

## 2023 Resource Report

# Village of Ludlow Electric Light Department

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**Submitted to:**

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

**Revision Submitted on:**

February 28, 2024

**Submitted by:**

Vermont Public Power Supply Authority  
on behalf of the Village of Ludlow Electric Light Department  
in fulfillment of Vermont Public Utility Commission Rule 5.206(B)



## Overview & Introduction

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

The information contained in this report describes LED’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 LED’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.

## Electricity Demand

In 2023, LED's energy requirements<sup>1</sup> ("Load") totaled 53,966,028 kWh, and its coincident annual peak with ISO-NE was 7,897 kW on September 7<sup>th</sup> at hour ending 18. As shown in Table 1, LED's energy requirements have fluctuated up to 8% per year while its peak loads<sup>2</sup> have fluctuated up to 20%. These fluctuations are a function of LED's two largest customers, Okemo and Imerys, whose operations have a large impact on LED's loads.

*Table 1: Historical Loads*

Year	Load (kWh)	% Change	Peak Load (kW)	% Change
2019	59,477,242		8,269	
2020	54,666,204	-8.1%	6,681	-19.2%
2021	54,919,795	0.5%	6,005	-10.1%
2022	58,234,173	6%	6,566	9.3%
2023	53,966,028	7.3%	7,897	20.3%

LED'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	57,303,957		7,975	
2025	57,424,127	0.2%	8,055	1%
2026	57,670,217	0.4%	8,136	1%
2027	57,974,891	0.5%	8,217	1%
2028	58,437,486	0.8%	8,299	1%

Assuming normal weather, loads (kWh) are forecast to increase by up to 0.8% per year. Peak loads (kW) are expected to increase by 1.0% per year.

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<sup>1</sup> LED's energy requirements ("Load") account for 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 LED's Real-Time Load Obligation (RTLO) with ISO New England.

<sup>2</sup> Peak Load is defined as the annual coincident peak with ISO New England and is based on RTLO.

## Electricity Supply

LED's power supply is made up of owned generation, long-term contracts and short-term contracts. The resources in LED'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 LED'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	17,520	30.2%	Hydro	12/31/27
Chester Solar	1,534	2.6%	System	6/30/39
Fitchburg Landfill	5,151	8.9%	Landfill Gas	12/31/31
HQUS Contract	2,535	4.4%	Hydro	10/31/38
Kruger Hydro	6,691	11.5%	System	12/31/37
Market Contracts	9,410	16.2%	System	Varies
McNeil Facility	3,696	6.4%	Wood	Life of Unit
NYPA Niagara Contract	3,113	5.4%	Hydro	9/1/25
NYPA St. Lawrence Contract	108	0.2%	Hydro	4/30/32
Phase I/II Transmission Facilities	0	0.0%	N/A	Life of Unit
Project #10	91	0.2%	Oil	Life of Unit
Ryegate Facility	1,645	2.8%	Wood	10/31/21
Standard Offer Program	1,254	2.2%	Solar	Varies
Stetson Wind 2023-2027	5,203	9.0%	Wind	12/31/27
Stony Brook Station	88	0.2%	Oil	Life of Unit
<b>TOTAL RESOURCES</b>	<b>58,038</b>	<b>100.0%</b>		

Total Load Including Losses	53,966			
ISO Exchange (+ Purchase/- Sale)	-4,072	-7.0%		

## 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: 2 MW On Peak, 2 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: 26.3% (1.26 MW), PPA
- Products: Energy, capacity
- End Date: 6/30/39
- Notes: The contract does not include the environmental attributes and appears as system mix in the summary table.

### 3. Fitchburg Landfill

- Size: 4.5 MW
- Fuel: Landfill Gas
- Location: Westminster, MA
- Entitlement: 17.035%, 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: 0.434 MW, 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: 19.29%, 1.29 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 appears 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

- Size: 54 MW
- Fuel: Wood
- Location: Burlington, Vermont
- Entitlement: 2%, 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 1.2% 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: 0.3911 MW (Niagara PPA), 0.0249 MW (St. Law. PPA)
- Products: Energy, capacity, VT Tier I RECs
- End Date: 4/30/32
- Notes: NYPA provides hydro power to the Electric Department under two contracts, which will be extended at the end of their term.

**9. Project 10**

- Size: 40 MW
- Fuel: Oil
- Location: Swanton, VT
- Entitlement: 10% (4 MW) 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 4.7% of the unit's output.

**10. Ryegate**

- Size: 20.5 MW
- Fuel: Wood
- Location: East Ryegate, VT
- Entitlement: 1.0146% PPA
- Products: Energy, capacity, renewable energy credits (CT Class I)
- End Date: 10/31/2032

**11. 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: 1.0401% (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.

**12. Stetson Wind 2023-2027**

- Size: 57 MW
- Fuel: Wind
- Location: Maine
- Entitlement: 4.91% (PPA)
- Products: Energy, VT Tier I RECs
- End Date: 12/31/27

### 13. Stony Brook Station

- Size: 352 MW
- Fuel: Natural Gas, Oil
- Location: Ludlow, MA
- Entitlement: 0.5283%, (1.86 MW), PPA
- Products: Energy, capacity, reserves
- End Date: Life of unit

## Resource Supply & Demand

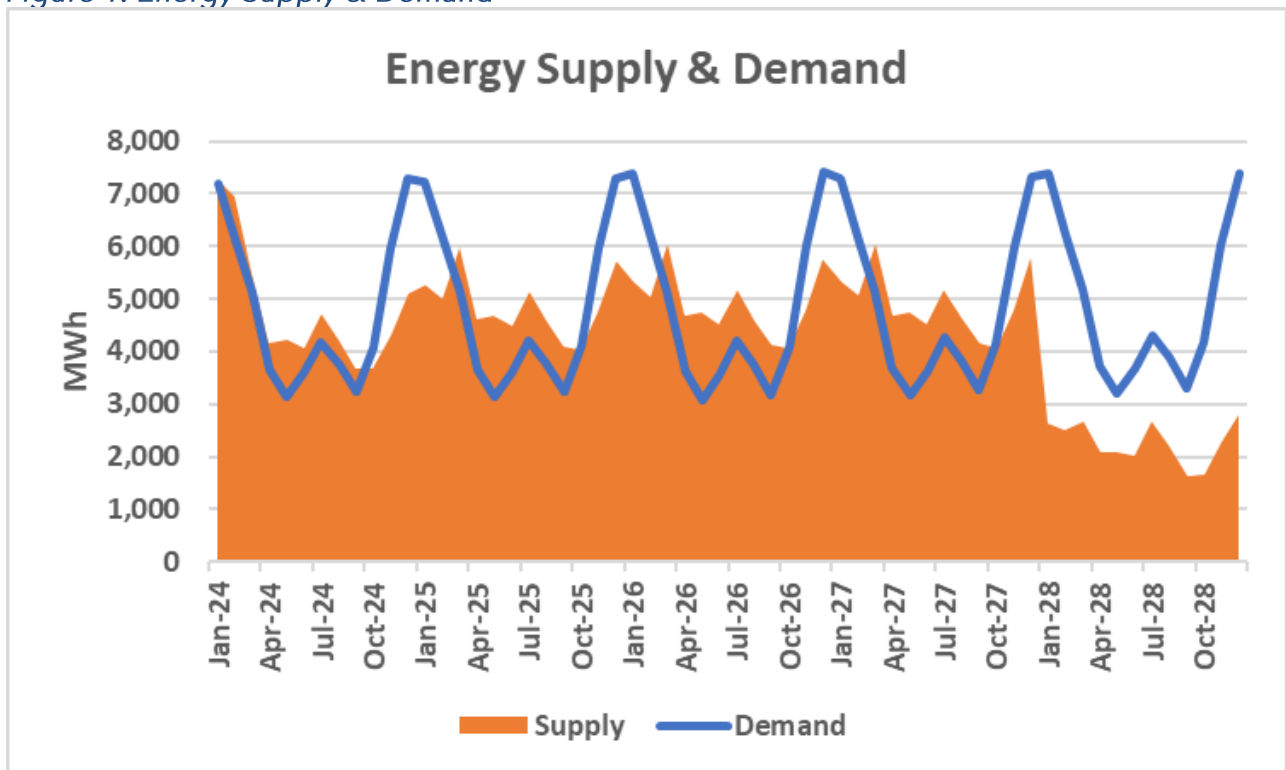
Energy, capacity and Renewable Energy Credits (RECs) are the primary products that LED needs to manage, and the following sections illustrate the forecasted balance between their supply and their demand over the next five to twenty years.

### Energy

Figure 1 shows the current forecast of energy supply and demand for the next five years. The forecast shows a deficit that fluctuates monthly with the operation of Okemo Mountain Resort. A significant deficit doesn't occur until 2028 when the Brookfield and Stetson contracts expire. There is an open position in the winter months due to the resort, which will be hedged in a month to month energy purchase based on weather forecasts.



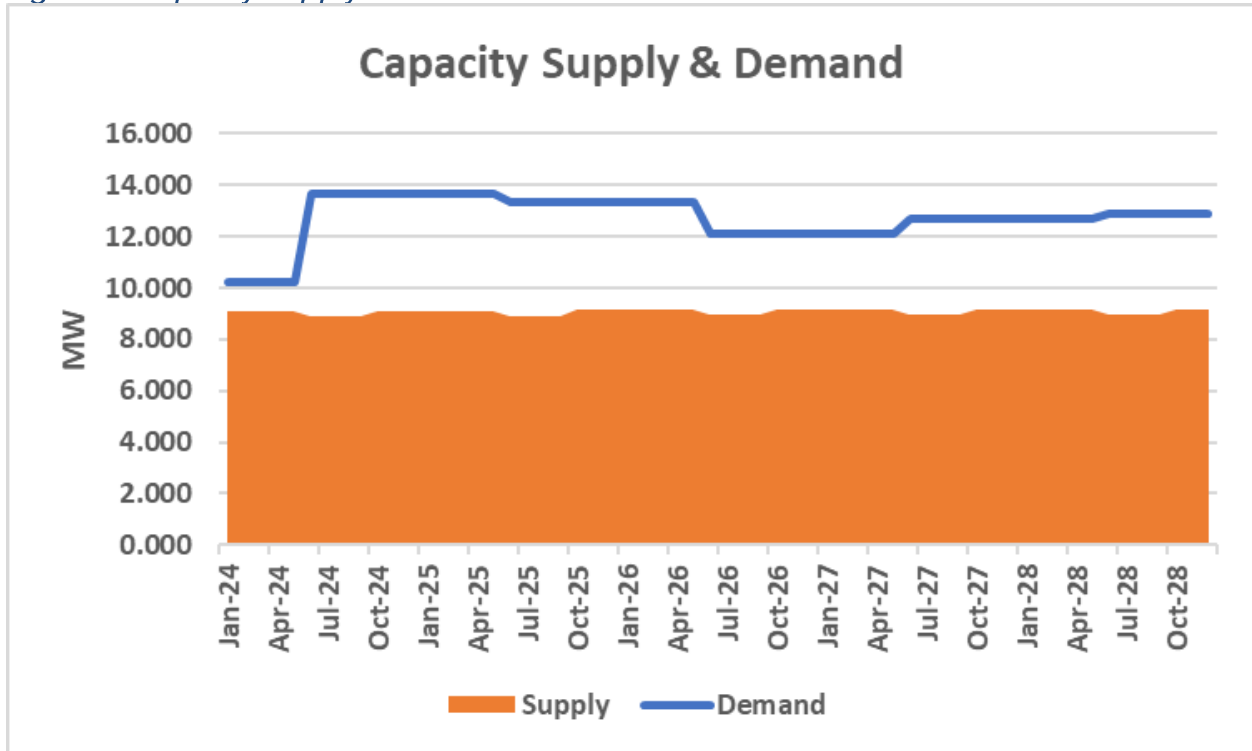
Figure 1: Energy Supply & Demand



## Capacity

Figure 2 shows the capacity supply and demand relatively balanced for the next two years and then there's forecasted to be a deficit of about 10-35%. LED's capacity supply deficit will be fulfilled by ISO New England's Forward Capacity Market. Capacity prices bottomed out in 2023 and have increased minimally through the majority of the forecast period.

Figure 2: Capacity Supply and Demand



# Renewable Energy Credits

*Figure 3 and*

**Tier II**

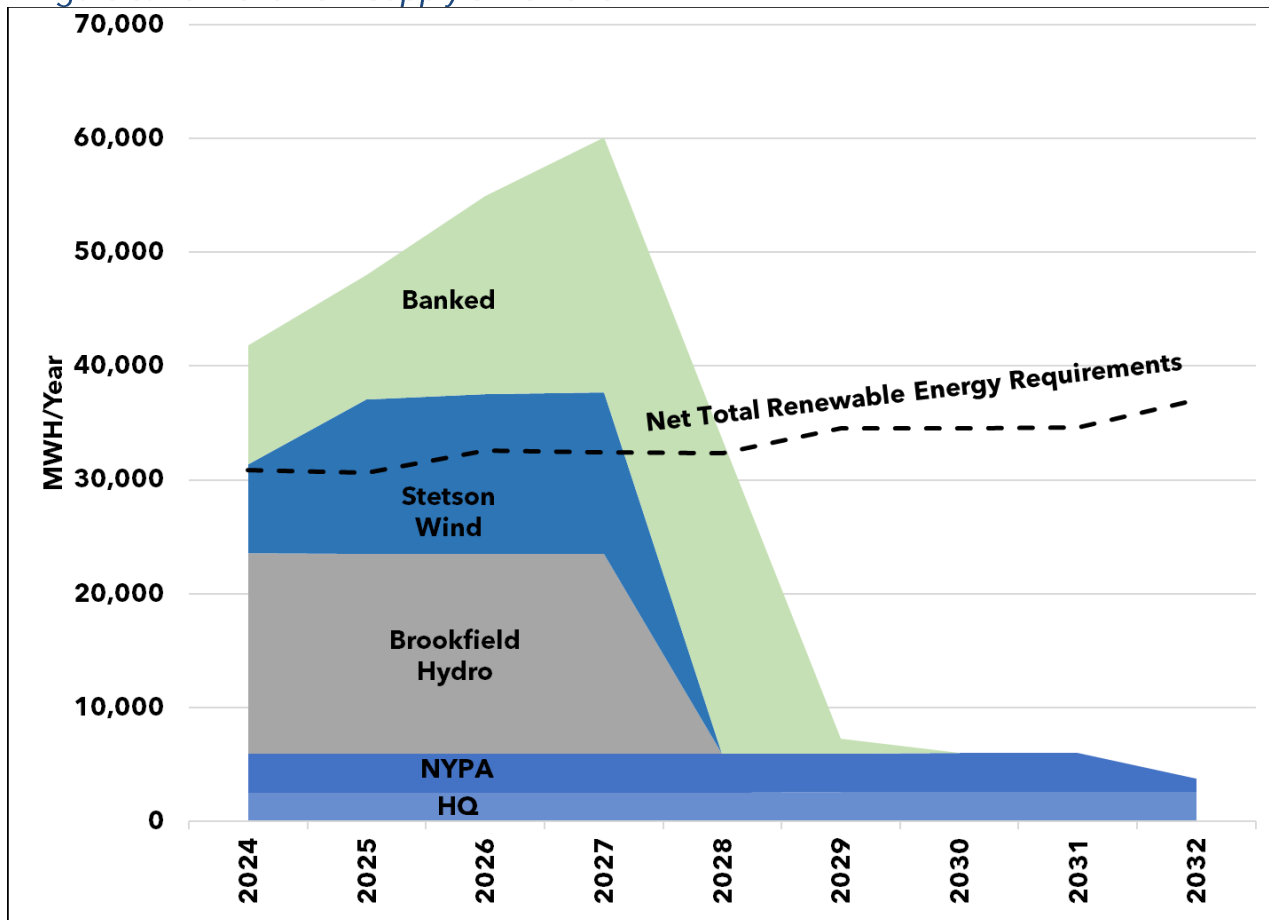
LED anticipated purchasing 2,300 - 5,200 MWH/year of Tier II RECs through 2032. In addition, LED expects to participate in the development of a Tier II qualified resource, mostly likely a solar PPA.

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 5 year Brookfield and Stetson PPAs, Ludlow anticipates banking RECs through 2028. After 2028, Ludlow will have a deficit ranging from 27,000-33,000 through 2032. The deficit will be filled either with a bundled energy and REC purchase or a REC only purchase.

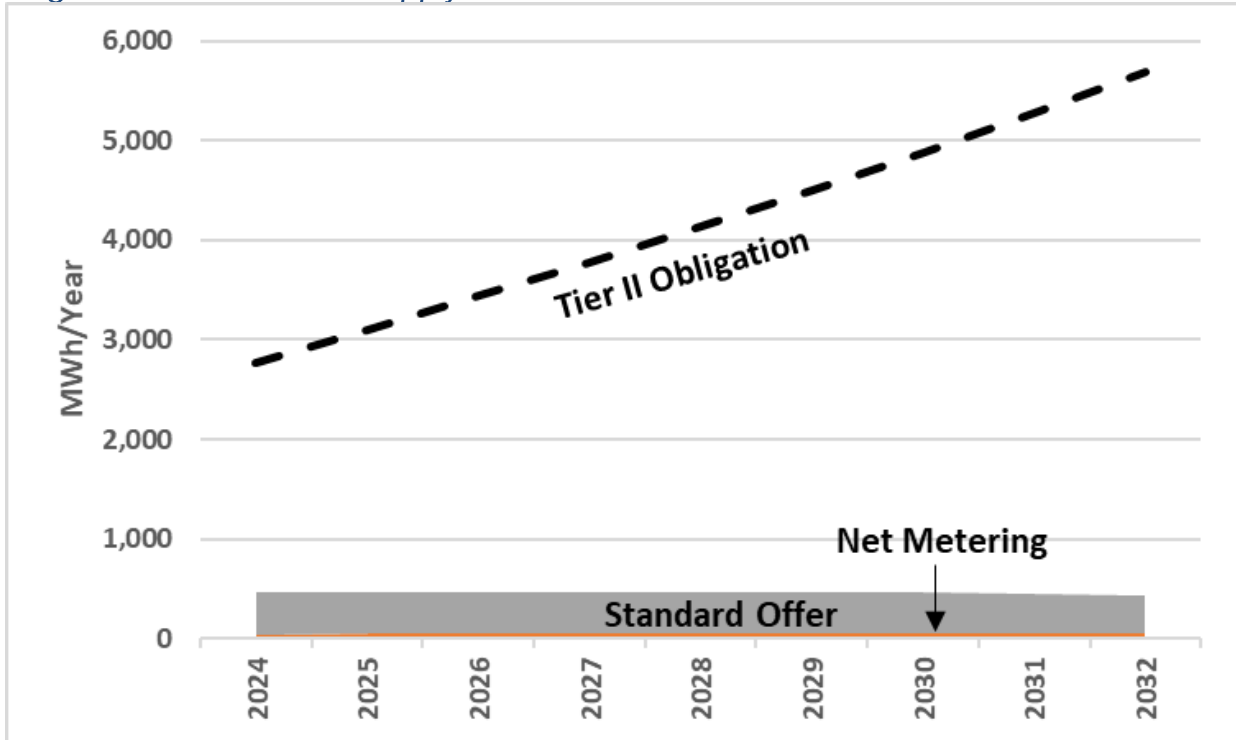
*Figure 3: Vermont Tier I Supply & Demand*



### Tier II

LED anticipated purchasing 2,300 - 5,200 MWh/year of Tier II RECs through 2032. In addition, LED expects to participate in the development of a Tier II qualified resource, mostly likely a solar PPA.

*Figure 4: Vermont Tier II Supply & Demand*



## 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	0-1.7 MW	\$26-\$95 /MWH	Monthly / Seasonally
On / Off Peak Energy	Purchase	1-60 months	0-2.1 MW	\$25-\$100 /MWH	Monthly / Seasonally
Long-Term Bundled PPAs	Purchase	5+ years	0-2.5 MW	\$30-\$70 /MWH	None anticipated.
Capacity	Purchase	5+ years	0 MW	\$2-\$5 /kW-month	None anticipated.
VT Tier I RECs	Purchase	1-5 years	27,000-33,000 MWH/Year	\$4 - \$10 /MWH	2028
VT Tier II RECs	Purchase	1-5 years	2,300 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 BVED'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 demand response using VPPSA's contract with Virtual Peaker<sup>3</sup>, 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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<sup>3</sup> 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. Because LED expects to have a deficit of Tier II RECs for the coming five years, LED may choose to develop and/or participate in a solar project in the coming year(s).

### Transmission

Ludlow 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.