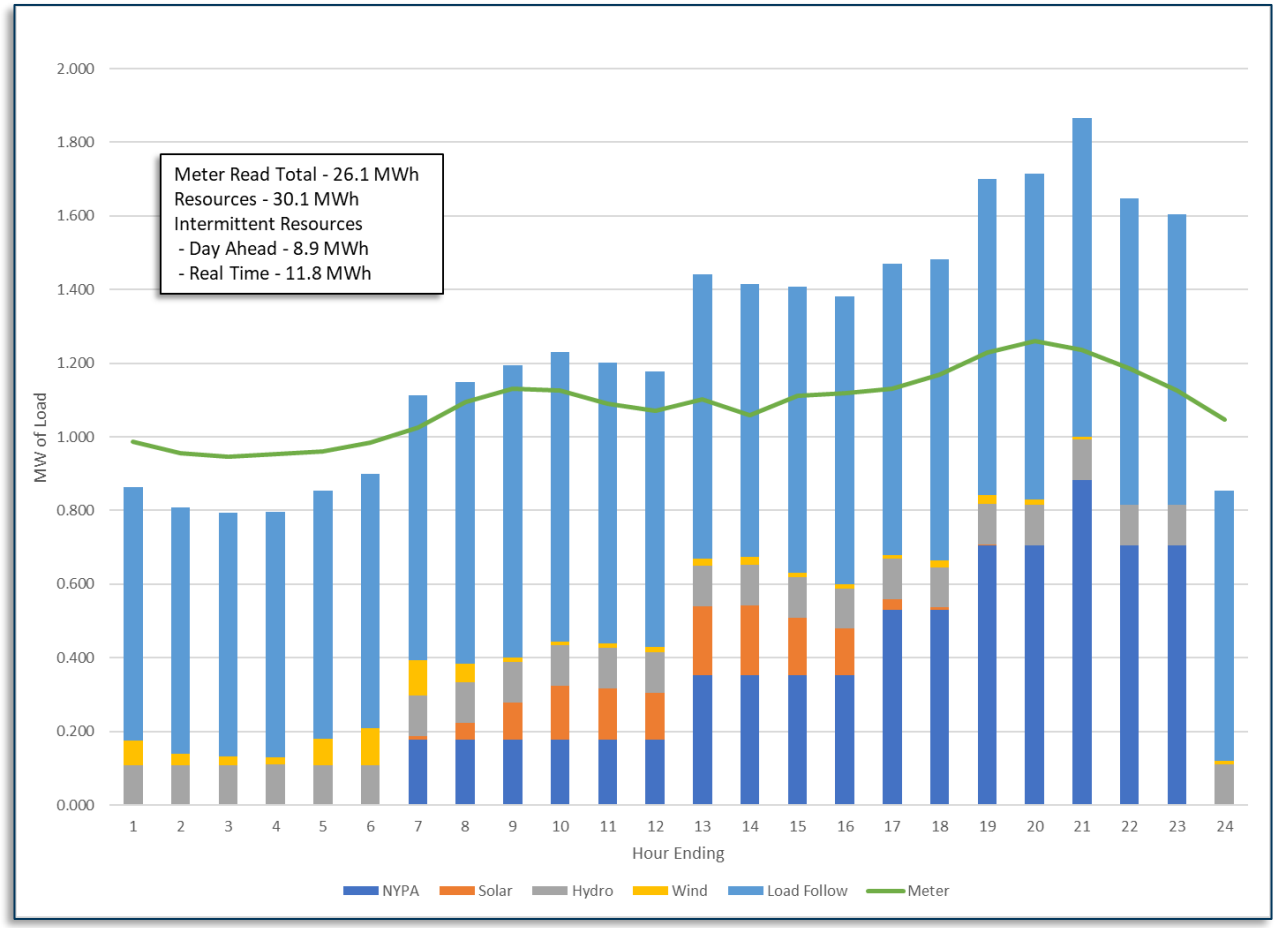
- Whether you use blocks or load following there are ways to integrate renewable resources into your portfolio with proper planning.
- New resources have lead time of 12 months to 36 months or longer.
- Supplement with blocks or short term load following pieces minimize price risk exposure should project get delayed.

Day Ahead with Intermittent Resources

Intermittent Resources
<u>% of Portfolio</u>
NYPA ~ 11%
Hydro ~ 4%
Solar ~ 3%
Wind ~ 8%



Real Time with Intermittent Resources



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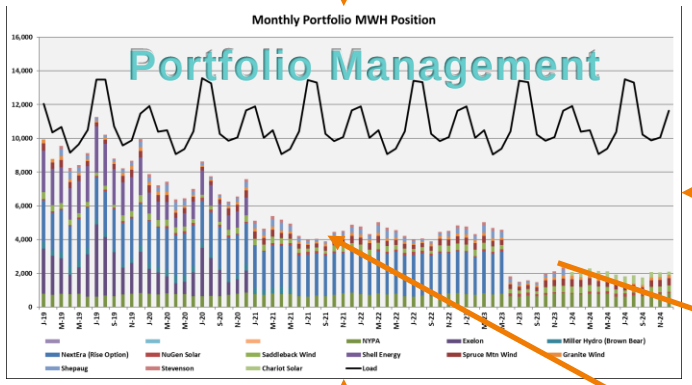
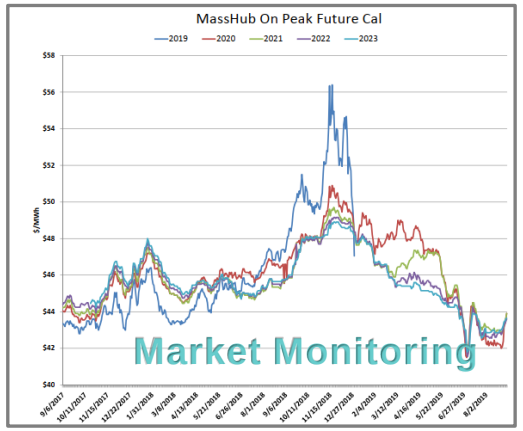
Comprehensive Portfolio Management

Contract Management

- EEI/ISDA
- Counterparty Credit





Procurement

Budgeting

** Updated September 13th to Include July Actuals **			
CY 19	9/18/2019	9/11/2019	Weekly Change
Total Costs	$ 13,064,492	$ 13,088,998	$ (24,506)
Total MWH's	129,474	129,012	462
Total Hedged	112,271	112,365	(95)
% Hedged	86.7%	87.1%	-0.4%
Cost / MWH	$ 100.90	$ 101.46	$ (0.55)
Target	$ 97.00	$ 97.00	$ -
Projected P&L	$ (505,519)	$ (574,806)	$69,287

Calendar 2020 prices are up about $0.42 since the last report.			
CY 20	9/18/2019	9/11/2019	Weekly Change
Total Costs	$ 12,757,700	$ 12,739,876	$ 17,823
Total MWH's	130,303	130,303	0
Total Hedged	85,786	85,786	0
% Hedged	65.8%	65.8%	0.0%
Cost / MWH	$ 97.91	$ 97.77	$ 0.14
Target	$ 97.00	$ 97.00	$ -
Projected P&L	$ (118,323)	$ (100,500)	-$17,823

Impact of Generation Assets

Load Forecasting

NEPOOL Generation Information System

REC Management

LINE	DESCRIPTION	BILLFROM/ BILL TO	DOCUMENT REF.	NET AMOUNT
1	Day-Ahead Energy	05/01/2009 00:00 05/05/2009 00:00	Sample text	1,900.00
2	Real-Time Energy	05/01/2009 00:00 05/05/2009 00:00	Sample text	700.00
3	RT Energy Emergency Purch EET	05/01/2009 00:00 05/05/2009 00:00	Sample text	-100.00
4	RT Energy Emergency Trans CA	05/01/2009 00:00 05/05/2009 00:00	Sample text	-120.00

Invoice Management

ENE Energy New England

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Detailed Budgeting

** Updated September 13th to Include July Actuals **			
CY 19	9/18/2019	9/11/2019	Weekly Change
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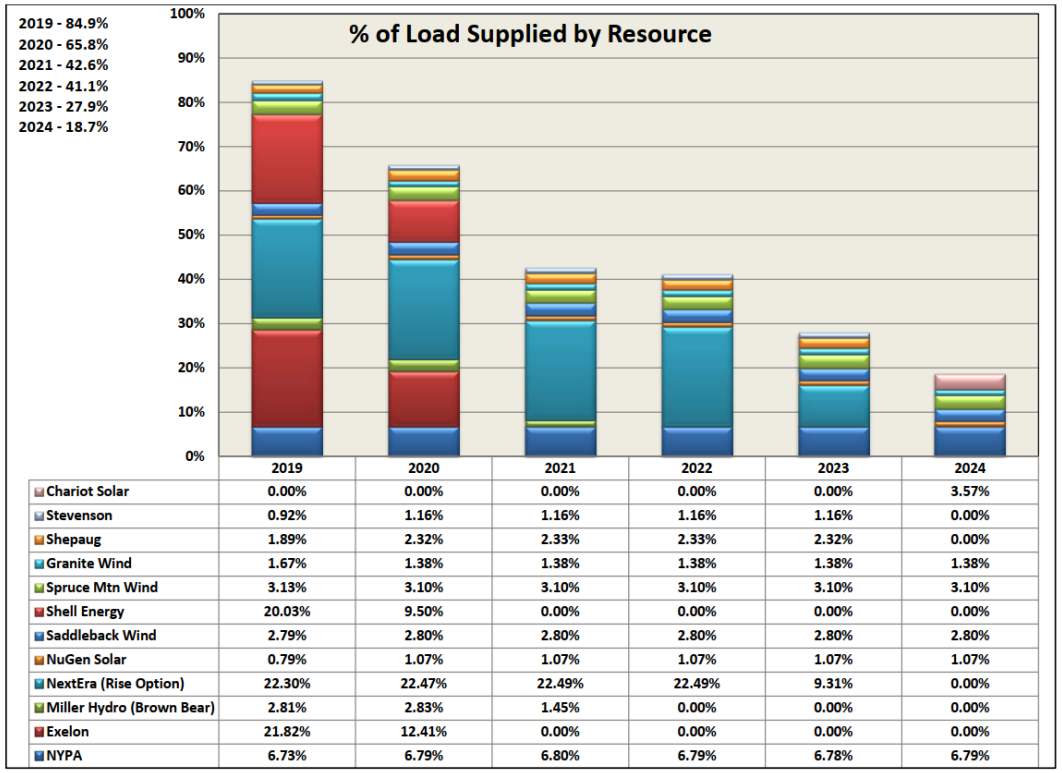
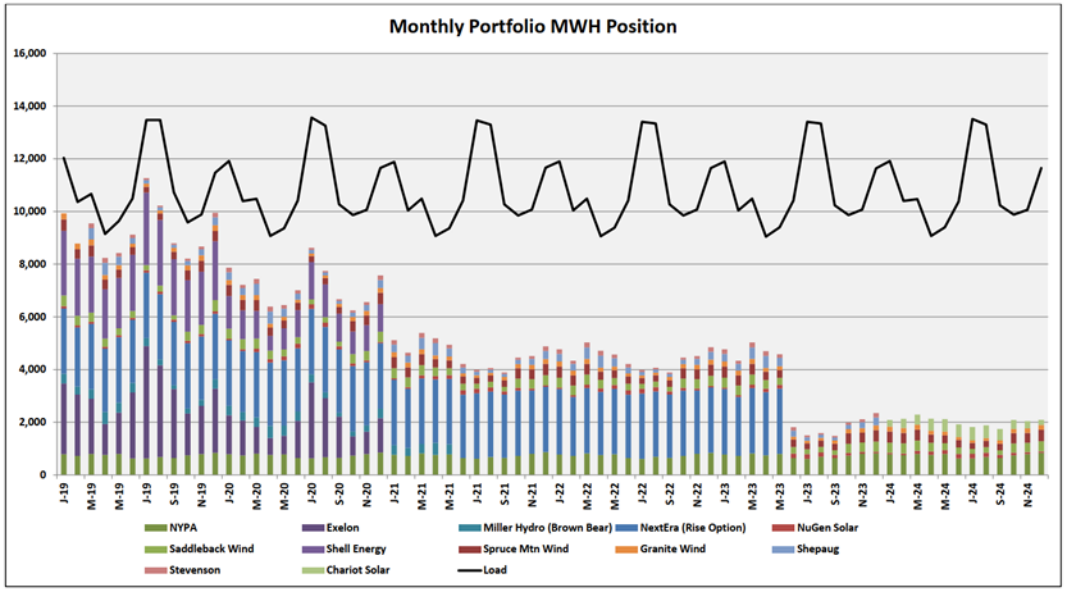
- Weekly updated budget report
  - Expected Costs
  - % Hedged
  - Projection vs. Target
  - Weekly change
  - Budget goes out 5 years

Resource Mix

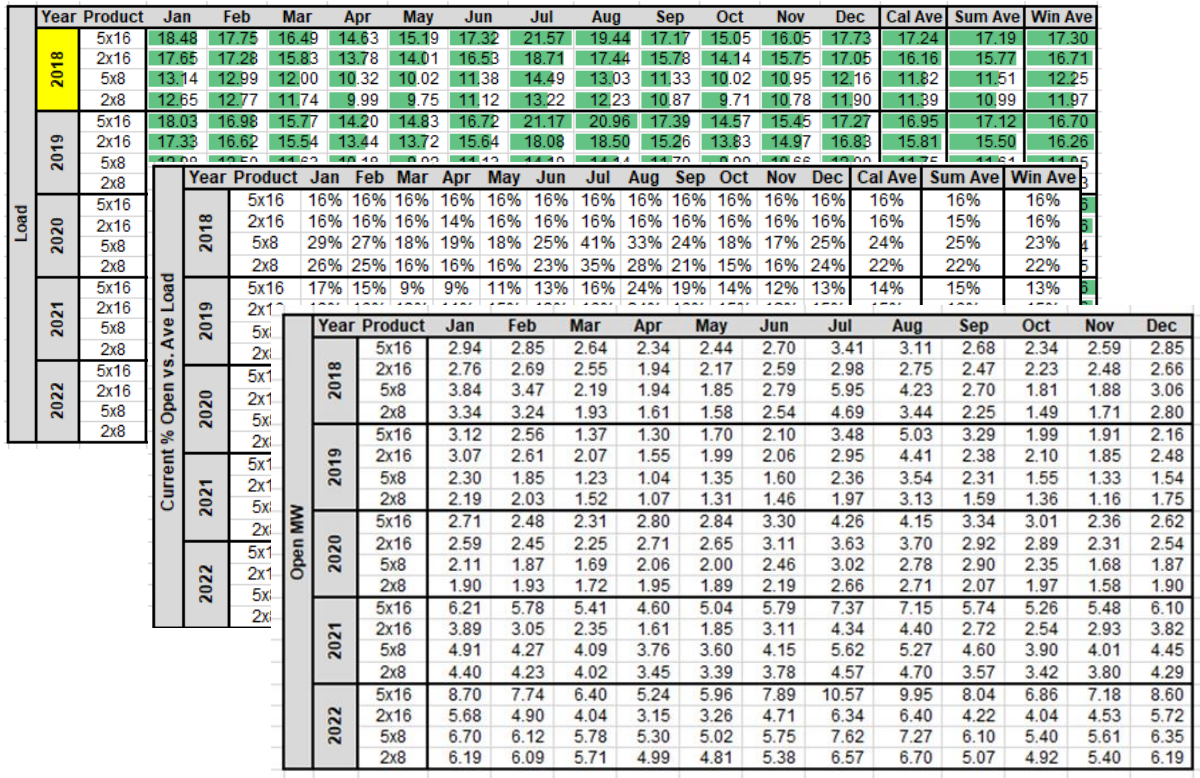


	2019	2020	2021	2022	2023	2024
Chariot Solar	0.00%	0.00%	0.00%	0.00%	0.00%	3.57%
Stevenson	0.92%	1.16%	1.16%	1.16%	1.16%	0.00%
Shepaug	1.89%	2.32%	2.33%	2.33%	2.32%	0.00%
Granite Wind	1.67%	1.38%	1.38%	1.38%	1.38%	1.38%
Spruce Mtn Wind	3.13%	3.10%	3.10%	3.10%	3.10%	3.10%
Shell Energy	20.03%	9.50%	0.00%	0.00%	0.00%	0.00%
Saddleback Wind	2.79%	2.80%	2.80%	2.80%	2.80%	2.80%
NuGen Solar	0.79%	1.07%	1.07%	1.07%	1.07%	1.07%
NextEra (Rise Option)	22.30%	22.47%	22.49%	22.49%	9.31%	0.00%
Miller Hydro (Brown Bear)	2.81%	2.83%	1.45%	0.00%	0.00%	0.00%
Exelon	21.82%	12.41%	0.00%	0.00%	0.00%	0.00%
NYPA	6.73%	6.79%	6.80%	6.79%	6.78%	6.79%



Graphically shows resource mix by generation and bilateral transactions – Annually and Monthly taking into account the projected generation by the intermittent assets (hydro, solar and wind)

Position Reports



Load

Year	Product	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Cal Ave	Sum Ave	Win Ave
2018	5x16	18.48	17.75	16.49	14.63	15.19	17.32	21.57	19.44	17.17	15.05	16.05	17.73	17.24	17.19	17.30
	2x16	17.65	17.28	15.83	13.78	14.01	16.53	18.71	17.44	15.78	14.14	15.75	17.05	16.16	15.77	16.71
	5x8	13.14	12.99	12.00	10.32	10.02	11.38	14.49	13.03	11.33	10.02	10.95	12.16	11.82	11.51	12.25
	2x8	12.65	12.77	11.74	9.99	9.75	11.12	13.22	12.23	10.87	9.71	10.78	11.90	11.39	10.99	11.97
2019	5x16	18.03	16.98	15.77	14.20	14.83	16.72	21.17	20.96	17.39	14.57	15.45	17.27	16.95	17.12	16.70
	2x16	17.33	16.62	15.54	13.44	13.72	15.64	18.08	18.50	15.26	13.83	14.97	16.83	15.81	15.50	16.26
	5x8															
	2x8															
2020	5x16															
	2x16															
	5x8															
	2x8															
2021	5x16															
	2x16															
	5x8															
	2x8															
2022	5x16															
	2x16															
	5x8															
	2x8															

Current % Open vs. Ave Load

Year	Product	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Cal Ave	Sum Ave	Win Ave
2018	5x16	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%
	2x16	16%	16%	16%	14%	16%	16%	16%	16%	16%	16%	16%	16%	16%	15%	16%
	5x8	29%	27%	18%	19%	18%	25%	41%	33%	24%	18%	17%	25%	24%	25%	23%
	2x8	26%	25%	16%	16%	16%	23%	35%	28%	21%	15%	16%	24%	22%	22%	22%
2019	5x16	17%	15%	9%	9%	11%	13%	16%	24%	19%	14%	12%	13%	14%	15%	13%
	2x16															
	5x8															
	2x8															
2020	5x16															
	2x16															
	5x8															
	2x8															
2021	5x16															
	2x16															
	5x8															
	2x8															
2022	5x16															
	2x16															
	5x8															
	2x8															

Open MW

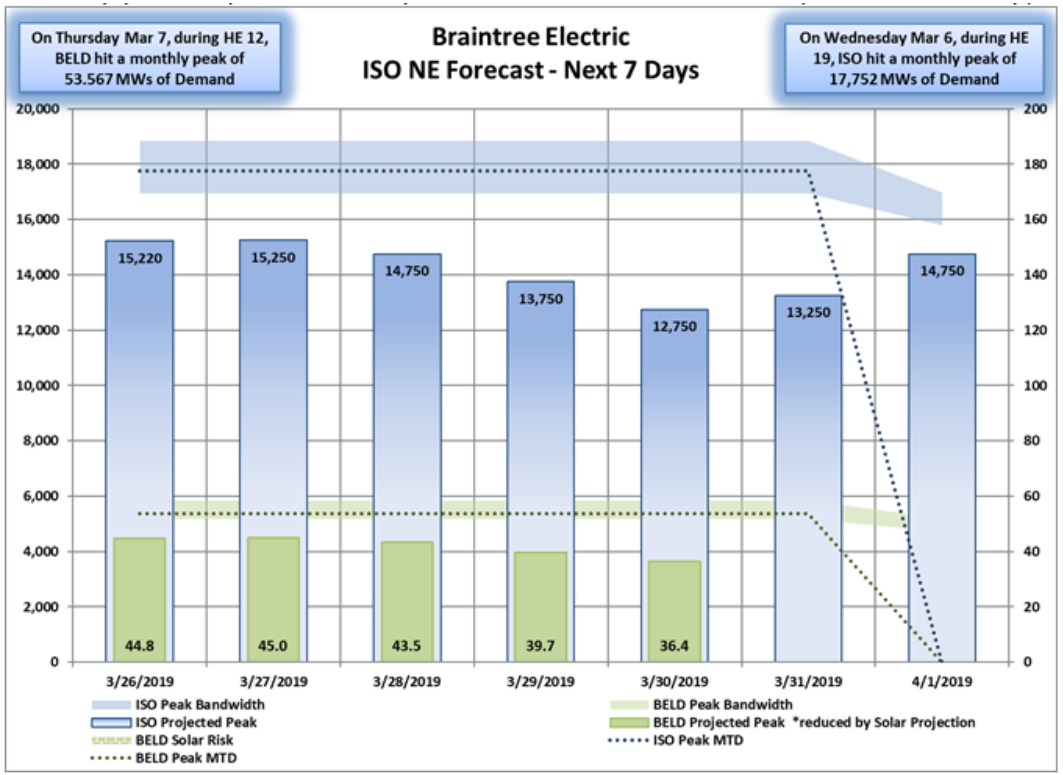
Year	Product	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2018	5x16	2.94	2.85	2.64	2.34	2.44	2.70	3.41	3.11	2.68	2.34	2.59	2.85
	2x16	2.76	2.69	2.55	1.94	2.17	2.59	2.98	2.75	2.47	2.23	2.48	2.66
	5x8	3.84	3.47	2.19	1.94	1.85	2.79	5.95	4.23	2.70	1.81	1.88	3.06
	2x8	3.34	3.24	1.93	1.61	1.58	2.54	4.69	3.44	2.25	1.49	1.71	2.80
2019	5x16	3.12	2.56	1.37	1.30	1.70	2.10	3.48	5.03	3.29	1.99	1.91	2.16
	2x16	3.07	2.61	2.07	1.55	1.99	2.06	2.95	4.41	2.38	2.10	1.85	2.48
	5x8	2.30	1.85	1.23	1.04	1.35	1.60	2.36	3.54	2.31	1.55	1.33	1.54
	2x8	2.19	2.03	1.52	1.07	1.31	1.46	1.97	3.13	1.59	1.36	1.16	1.75
2020	5x16	2.71	2.48	2.31	2.80	2.84	3.30	4.26	4.15	3.34	3.01	2.36	2.62
	2x16	2.59	2.45	2.25	2.71	2.65	3.11	3.63	3.70	2.92	2.89	2.31	2.54
	5x8	2.11	1.87	1.69	2.06	2.00	2.46	3.02	2.78	2.90	2.35	1.68	1.87
	2x8	1.90	1.93	1.72	1.95	1.89	2.19	2.66	2.71	2.07	1.97	1.58	1.90
2021	5x16	6.21	5.78	5.41	4.60	5.04	5.79	7.37	7.15	5.74	5.26	5.48	6.10
	2x16	3.89	3.05	2.35	1.61	1.85	3.11	4.34	4.40	2.72	2.54	2.93	3.82
	5x8	4.91	4.27	4.09	3.76	3.60	4.15	5.62	5.27	4.60	3.90	4.01	4.45
	2x8	4.40	4.23	4.02	3.45	3.39	3.78	4.57	4.70	3.57	3.42	3.80	4.29
2022	5x16	8.70	7.74	6.40	5.24	5.96	7.89	10.57	9.95	8.04	6.86	7.18	8.60
	2x16	5.68	4.90	4.04	3.15	3.26	4.71	6.34	6.40	4.22	4.04	4.53	5.72
	5x8	6.70	6.12	5.78	5.30	5.02	5.75	7.62	7.27	6.10	5.40	5.61	6.35
	2x8	6.19	6.09	5.71	4.99	4.81	5.38	6.57	6.70	5.07	4.92	5.40	6.19

- Position report easily tracks open positions by product type to give you the granularity needed
  - On Peak (5x16)
  - Weekend Peak (2x16)
  - Weekday Off Peak (5x8)
  - Weekend Off Peak (2x8)
- Summarizes by:
  - Month
  - Season
  - Calendar
- Graphically indicates how close to fully hedged

Renewable Procurement

- Facilitated the development of seven new renewable resources
- 240 MW of new green resources – Wind and Solar
- Evaluated the economics of each project and how it would fit within each Municipal's resource plan.
- Handle all the GIS requirements
  - Approximately 400,000 REC produced and that will grow to over 650,000 REC in a few years as new resources come online.
  - Current value of these RECs approximately $10M per year

Peak Load Management



- Monitor ISO-NE Load
- Issue shed warnings in advance of coincident peak events to reduce capacity/transmission requirements
- Accuracy
  - ISO-NE Peak – 98%
  - RNS Peak – 96%

EEI Master Agreements

- Standard form of Agreement containing the essential terms governing forward purchases and sales of wholesale electricity
- BIUD has EEI Master Agreements with Shell Energy, PSEG Power, and BP Energy Company

Purchase History

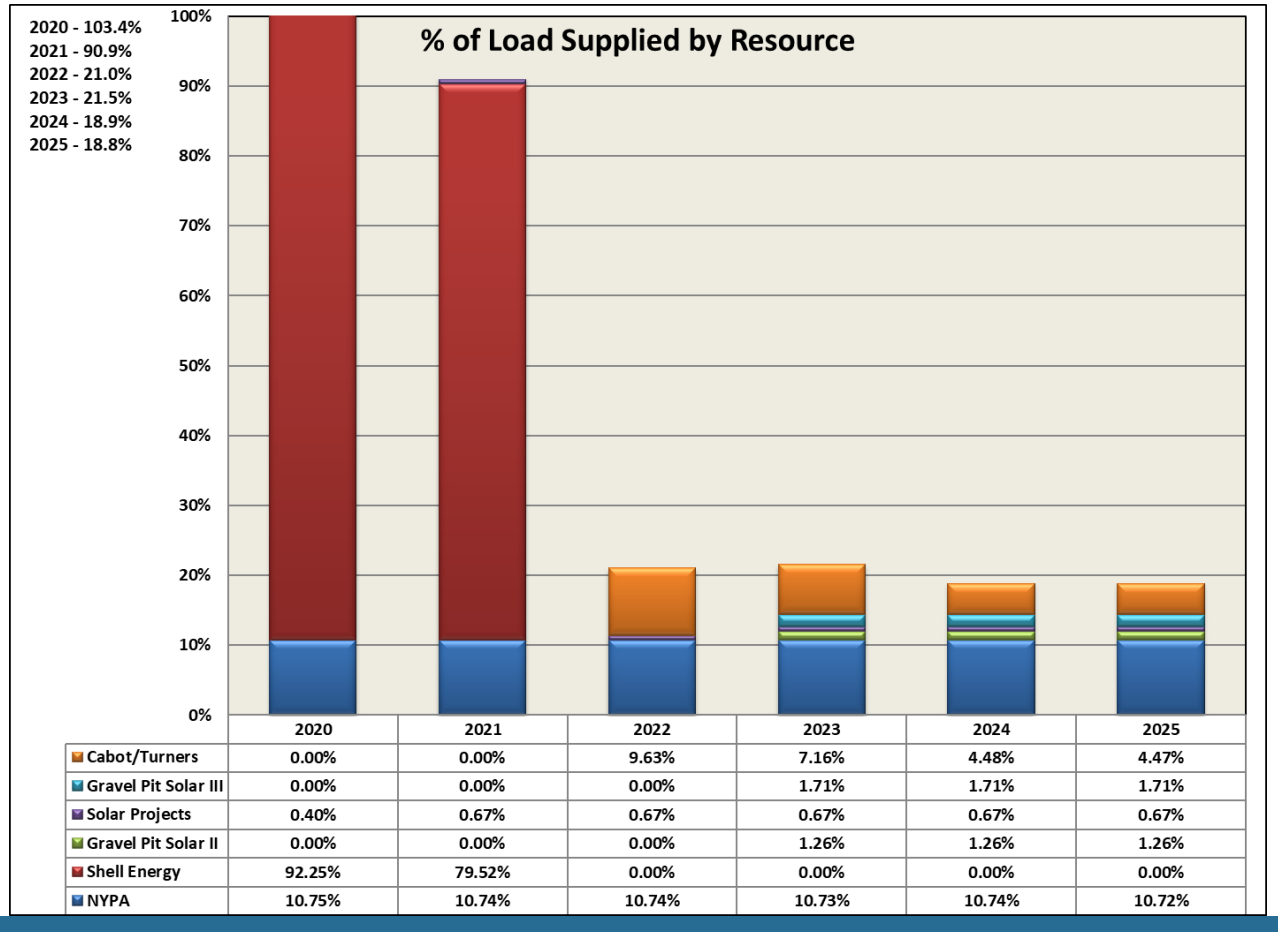
Block Island Utility Purchase History						
	Suppliers	Trade Date	Winning Supplier	Term	Product	Price $/MWh
Solicitation No. 1	Shell, PSEG	April 25, 2017	Shell	May 1, 2017 - October 31, 2018	100% Load Follow Energy	$ 36.77
Solicitation No. 2	Shell, PSEG	February 20, 2018	Shell	November 1, 2018 - April 30, 2020	100% Load Follow Energy	$ 42.20
Soliciattion No. 3	Shell, PSEG	December 17, 2019	Shell	May 1, 2020 - October 31,2021	90% Load Follow Energy	$ 34.85

Renewable Resource Projects

						% of BIUD	
Project	Signed	MW	MWh/yr.	Start	End	2022	2024
Gravel Pit Solar I	Dec-19	0.10	172	4/1/2023	3/31/2042	1.2%	1.2%
Gravel Pit Solar III	Jun-20	0.15	257	1/1/2024	12/31/2048	1.7%	1.7%
FirstLight Cabot/Turner Falls	Oct-20	0.16	1,474	1/1/2022	12/31/2030	10.0%	4.7%

Note: Cabot/Turner volumes decline to 689 MWh/yr. in 2024 and stays at that level through 2030

Block Island Resource Mix



	2020	2021	2022	2023	2024	2025
Cabot/Turners	0.00%	0.00%	9.63%	7.16%	4.48%	4.47%
Gravel Pit Solar III	0.00%	0.00%	0.00%	1.71%	1.71%	1.71%
Solar Projects	0.40%	0.67%	0.67%	0.67%	0.67%	0.67%
Gravel Pit Solar II	0.00%	0.00%	0.00%	1.26%	1.26%	1.26%
Shell Energy	92.25%	79.52%	0.00%	0.00%	0.00%	0.00%
NYPA	10.75%	10.74%	10.74%	10.73%	10.74%	10.72%

NextEra Carbon-Free Energy Summary

- 10-year term starting 2025
- Firm Physical DA Energy
- Delivered at Mass Hub
- ATC or Shaped
- Linked with corresponding volume of EFECs

Term	Shape	Price ($/MWh)
Jan 2025 – Dec 2034	ATC	$43.05
Jan 2025 – Dec 2034	ENE Provided Shape	$44.07

ENE Provided Shape (per 10 MW ATC)[1]		
	ON	Off
Jan	12.0	9.8
Feb	11.4	9.5
Mar	10.6	8.9
Apr	9.8	7.9
May	9.8	7.8
Jun	11.3	8.6
Jul	13.9	11.0
Aug	13.1	9.6
Sep	10.7	8.3
Oct	9.9	7.6
Nov	10.6	8.7
Dec	11.7	9.5

Capacity Component Summary

- **NextEra can structure capacity hedges so that MLP share 50% of upside/downside above/below $4/kW-Month**
  - Financially settled capacity, upside not capped, while downside is
    - -- If FCA clears at $4, effective cost is $4.00/kW-mo.
    - -- If FCA clears at $1, effective cost is $2.50/kW-mo.
    - -- If FCA clears at $10, effective cost is $7.00/kW-mo.
  - Sharing structure – provides protection to MLP from future high FCA clearing prices
- **Capacity supplied from the Bellingham Energy Center – protects MLP from zonal separation risk**
- **Linked to energy volume, ranging from 50% to 300% of equivalent ATC MW volume, provides quantity flexibility for MLPs**
  - If MLP chooses 1MW of carbon-free energy, has ability to choose between 0.5MW and 3MW of SENE settled capacity

Capacity Component Summary (continued)

- **If Bellingham is retired, sold or no longer qualifies as an Installed Capacity Resource, NextEra will have option to:**
  - Replace Bellingham with another unit in Bellingham's zone
  - Replace the Bellingham Capacity with Capacity from Seabrook, subject to MLP and Seller mutually agreeing
  - Terminate the Capacity portion of the transaction (energy portion of the transaction will remain outstanding)

- **If the Reference Unit is partially or fully delisted or does not obtain a Capacity Supply Obligation for its entire Qualified Capacity for a specific FCM annual auction**
  - MLP and NextEra will have no obligations to financially settle capacity during the Capacity Commitment Period of an FCA Delist Year

NextEra Energy

- Block Island would need to execute an EEI with NextEra
- This would add another supplier to your mix.
- NextEra Energy is the world's biggest investor-owned generator of wind and solar power
- NextEra Energy is one of the largest energy trading companies in the US
- Own Seabrook Nuclear Power Plant (1,103 MW net)

Real Time Price (All Hours)

Row Labels	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
1	$71.79	$37.10	$84.17	$162.88	$65.59	$33.99	$36.66	$107.54	$51.50	$26.22
2	$57.37	$30.14	$108.25	$152.84	$126.70	$27.39	$28.05	$36.91	$36.92	$20.32
3	$44.50	$25.39	$53.99	$116.02	$57.93	$17.20	$34.81	$32.87	$36.92	$16.82
4	$43.91	$25.41	$42.69	$41.20	$25.88	$28.00	$31.51	$43.38	$26.80	$18.09
5	$43.52	$28.00	$38.46	$35.46	$26.12	$21.29	$29.44	$23.89	$22.89	$17.97
6	$43.13	$33.82	$39.49	$37.92	$19.61	$21.24	$23.93	$26.02	$22.43	$21.17
7	$57.98	$41.94	$57.12	$34.91	$25.40	$29.33	$26.62	$33.67	$29.18	$22.47
8	$43.92	$42.80	$35.08	$30.21	$35.35	$40.19	$23.77	$39.18	$23.58	$23.87
9	$42.56	$33.59	$36.26	$36.04	$35.83	$27.21	$26.31	$41.17	$20.45	$19.88
10	$39.66	$34.65	$35.92	$30.64	$32.62	$22.72	$31.71	$39.58	$20.37	$26.87
11	$38.30	$56.34	$45.83	$44.86	$26.12	$24.30	$33.30	$55.49	$34.27	$24.73
12	$33.89	$43.63	$98.53	$42.47	$21.35	$53.83	$79.89	$41.86	$42.77	