2023 Resource Report

Village of Lyndon Electric Department

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the Vermont Public Utility Commission
and the Vermont Department of Public Service

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Submitted by:
Vermont Public Power Supply Authority
on behalf of Village of Lyndon Electric Department
in fulfillment of Vermont Public Utility Commission Rule 5.206(B)

VPPSA
Vermont Public Power Supply Authority

Overview & Introduction

As a member of the Vermont Public Power Supply Authority (VPPSA), Village of Lyndon Electric Department ("Lyndon") relies on VPPSA to plan for and manage its power supply in New England's wholesale markets. In this role, VPPSA not only manages Lyndon's power supply in the ISO New England's (ISO-NE) wholesale power markets, but also plans for and solicits new power supplies for Lyndon and its other municipal utility members.

The information contained in this report describes Lyndon's power supply needs and acquisition strategy over the next five years. It is divided into four sections.

I. Electricity Demand
This section shows how electricity demand has changed over the past five years, and forecasts the demand for the upcoming five years.

II. Electricity Supply
This section describes each resource in Lyndon's portfolio of supplies, as well as the new resources that have been acquired over the past year.

III. Electricity Supply & Demand
This section illustrates the balance between the supply and demand for energy, capacity, and renewable energy credits.

IV. Anticipated Transactions & Acquisition Strategy
This section lists the resources that are expected to be acquired over the upcoming five-year period, and outlines the strategy for procuring them.

I. Electricity Demand

In 2023, Lyndon's energy requirements[1] ("Load") totaled 66,104,698 kWh, and its coincident annual peak with ISO-NE was 8,350 kW on September 7th at hour ending 18. As shown in Table 1, Lyndon's energy requirements have fluctuated by about +/- 4% per year while its peak loads[2] have fluctuated by up to 8.5%. This peak fluctuation is due in part to Lyndon's run-of-river, behind-the-meter hydro resources, which are not always operating at their capacity during the coincident peak hour.

Table 1: Historical Loads

Year	Load (kWh)	% Change	Peak Load (kW)	% Change
2019	64,274,622		9,310	
2020	62,391,281	-2.9%	9,154	-1.7%
2021	64,829,556	3.9%	9,781	6.8%
2022	66,284,998	2.3%	9,162	-6.3%
2023	66,104,698	-0.3%	8,350	-8.9%

Lyndon's peak and energy needs are forecasted annually using a multiple regression model whose inputs include historical loads, weather, and economic variables like employment and income. These forecasts are adjusted for anticipated changes in net metering, heat pump and electric vehicle penetrations. Table 2 shows the results of the most recent 5-year load forecast.

Table 2: Forecast Loads

Year	Load (kWh)	% Change	Peak Load (kW)	% Change
2024	65,105,805		8,433	
2025	64,974,127	-0.2%	8,518	1.0%
2026	65,131,595	0.2%	8,603	1.0%
2027	65,358,515	0.4%	8,689	1.0%
2028	65,983,851	1.0%	8,776	1.0%

Assuming normal weather, loads (kWh) are forecast to change by 0.2%-1% per year through 2028. Peak loads (kW) are forecast to increase by about 1.0% per year.

[1] Lyndon's energy requirements ("Load") include behind-the-meter hydro generation, transmission losses, and adjustments for Vermont's Standard Offer Program. Also known as "Total Load – Including Losses, it is not the same as Lyndon's Real-Time Load Obligation (RTLO) with ISO New England.

[2] Peak Load is defined as the annual coincident peak with ISO New England and is based on RTLO.

II. Electricity Supply

Lyndon's power supply is made up of owned generation, long-term contracts, and short-term contracts. The resources in Lyndon's portfolio represent a range of fuel types and technologies. In addition, they are located throughout Vermont, New England, New York and Quebec, and many of their expiration dates have been chosen not to overlap. As a result, they act as a diversified portfolio that effectively hedges Lyndon's power supply costs against the cost of serving load in ISO New England's energy, capacity and ancillary markets. These power supply resources are summarized in Table 3.

Table 3: 2023 Electricity Supply Resources

Resource	2023 MWH	%	Fuel	Exp. Date
Brookfield 2023-2027	12,201	18.9%	Hydro	12/31/27
Chester Solar	1,738	2.7%	System	6/30/39
Fitchburg Landfill	7,497	11.6%	Landfill Gas	12/31/31
HQUS Contract	3,522	5.5%	Hydro	10/31/38
Kruger Hydro	8,828	13.7%	System	12/31/37
Market Contracts	2,352	3.7%	System	Varies
McNeil Facility	5,544	8.6%	Wood	Life of Unit
NYPA Niagara Contract	4,725	7.3%	Hydro	9/1/25
NYPA St. Lawrence Contract	162	0.3%	Hydro	4/30/32
Phase I/II Transmission Facilities	0	0.0%	N/A	Life of Unit
Project #10	178	0.3%	Oil	Life of Unit
Ryegate Facility	1,981	3.1%	Wood	10/31/21
Standard Offer Program	1,511	2.3%	Solar	Varies
Stetson Wind 2023-2027	9,812	15.2%	Wind	12/31/27
Stony Brook Station	73	0.1%	Oil	Life of Unit
Vail & Great Falls Hydro	4,306	6.7%	Hydro	Life of Unit
TOTAL RESOURCES	**64,430**	**100%**		

Total Load Including Losses	66,105			
ISO Exchange (+ Purchase/- Sale)	1,675	2.6%		

Resource Descriptions

The following bullets summarize the essential characteristics of each resource, and in some cases, include notes that describe unique aspects of the resource.

1. **Brookfield Hydro 2023-2027**
   - Size: 8 MW On Peak, 7 MW Off Peak
   - Fuel: Hydro
   - Location: Varies
   - Entitlement: 1.5 MW On Peak, 1.3 MW Off Peak
   - Products: Energy, VT Tier I RECs
   - End Date: 12/31/27

2. **Chester Solar**
   - Size: 4.8 MW
   - Fuel: Solar
   - Location: Chester, MA
   - Entitlement: 29.8% (1.423 MW), PPA
   - Products: Energy, capacity
   - End Date: 6/30/39
   - Notes: The contract does not include the environmental attributes and is listed as system mix in the summary table.

3. **Fitchburg Landfill**
   - Size: 4.5 MW
   - Fuel: Landfill Gas
   - Location: Westminster, MA
   - Entitlement: 24.8%, PPA
   - Products: Energy, capacity, renewable energy credits (MA I)
   - End Date: 12/31/31

4. **Hydro Quebec US (HQUS)**
   - Size: 212 MW
   - Fuel: Hydro
   - Location: Quebec
   - Entitlement: 0.603%, PPA
   - Products: Energy, renewable energy credits (Quebec system mix)
   - End Date: 10/31/38

5. Kruger Hydro

- Size: 6.7 MW
- Fuel: Hydro
- Location: Maine and Rhode Island
- Entitlement: 25.45% (1.730) MW, PPA
- Products: Energy, capacity
- End Date: 12/31/37
- Notes: The Electric Department has an agreement with VPPSA to purchase unit contingent energy and capacity from six hydroelectric generators. The contract does not include the environmental attributes and is listed as system mix in the summary table.

6. Market Contracts

- Size: Varies
- Fuel: New England System Mix
- Location: New England
- Entitlement: Varies (PPA)
- Products: Energy, renewable energy credits
- End Date: Varies, less than 5 years.
- Notes: In addition to the above resources, the Electric Department purchases system power from various other entities under short-term (5 year or less) agreements. These contracts are described as Planned and Market Purchases in the tables below.

7. McNeil Station

- Size: 54 MW
- Fuel: Wood
- Location: Burlington, Vermont
- Entitlement: 3% (1.5 MW), joint-owned through VPPSA
- Products: Energy, capacity, renewable energy credits (CT Class I)
- End Date: Life of Unit
- Notes: As the joint-owner, VPPSA has agreements with the Electric Department to pay for and purchase 3% of the unit's output.

8. New York Power Authority (NYPA)

- Size: 2,675 MW (Niagara), 1,957 MW (St. Lawrence)
- Fuel: Hydro
- Location: New York State
- Entitlement: 0.59 MW (Niagara PPA), 0.037 MW (St. Lawrence PPA)
- Products: Energy, capacity, VT Tier I RECs
- End Date: 4/30/2032
- Notes: NYPA provides hydro power to the Electric Department under two contracts, which will be extended at the end of their term.

9. PUC Rule 4.300 (Standard Offer Program)

- Size: Small renewables, primarily solar < 2.2 MW
- Fuel: Mostly solar, but also some wind, biogas and micro-hydro
- Location: Vermont
- Entitlement: 1.26% (Statutory)
- Products: Energy, capacity, renewable energy credits
- End Date: Varies
- Notes: The Electric Department is required to purchase power from small power producers through the Vermont Standard Offer Program in 2023, in accordance with PUC Rule #4.300. The entitlement percentage fluctuates slightly each year with the Electric Department's pro rata share of Vermont's retail energy sales.

10. Project 10

- Size: 40 MW
- Fuel: Oil
- Location: Swanton, VT
- Entitlement: 19.6% (7.84 MW), joint-owned through VPPSA
- Products: Energy, capacity, reserves
- End Date: Life of unit
- Notes: As the joint-owner, VPPSA has agreements with the Electric Department pay for and purchase 19.6% of the unit's output.

11. Ryegate

- Size: 20.5 MW
- Fuel: Wood
- Location: East Ryegate, VT
- Entitlement: 1.2%, PPA
- Products: Energy, capacity, renewable energy credits (CT Class I)
- End Date: 10/31/2032

12. Stetson Wind 2023-2027

- Size: 57 MW
- Fuel: Wind
- Location: Maine
- Entitlement: 9.3% (PPA)
- Products: Energy, VT Tier I RECs
- End Date: 12/31/2027

13. Stonybrook

- Size: 352 MW
- Fuel: Natural Gas, Oil
- Location: Ludlow, MA
- Entitlement: 0.44%, (1.55 MW), PPA
- Products: Energy, capacity, reserves
- End Date: Life of unit

14. Vail & Great Falls Hydro

- Size: 2.4 MW
- Fuel: Hydro
- Location: Lyndon, VT
- Entitlement: 100%, Owned
- Products: Energy, capacity, renewable energy credits (VT Tier I & II)
- End Date: Life of unit

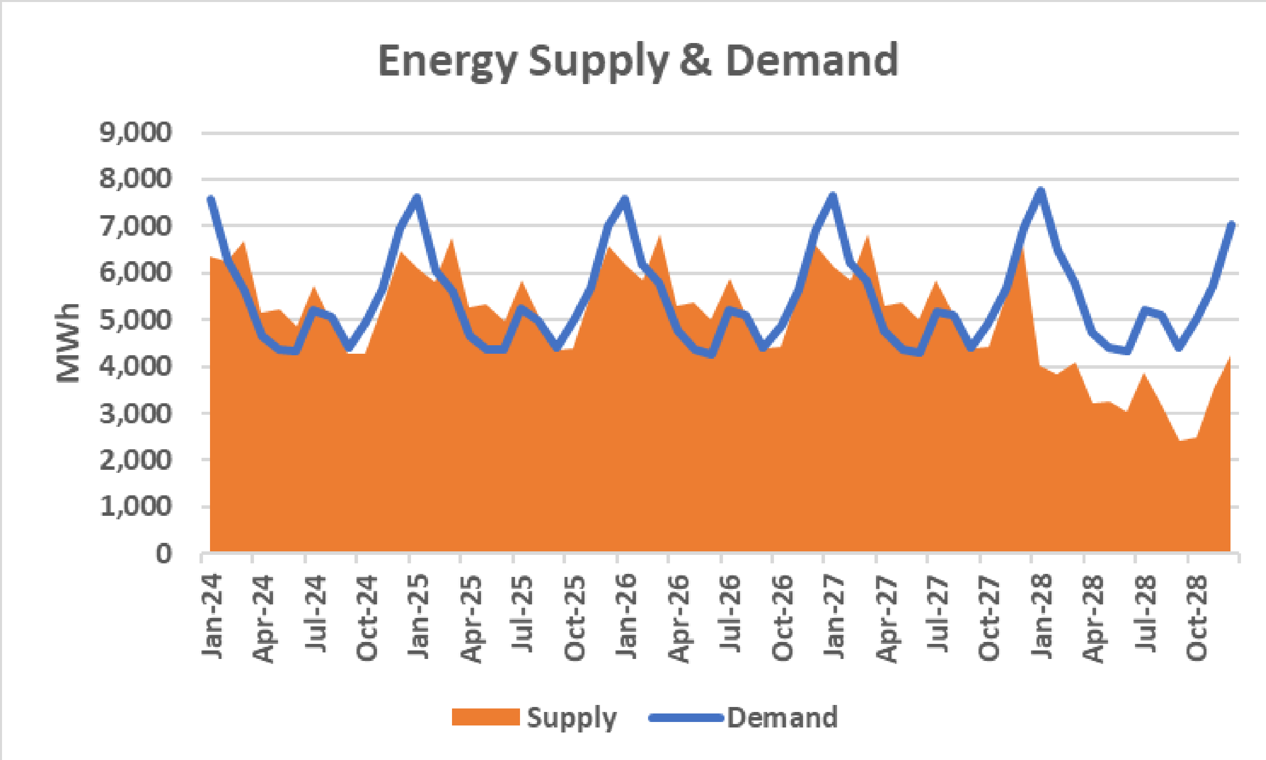
III. Resource Supply & Demand

Energy, capacity and Renewable Energy Credits (RECs) are the primary products that LED needs to manage, and the following sections illustrate the forecasted balance between their supply and their demand over the next five to twenty years.

Energy

Figure 1 shows the current forecast of energy supply and demand for the next five years. A large deficit develops in 2028 due to the expiration of the Brookfield and Stetson contract. That deficit will be filled using the Planned Purchase process described the next section.

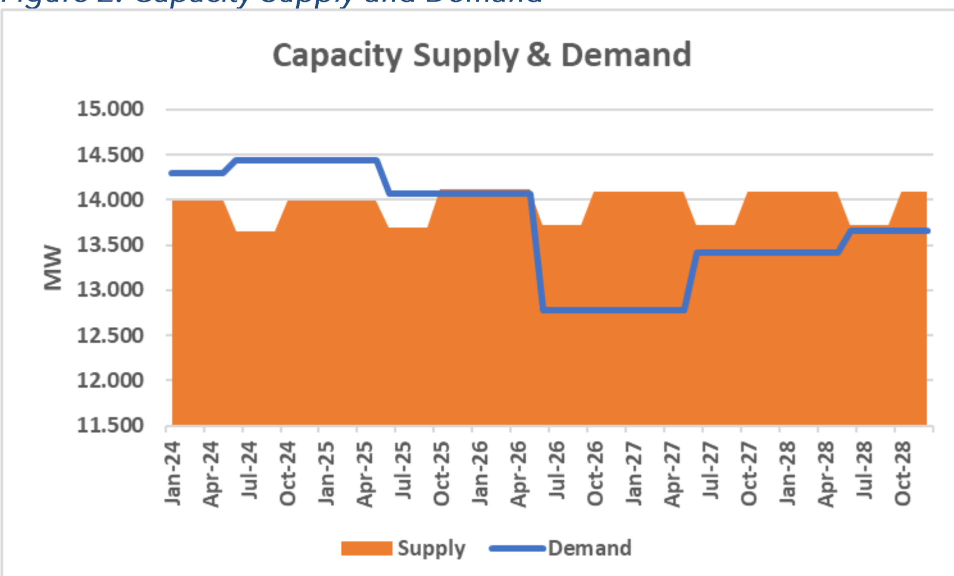
Figure 1: Energy Supply & Demand



Capacity

Figure 2 shows the capacity supply and demand balance for the next five years. The supply is forecasted to be in good alignment with the demand over the next 2.5 years before demand drops quite a bit. This outcome depends on stream flows at the annual coincident peak hour with ISO New England. If conditions are wetter-than-forecast, then the behind-the-meter hydro resources will reduce the demand line. If the conditions are dry then any resulting supply deficit will be fulfilled by ISO New England's Forward Capacity Market.

Figure 2: Capacity Supply and Demand



Renewable Energy Credits

Figure 3 and

Tier II

Lyndon has a deficit of about 850 Tier II RECs in 2024. This increases to about 4,300 RECs in 2032. As a result, additional Tier II RECs and/or resources will be acquired and/or developed to meet the RES requirements.

Figure 4 illustrate LED's need for RECs under Vermont's Renewable Energy Standard (RES).

Tier I

Due to a large Tier I purchase in 2023 that will be banked for use for 2024 compliance as well as the Brookfield and Stetson Wind bundled PPAs, Lyndon will not need to purchase Tier I RECs until 2028. After those PPAs expire in 2028 the deficit of 14,000-36,000 RECs will be filled either with a bundled energy and REC purchase or a REC only purchase.

Figure 3: Vermont Tier I Supply & Demand

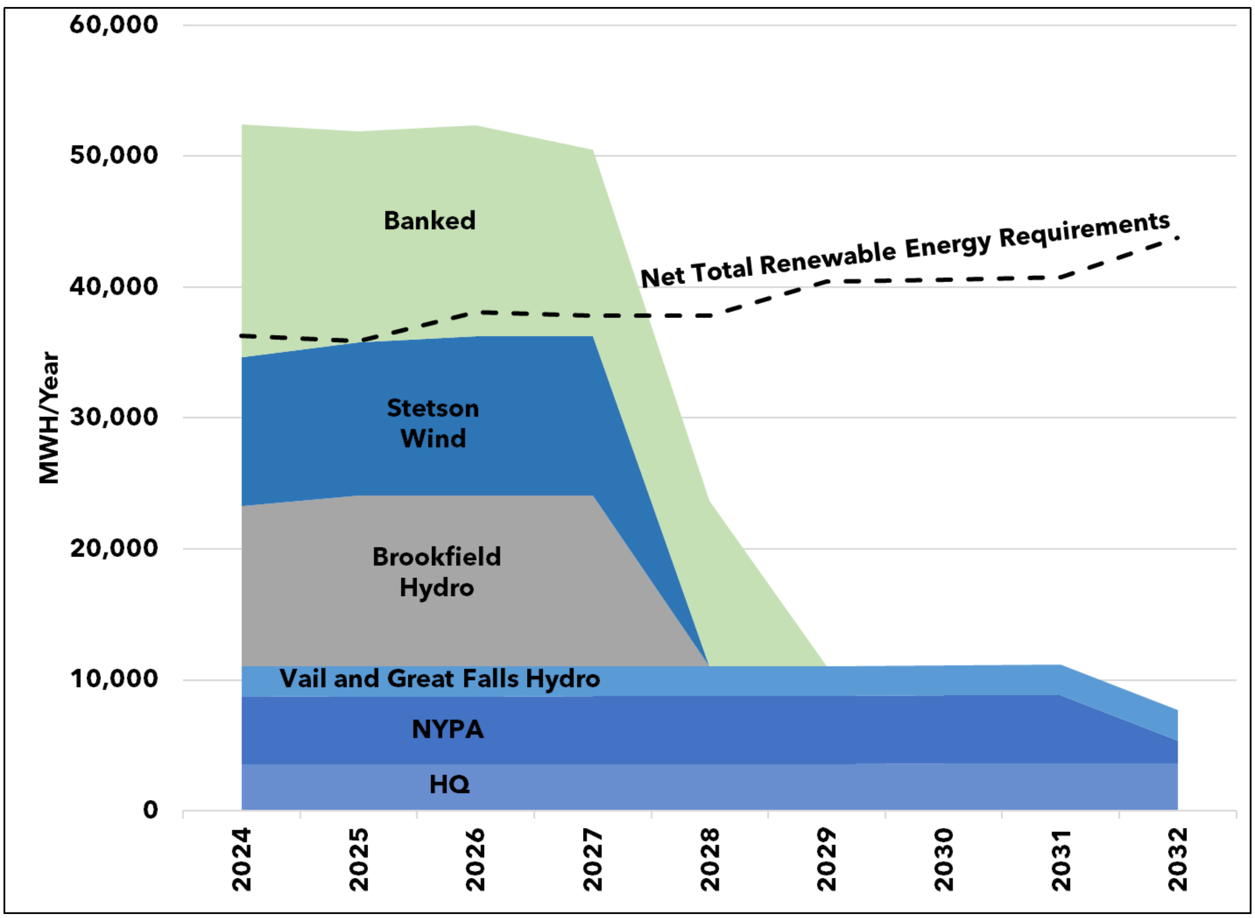


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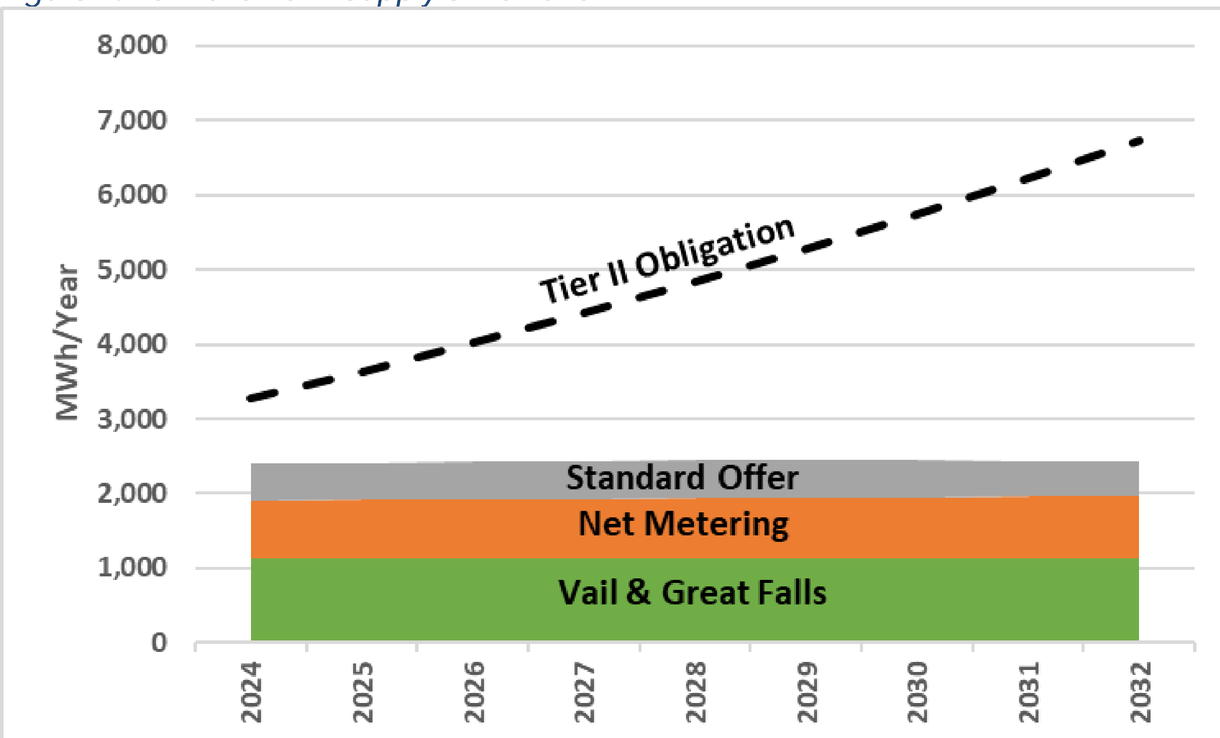
Figure 4: Vermont Tier II Supply & Demand



IV. Anticipated Transactions & Acquisition Strategy

VPPSA anticipates that LED may enter into one or more of the transactions that are listed in Table 4.

Table 4: Anticipated Hedging Transactions

Product	Action	Term	Quantity	Anticipated Price Range	Transaction Anticipated
7x24 Energy	Purchase or Sale	1 month	0-1.4 MW	$26-$95 /MWH	Monthly / Seasonally
On / Off Peak Energy	Purchase	1-60 months	0-1.8 MW	$25-$100 /MWH	Monthly / Seasonally
Long-Term Bundled PPAs	Purchase	5+ years	1.5-5 MW	$30-$70 /MWH	None anticipated.
Capacity	Sale	5+ years	0 MW	$2-$5 /kW-month	None anticipated.
VT Tier I RECs	Purchase	1-5 years	14,000-36,00 MWH/Year	$4 - $10 /MWH	2028
VT Tier II RECs	Purchase	1-5 years	850-4,300 MWH/Year	$35 - $45 /MWH	July 2024

Energy Acquisition Strategy

7x24 Energy

VPPSA's Power Supply Authorities Policy requires that energy supplies be within +/-5% of the forecasted demand in each month of the year. This is known as the hedge ratio, and it is simply the ratio of the forecasted supply to the forecasted demand. Any imbalances between supply and demand are hedged to these levels before the operating month begins. In practice, changes in weather, generator availability and forecast error sometimes combine to push the actual percentage outside of the +/-5% threshold.

The following three-step process is used to balance supply and demand on a monthly basis within the current budget (calendar) year.

1. Update Budget Forecast
   a. The budgeted volumes (MWH) are updated to reflect known changes to demand and supply including unit availability, fuel supply, and hydrological conditions.
2. Hydroelectric Adjustment
   a. Supply is reduced by one standard deviation from the long-term average in order to avoid making sales that could end up being unhedged by supply in the event of a dryer-than-normal month.
3. Execute Purchases or Sales
   a. **Internal Transactions**: VPPSA seeks first to make internal transactions between its members to balance supply and demand. The transactions are designed to result in a hedge ratio that falls within the +/-5% range that is required by VPPSA's Power Supply Authorities Policy.
   b. **External Transactions**: In the event that internal transactions cannot bring LED into the +/-5% range, external transactions are placed with power marketers, either directly or through a broker.
   c. **Price**: For Internal Transactions, the price of the transaction is set by an average of the bid-ask spread as reported by brokers on the date of the transaction. For External Transactions, the price is set through a negotiation with the counterparty.

On / Off Peak Energy

Known within VPPSA as "planned purchases", these transactions are almost always purchases. They typically take place no more than once a year, usually carry a 1-5 year term, and if possible, are executed at a time when market prices are at or below budgeted levels.

These purchases are designed to fit the on and off-peak energy needs in each month of the year as precisely as possible. As a result, they minimize the need for monthly 7x24 hedging transactions under VPPSA's Power Supply Authorities Policy.

The solicitation method is an informal Request for Proposals (RFP), and follows a three-step process.

1. **Pre-Approval Term Sheet:** First, the proposed purchase volumes and anticipated prices are documented in a standardized term sheet. This document is distributed to each VPPSA member for their pre-approval, and it defines their share of the total purchase.

2. **Issue RFP:** Once all of the pre-approvals are received, the term sheet is distributed to three or more power marketers, who are asked to make their best offer by a deadline, typically within 5 business days.

3. **Evaluate & Execute:** When all of the bids are received, VPPSA evaluates them to determine the lowest cost bid, and executes the purchase with that counterparty. Then the purchase is allocated to each VPPSA member according to their pre-approved term sheet, and the data is entered into VPPSA's database for scheduling, delivery and invoice tracking.

Long-Term Bundled PPAs

VPPSA evaluates long-term Purchased Power Agreements (PPAs) for bundled energy, capacity, renewable energy credits, and/or ancillary products on an ongoing basis. There is currently no plan for a long-term PPA, although additional energy contracts will be required once the Brookfield and Stetson contracts expire at the end of 2027. Because long-term PPAs are subject to PUC approval, the acquisition strategy is simply to negotiate the best terms and to make contract execution contingent on PUC approval.

Capacity Acquisition Strategy

Capacity is seldom acquired as a stand-alone product, and because market prices are fixed by the Forward Capacity Market three years in advance of the operating year, there is little opportunity to make short-term (< 5 year) capacity purchases. ISO New England is on track to drastically change the capacity market to a prompt/seasonal market which is likely to alter Lyndon's capacity procurement strategy once the new market details are known. Beyond purchasing capacity, there is short-term opportunity on the demand side. For example, VPPSA forecasts monthly and annual coincident peak loads, and communicates the forecast of the peak day and hour to its members. As a result, all available demand-side actions are taken to reduce capacity requirements. This presently includes maximizing behind-the-meter generation such as load-reducing hydro, and demand response using VPPSA's contract with Virtual Peaker[3], and exploring battery storage for peak shaving.

For long-term (>5 years) capacity purchases, the acquisition strategy is to bundle capacity into negotiations for long-term, bundled PPAs as mentioned in the previous section.

REC Acquisition Strategy

The acquisition strategy has three parts.

1. First, VPPSA completes an analysis of Tier I and Tier II requirements before or during the annual REC trading period. Because REC banking is limited to three years, the analysis never calls for purchasing more RECs than can be used during that time frame.

2. Second, broker quotes are compared to the Alternative Compliance Payment and budgeted REC prices to decide when to purchase RECs.

3. VPPSA may purchase smaller volumes of Tier I RECs toward the close of quarter 4 if prices are lower than budget.

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[3] More information on Virtual Peaker can be found on their website at https://www.virtual-peaker.com/.

Generation and Transmission Facility Transactions

Generation

VPPSA continues to work with Encore Renewables to develop Tier II qualifying solar projects within its members service territories.

Transmission

LED does not anticipate any transmission facility transactions in the coming year.

Waiver Request

In accordance with Rule 5.204, LED requests a waiver of the notification for short-term transactions that will be subject to after-the-fact reporting, pursuant to Rule 5.206(A). These transactions could be up to five years in nature and are designed to either hedge LED's short-term exposure or maximize short-term value of existing resources. LED anticipates seeking individual waivers of any longer-term purchases as otherwise required by Rule 5.200, if necessary.