# CALEDONIA COUNTY, VT

**Bioeconomy Development Opportunity Zone**

# RATING GRADE: 'A'

**Date of Issue: June 21, 2024**

**A**
**High Quality**

## Rating Parameters:

| Category | Rated Quantity | Delivered Price | BDO Zone Size |
|---|---|---|---|
| **Pulpwood** | **500,000 bdt/yr** | **$117-$135/bdt** | **75-mi drive** |
| **Forest Residues** | **120,000 bdt/yr** | **$66-$100/bdt** | **distance from** |
| **Sawmill Residues** | **106,000 bdt/yr** | **$50-$135/bdt** | **Lyndonville, VT** |

## BDO ZONE ASSETS

- Closure of biomass power plants and pulp mills freed large amounts of biomass and supply chain capacity that can be available for a new project.
- Forestry remains a long-established and robust industry in the BDO Zone, despite the closure of regional pulp mills.
- Forestry supply chains well-established and efficient for commercial quantities of pulpwood, sawmill residues, and forest residues.

## BDO ZONE LIABILITIES

- Act 250 likely to add uncertainty, cost, and lengthy review process for new bio-based projects.
- Strained forest residue supply chain due to market prices at or below production costs.
- Severe and increasingly frequent floods have had a negative economic effect on logging contractors.
- Logging company ownership and management is aging and may face difficulties with the transfer of ownership upon retirement.

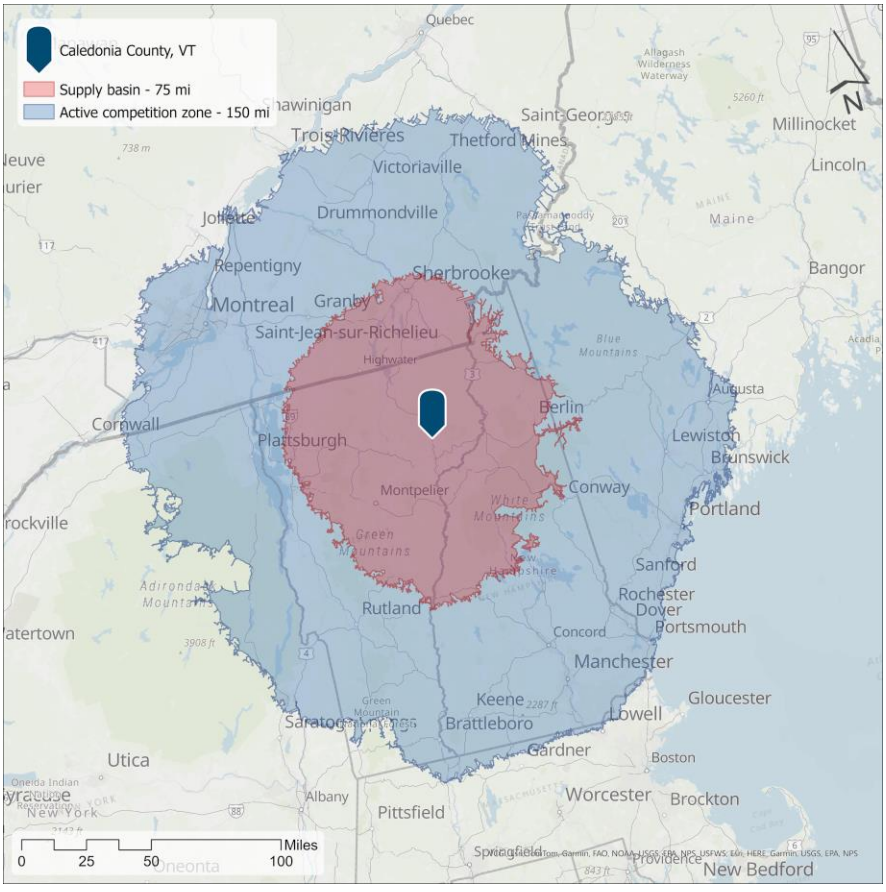
## RATING GRADE

**The Caledonia County, VT, Bioeconomy Development Opportunity Zone, is rated 'A', or 'low' risk.**

Risk Rating Grades are defined as follows: AAA (extremely low), AA (very low), A (low), BBB (low-moderate), BB (moderate), B (moderate-high), and C (high).

'A' ratings denote high prospective viability of Feedstock Supply and Infrastructure and low expectations of default risk in the Zone. Capacity to support new biobased plant operations is considered strong. This capacity may, nevertheless, be more vulnerable to uncertainty in the permitting process, opposition to large-scale biomass power plants, flooding hazards, and aging management in logging companies than is the case for higher ratings.

## CALEDONIA COUNTY, VERMONT BDO ZONE






BD OZ BIOECONOMY DEVELOPMENT OPPORTUNITY ZONE INITIATIVE

## ANALYST NOTES

In this risk rating assessment, we determine the availability and pricing of three types of woody biomass, including pulpwood, forest residues, and sawmill residues. The estimated rated quantity for future biomass projects is the low-risk quantity after considering current competition, supply chain constraints (e.g., operational, accessibility, and market dynamics), and data/model uncertainty. The rated pricing is the expected price that future biomass projects are likely to pay to secure the rated quantity.

Our analysis indicates that a potential of 500,000 bdt/yr of pulpwood, representing approximately 30% of the total available unutilized pulpwood in the BDO Zone, can be feasibly sourced for a new project at low risk. Around 25% of generated forestry residues, amounting to 120,000 bdt/yr, can also be sourced at low risk. Furthermore, considering the current consumption rates in the Competition Zone, it is projected that 30% of produced sawmill residues, equivalent to 106,000 bdt/yr, from the 17 identified sawmills within the BDO Zone can be procured at low risk for utilization in a new project. We expect the rated quantities of woody biomass to be available at a price range of $117-$135 per bdt for pulpwood, $66-$100 per bdt for forest residues, and $50-$135 per bdt for sawmill residues.

In addition to the rated quantity and pricing, the BDO Zone's suitability to accommodate future biomass projects was assessed against 10 supplier risks, 10 competition risks, 46 supply chain risks, 2 feedstock scale-up risks, and 20 infrastructure risks. We found 2 high-risk indicators, which were attributed to natural gas availability at the industrial site and labor costs, and 29 medium-risk indicators related to the infrastructure and supply chain scale-up, particularly biomass harvesting, permitting, and transportation. The other 53 risk indicators are low/very low risks, which can be considered assets. Most low-risk indicators are associated with the stable forest industry, supply, and infrastructure for woody biomass in the BDO Zone. A summary of main assets (very low/low risks) and liabilities (medium/high risks) are discussed in the following sections.

The demand for woody biomass from the BDO Zone was estimated at 769,000 bdt/yr and was driven by six primary consumer markets: combined heat and power (CHP), biopower, bioheat, wood pellet, firewood, and pulp and paper. There are 21 competitor facilities in the Competition Zone. Biomass power plants and pulp and paper facilities consume the vast majority (80%) of biomass supplied from the BDO Zone.

### BDO ZONE ASSETS

Consumption within the Competition Zone declined by 28%, or 1.7 million bdt/yr, from 2011 due to plant closures and production curtailments. In the first quarter of 2024, the 75 MW biomass power plant in Berlin, NH, which at capacity consumes upwards of 420,500 bdt/yr of low-grade wood, had filed for bankruptcy. The trending decline of pulpwood consumption has freed the supply that could be available for a new project.

Forestry is a long-established industry in the BDO Zone, with suppliers operating for an average of 55 years. Modern planting, growing, harvesting, and collection practices have been applied consistently in the BDO Zone.

Supply chains of pulpwood, forest residues, and sawmill residues are well-organized. Despite the closure of regional pulp mills, the forestry sector in the BDO Zone remains robust. Demand from large biomass power plants continues to drive significant pulpwood and forest residue harvesting. Concentration yards process and distribute chipped pulpwood for biomass power plants and pulp and paper facilities. Regional contractors specialize in integrated operations and mobile chipping, enhancing operational efficiency and adaptability.

Outreach with local logging operators suggested that harvesting and delivering the rated quantity of pulpwood and forest residues of 620,000 bdt/yr to a new project in Lyndonville was realistic. Much of the equipment and experience relevant to woody biomass supply chains is already in the region. Equipment includes 20 - 30 mobile chippers and approximately 300 logging operators who typically own one to three trucks.

### BDO ZONE LIABILITIES

Act 250 in Vermont is designed to evaluate development proposals against ten specific criteria, such as ecology, community well-being, and aesthetics. A long review process, inconsistencies in enforcement, and subjective evaluation criteria are perceived as obstacles to advancing

new bio-based projects. However, the proposed industrial site has an existing Act 250 master permit, allowing for potentially shorter permitting timelines.

According to local experts, if forest residue prices remain below the cost of loading, comminution, and transportation, the structural integrity of the forest residue supply chain could be at risk. This ongoing situation has strained the supply chain, causing some logging companies to shut down or exit the industry altogether.

Flooding is the most common recurring hazard event in the BDO Zone, with increasing intensity and severity in recent years. In July 2023, Caledonia County's economy incurred the second-highest economic loss among affected counties. Significant supply chain disruptions occurred, resulting in eight weeks of delayed log deliveries and a 70% drop in wood products sales. Several sawmills faced wood shortages lasting more than a week, while log truckers dealt with reduced work availability and extended travel times. Proponents of a new project should not underestimate the flooding challenges in the BDO Zone and implement effective risk management and safeguards.

The BDO Zone faces an imminent shortage of loggers, with the average age approaching 50. The region provides job-specific training centers and vocational schools for the forestry industry, including access to programs like the Vermont Forest Products Program, LEAP, Master Logger, and NNU Center for Professional Studies.

### INFRASTRUCTURE PROFILE

The project site is situated in the St. Johnsbury/Lyndon Industrial Park, a 7.7-acre greenfield lot, 2.5 miles south of Lyndonville, near the intersection of Interstate 91 and US Route 5. Access to Interstate 91 is crucial for the western part of Vermont, while US Route 2 runs east-west routes across Vermont.

The project site has on-site utilities, including 3-phase power, potable water, fire hydrants, sewer, stormwater system, and a paved roadway. The industrial park benefits from an established Act 250 master permit, enabling tenants to seek amendments within the existing framework. This presents the potential for expedited permitting processes, reducing associated timelines.

The industrial park lots are zoned commercial/industrial, with other zoning classes within proximity, including commercial, residential, and industrial. Other lots are available within the industrial park or in the vicinity, allowing for expansion.

## SCORING & RATING METHODOLOGY

In assessing the biomass supply chain risk for the Bioeconomy Development Opportunity (BDO) Zone, 88 Risk Indicators from the US Standards for Biomass Supply Chain Risk (BSCR) were applied. These BDO Zone Risk Indicators are the subset of BSCR Risk Indicators applicable to evaluating feedstock risk within a BDO Zone.

Feedstock quantities are expressed in bone dry tons per year (bdt/yr), while feedstock costs are expressed in United States dollars (USD). Maximum transport distance is based on a 75-mile driving distance from the center point (Lyndonville, VT).

The BDO Zone rating is based on an aggregation of the scores assigned to each BDO Zone Risk Indicator (RI) assessed in this report. First, each BDO Zone Risk Indicator is given a **Raw Risk Likelihood (RRL)** score, which denotes the likelihood of a risk to future BDO Zone projects due to the Risk Indicator. RRL Scores are scaled as either very low (2), low (4), medium (6), high (8), or very high (10).

Each BDO Zone Risk Indicator is given a **Raw Risk Impact (RRI)** score, which denotes the impact on a future BDO Zone project due to the Risk Indicator. RRI scores are scaled as either very low (2), low (4), medium (6), high (8), or very high (10). Impact level scores are based on the impact level of a risk on the successful development and deployment of a BDO Zone project with no mitigation measures.

The **Gross Risk Indicator (GRI)** score is then calculated as the product of the RRL and the RRI scores. For example, if the 'Competitor Price and Price Sensitivity' is scored at an RRL of 2 and an RRI of 8, then the GRI for this risk indicator is 2 X 8 = 16.

If the analyst deems that a typical bio-based project could implement economically reasonable measures or best practices that mitigate the likelihood (RRL), the impact (RRI), or both, then the GRI will be notched accordingly.

The **Loaded RI** score for each Risk Indicator is the product of the GRI score and any notched scores. Loaded RIs are the final score for a Risk Indicator.

Loaded RI scores of 4 or less are deemed very low risk; scores between 5 and 16 are deemed low risk; scores between 17 and 36 are deemed medium risk; scores between 37 and 64 are deemed high risk; and scores of 65 and greater are deemed very high risk.

The total risk rating for the BDO Zone is the average of all Loaded RI scores and Infrastructure Indicators. The BDO Zone score for Caledonia County, VT, is ***22.31 out of 100, resulting in an 'A' designation.***

All scoring and rationale for each Risk Indicator are provided in Section C.

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**Peter Corey** – President, North Country Investment Corporation

## SECTION A: RISK INDICATOR SUMMARY

**Figure A-1. Average Loaded RI Scores for Each Risk Factor**

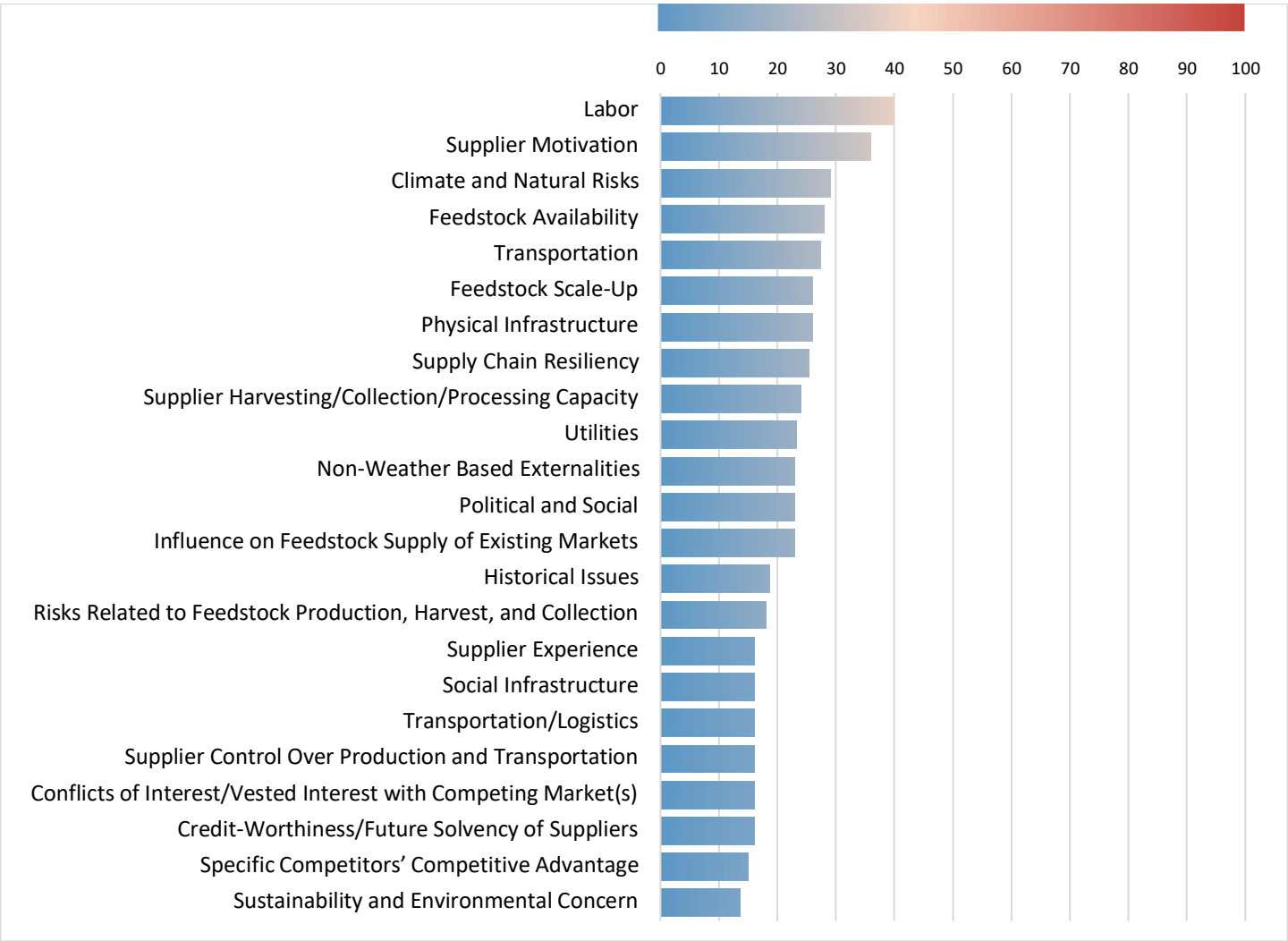
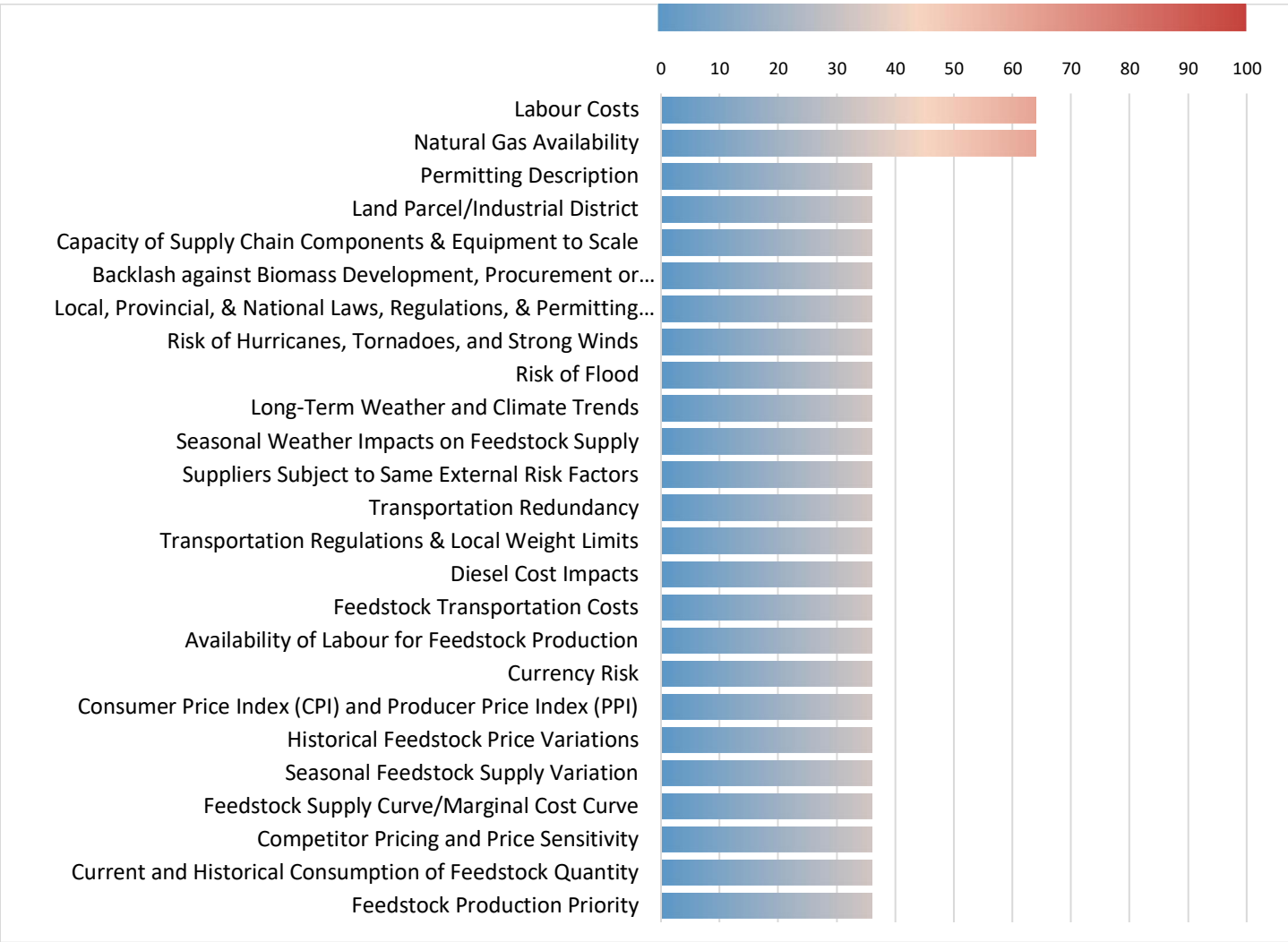


**Figure A-2. Highest Risk Indicators**



## Table A-1. Risk Indicators and Associated Scores

| Feedstock Supply Chain Risk Indicators | Raw Risk Likelihood | Raw Risk Impact | Gross Risk Indicator | Mitigation /Notching | Loaded RI Score |
|---|---|---|---|---|---|
| **Category 1.0: Supplier Risk** | | | | | |
| ***1.1 Risk Factor: Credit-Worthiness/Future Solvency of Suppliers*** | | | | | |
| 1.1.1 Longevity & History of Supplier Performance | 4 | 4 | 16 | NN | 16 |
| ***1.2 Risk Factor: Conflicts of Interest/Vested Interest with Competing Market(s)*** | | | | | |
| 1.2.1 Suppliers' Dependence on, or Preference for, Competing Market(s) | 4 | 4 | 16 | NN | 16 |
| ***1.3 Risk Factor: Supplier Control Over Production and Transportation*** | | | | | |
| 1.3.1 Ownership of Land/Means of Production | 4 | 4 | 16 | NN | 16 |
| 1.3.2 Ownership of Equipment | 4 | 4 | 16 | NN | 16 |
| 1.3.3 Ownership of Transportation/Logistics | 4 | 4 | 16 | NN | 16 |
| 1.3.4 Feedstock as a Secondary Transformation | 4 | 4 | 16 | NN | 16 |
| ***1.4 Risk Factor: Supplier Experience*** | | | | | |
| 1.4.1 Fundamental Feedstock Production Experience | 4 | 4 | 16 | NN | 16 |
| 1.4.2 Production Scale Experience | 4 | 4 | 16 | NN | 16 |
| ***1.5 Risk Factor: Supplier Harvesting/Collection/Processing Capacity*** | | | | | |
| 1.5.1 Supplier's Equipment Efficiency | 4 | 6 | 24 | NN | 24 |
| ***1.6 Risk Factor: Supplier Motivation*** | | | | | |
| 1.6.1 Feedstock Production Priority | 6 | 6 | 36 | NN | 36 |
| **Category 2.0: Competitor Risk** | | | | | |
| ***2.1 Risk Factor: Influence on Feedstock Supply of Existing Markets*** | | | | | |
| 2.1.1 Competitor Locations and Overall Geographic Influence | 6 | 6 | 36 | 50% | 18 |
| 2.1.2 Current and Historical Consumption of Feedstock Quantity | 6 | 6 | 36 | NN | 36 |
| 2.1.3 Competitor Pricing and Price Sensitivity | 6 | 6 | 36 | NN | 36 |
| 2.1.4 Impacts of Future Demand on Feedstock Availability and Price by Current Competitors | 4 | 4 | 16 | NN | 16 |
| 2.1.5 Soft Supply Influence of Existing Markets | 4 | 4 | 16 | NN | 16 |
| 2.1.6 Temporary Market-Driven Markets | 4 | 4 | 16 | NN | 16 |
| ***2.2 Risk Factor: Specific Competitors' Competitive Advantage*** | | | | | |
| 2.2.1 Relative Inventory Capacity | 4 | 4 | 16 | NN | 16 |
| 2.2.2 Relative Accessibility/Delivery Hours and Wait Times | 2 | 2 | 4 | NN | 4 |
| 2.2.3 Relative Specification Advantages | 4 | 4 | 16 | NN | 16 |
| 2.2.4 Demand for Competitors' Products | 6 | 4 | 24 | NN | 24 |
| **Category 3.0: Supply Chain Risk** | | | | | |
| ***3.1 Risk Factor: Feedstock Availability*** | | | | | |
| 3.1.1 Biomass Availability Multiple (BAM) | 4 | 6 | 24 | NN | 24 |
| 3.1.2 Feedstock Supply Curve/Marginal Cost Curve | 6 | 6 | 36 | NN | 36 |
| 3.1.3 Seasonal Feedstock Supply Variation | 6 | 6 | 36 | NN | 36 |
| 3.1.4 Year-to-Year Variation in Feedstock Availability | 4 | 4 | 16 | NN | 16 |
| ***3.2 Risk Factor: Historical Issues*** | | | | | |
| 3.2.1 Historical Feedstock Price Variations | 6 | 6 | 36 | NN | 36 |
| 3.2.2 Low Historical Demand for Feedstock in the BDO Zone | 2 | 2 | 4 | NN | 4 |
| 3.2.3 History of Production/Feedstock is a New/Secondary Crop or a By-Product | 4 | 4 | 16 | NN | 16 |
| ***3.3 Risk Factor: Non-Weather Based Externalities*** | | | | | |
| 3.3.1 Consumer Price Index (CPI) and Producer Price Index (PPI) | 6 | 6 | 36 | NN | 36 |
| 3.3.2 Currency Risk | 6 | 6 | 36 | NN | 36 |
| 3.3.3 Border Risk | 4 | 4 | 16 | NN | 16 |
| 3.3.4 Temporary Externality-Driven Markets for Feedstock | 2 | 2 | 4 | NN | 4 |
| ***3.4 Risk Factor: Risks Related to Feedstock Production, Harvest, and Collection*** | | | | | |
| 3.4.1 Harvest & Collection Practices & Schedules | 4 | 4 | 16 | NN | 16 |
| 3.4.2 Harvesting & Collection Equipment | 4 | 4 | 16 | NN | 16 |
| 3.4.3 Variation in Densification Methods Among Different Suppliers | 2 | 2 | 4 | NN | 4 |
| 3.4.4 Availability of Labor for Feedstock Production | 6 | 6 | 36 | NN | 36 |
| ***3.5 Risk Factor: Transportation*** | | | | | |
| 3.5.1 Feedstock Transportation Costs | 6 | 6 | 36 | NN | 36 |
| 3.5.2 Diesel Cost Impacts | 6 | 6 | 36 | NN | 36 |
| 3.5.3 Transport of Feedstock Requires Specialized Equipment | 4 | 4 | 16 | NN | 16 |
| 3.5.4 Delivery Routes through Local Communities | 4 | 4 | 16 | NN | 16 |
| 3.5.5 Transportation Regulations & Local Weight Limits | 6 | 6 | 36 | NN | 36 |
| 3.5.6 Road Infrastructure | 4 | 4 | 16 | NN | 16 |
| 3.5.7 Transportation Redundancy | 6 | 6 | 36 | NN | 36 |
| ***3.6 Risk Factor: Supply Chain Resiliency*** | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 3.6.1 Size, Number, and Location of Suppliers | 4 | 4 | 16 | NN | 16 |
| 3.6.2 Suppliers Subject to Same External Risk Factors | 6 | 6 | 36 | NN | 36 |
| 3.6.3 Land Ownership Structures | 6 | 4 | 24 | NN | 24 |
| ***3.7 Risk Factor: Climate and Natural Risks*** | | | | | |
| 3.7.1 Seasonal Weather Impacts on Feedstock Supply | 6 | 8 | 48 | 25% | 36 |
| 3.7.2 Long-Term Weather and Climate Trends | 6 | 6 | 36 | NN | 36 |
| 3.7.3 Forest/Crop Fire | 4 | 4 | 16 | NN | 16 |
| 3.7.4 Risk of Infestation | 4 | 8 | 32 | NN | 32 |
| 3.7.5 Risk of Hail | NR | NR | NR | NR | NR |
| 3.7.6 Risk of Flood | 8 | 6 | 48 | 25% | 36 |
| 3.7.7 Risk of Drought | 4 | 6 | 24 | NN | 24 |
| 3.7.8 Risk of Hurricanes, Tornadoes, and Strong Winds | 6 | 6 | 36 | NN | 36 |
| 3.7.9 Risk of Low Temperatures | 4 | 4 | 16 | NN | 16 |
| ***3.8 Risk Factor: Political and Social*** | | | | | |
| 3.8.1 Government Subsidies for Feedstock Production or Utilization | 4 | 4 | 16 | NN | 16 |
| 3.8.2 Local, Provincial, & National Laws, Regulations, & Permitting pertaining to Biomass | 8 | 6 | 48 | 25% | 36 |
| 3.8.3 Backlash against Biomass Development, Procurement or Usage in the BDO Zone | 8 | 8 | 64 | 44% | 36 |
| 3.8.4 Consent of, and Cooperation with, Indigenous Communities and First Nations | 2 | 2 | 4 | NN | 4 |
| 3.8.5 Food Security Concerns | NR | NR | NR | NR | NR |
| ***3.9 Risk Factor: Sustainability and Environmental Concern*** | | | | | |
| 3.9.1 Feedstock Sustainability | 4 | 4 | 16 | NN | 16 |
| 3.9.2 Risk to Soil Quality | 4 | 4 | 16 | NN | 16 |
| 3.9.3 Risk to Surface and Groundwater | 4 | 4 | 16 | NN | 16 |
| 3.9.4 Water Use | NR | NR | NR | NR | NR |
| 3.9.5 Pesticide Risk to Human and Ecosystem Health | 2 | 2 | 4 | NN | 4 |
| 3.9.6 Risk to Wildlife and Landscape | 4 | 4 | 16 | NN | 16 |
| 3.9.7 Biomass Classified as Genetically Modified Organism (GMO) | NR | NR | NR | NR | NR |
| **Category 4.0: Feedstock Scale-up Risk** | | | | | |
| ***4.1 Risk Factor: Feedstock Scale-Up*** | | | | | |
| 4.1.1 Feedstock Quality at Production Scale | 4 | 4 | 16 | NN | 16 |
| 4.1.2 Capacity of Supply Chain Components & Equipment to Scale | 6 | 6 | 36 | NN | 36 |
| **Category 5.0: Infrastructure** | | | | | |
| ***5.1 Risk Factor: Physical Infrastructure*** | | | | | |
| 5.1.1 Land Parcel/Industrial District | 6 | 6 | 36 | NN | 36 |
| 5.1.2 Ownership of Land | 4 | 4 | 16 | NN | 16 |
| 5.1.3 Permitting Description | 8 | 6 | 48 | 25% | 36 |
| 5.1.4 Environmental Issues | 4 | 4 | 16 | NN | 16 |
| ***5.2 Risk Factor: Utilities*** | | | | | |
| 5.2.1 Natural Gas Availability | 8 | 8 | 64 | NN | 64 |
| 5.2.2 Electric Availability | 4 | 4 | 16 | NN | 16 |
| 5.2.3 Water Availability | 2 | 2 | 4 | NN | 4 |
| 5.2.4 Waste Disposal | 4 | 4 | 16 | NN | 16 |
| 5.2.5 Internet Availability | 4 | 4 | 16 | NN | 16 |
| ***5.3 Risk Factor: Transportation/Logistics*** | | | | | |
| 5.3.1 Roads/Highways Access | 4 | 4 | 16 | NN | 16 |
| 5.3.2 Rail Access to Site | 4 | 4 | 16 | NN | 16 |
| 5.3.3 Airport Access to Site | 4 | 4 | 16 | NN | 16 |
| 5.3.4 Water Freight Access | 4 | 4 | 16 | NN | 16 |
| ***5.4 Risk Factor: Social Infrastructure*** | | | | | |
| 5.4.1 Healthcare (Local) | 4 | 4 | 16 | NN | 16 |
| 5.4.2 Education (Schools) | 4 | 4 | 16 | NN | 16 |
| 5.4.3 Local Transportation | 4 | 4 | 16 | NN | 16 |
| 5.4.4 Public Safety (Local) | 4 | 4 | 16 | NN | 16 |
| 5.4.5 Housing/Cost of Living | 4 | 4 | 16 | NN | 16 |
| ***5.5 Risk Factor: Labor*** | | | | | |
| 5.5.1 Workforce | 4 | 4 | 16 | NN | 16 |
| 5.5.2 Labor Costs | 8 | 8 | 64 | NN | 64 |
| | | | | ***Average*** | **22.31** |

# SECTION B: BIOMASS AVAILABILITY AND PRICING

This section assesses the availability and pricing of woody biomass as feedstock for bioenergy, biofuels, and other bio-based products in Caledonia County, Vermont, as a BDO Zone region with Lyndonville, VT, as the center point.

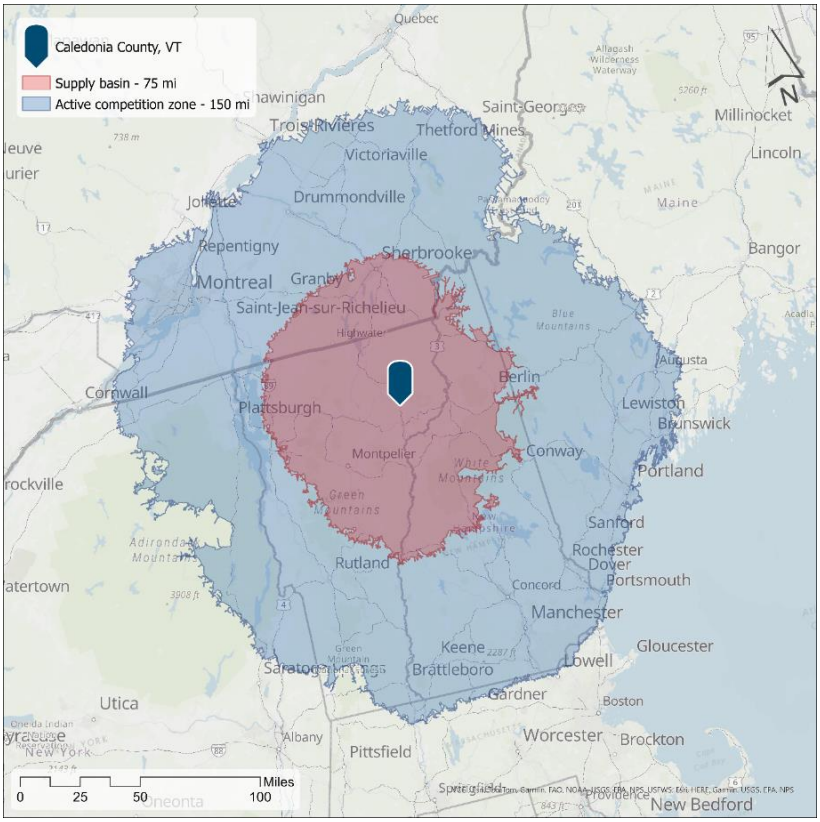
## OVERVIEW

Map B-1 delineates the Caledonia BDO Zone and its corresponding Competition Zone, encompassing regions across Vermont, New Hampshire, and the Province of Quebec in Canada. The BDO Zone is characterized by a drive distance of 75 miles from the central point (Lyndonville, VT), serving as the primary source location for biomass procurement in a forthcoming project. The Competition Zone extends to a driving distance of 150 miles from the BDO Zone center, representing the geographical area where biomass users compete for biomass generated in the BDO Zone.

In this risk rating assessment, we determine the availability and pricing of three types of woody biomass, including pulpwood, forest residues, and sawmill residues. The estimated rated quantity for future biomass projects is the low-risk quantity. The rated pricing is the expected price that future biomass projects are likely to pay to secure the rated quantity.

The rated feedstock quantities were calculated by estimating the potential amount of each biomass type within the Caledonia BDO Zone and subtracting the expected demand for biomass in the Competition Zone. A Biomass Availability Multiple (BAM) was then applied to further reduce these amounts based on informed supply chain constraints (e.g., operational, accessibility, and market constraints). The resulting rated feedstock quantities are conservative, low-risk estimates of availability for new projects. The price range for each biomass type was determined through market analysis and confirmed and/or adjusted by outreach.

**Map B-1. Caledonia County BDO Zone and Competition Zone with Lyndonville as Center Point**



## EVALUATED FEEDSTOCKS

The following three biomass types were evaluated:

**Pulpwood:** Roundwood produced from small diameter trees between 5 in and 11 in diameter at breast height (DBH)[1] used in manufacturing paper, paperboard, oriented strand board (OSB), medium-density fiberboard (MDF), wood pellets, boxes, pallets, landscape ties, and various other wood products.

**Forest residues:** By-products or leftover materials resulting from forestry operations, such as timber harvesting and thinning. They consist of branches, tops, and other woody debris that remain on-site after the merchantable timber is harvested.

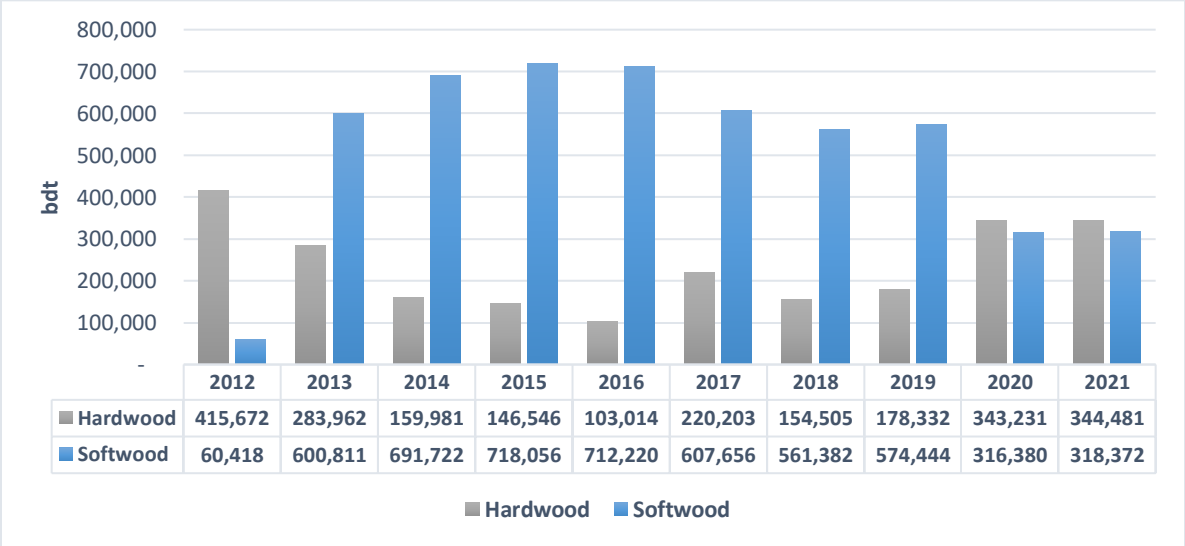
**Sawmill residues:** by-products of sawmill operations, produced from converting sawlogs into lumber and engineered wood. About half of the sawlog volume is converted into finished wood products, and the remaining portion is comprised of wood chips, sawdust, shavings, and bark (also known as hog fuel).

## SUPPLY ANALYSIS

### *Pulpwood*

Historically, the Caledonia BDO Zone has supplied a significant volume of pulpwood to the local industry (Figure B-1). Annual pulpwood removals dropped by 25%, from 860,000 bdt/yr in 2015 and 2016 to 660,000 bdt/yr in 2021.[2] Figure B-1 shows how softwoods used to be the prevalent pulpwood species removed from 2015 to 2016, while in 2021, both pulpwood and hardwood species were equally harvested. Throughout the ten-year horizon (2012-2021), pulpwood removals constituted approximately 40% of the total roundwood removals in the BDO Zone.[3] Significant mill and power plant closures accounted for the wide variability of softwood removals between 2012 and 2020. Most notable were the shutdowns of four biomass power plants in New Hampshire between 2018 and 2020 and the Great Northern Paper Company mill in Millinocket, Maine, in 2011, a major player in global pulp production.

**Figure B-1. Pulpwood Harvest Removals by Species in the BDO Zone**




| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|---|---|---|---|---|
| Hardwood | 415,672 | 283,962 | 159,981 | 146,546 | 103,014 | 220,203 | 154,505 | 178,332 | 343,231 | 344,481 |
| Softwood | 60,418 | 600,811 | 691,722 | 718,056 | 712,220 | 607,656 | 561,382 | 574,444 | 316,380 | 318,372 |

[1] DBH is the diameter outside the bark of the tree's stem measured at a point 4½ feet above the ground (extension.psu.edu/downloadable/download/sample/sample_id/13070/)

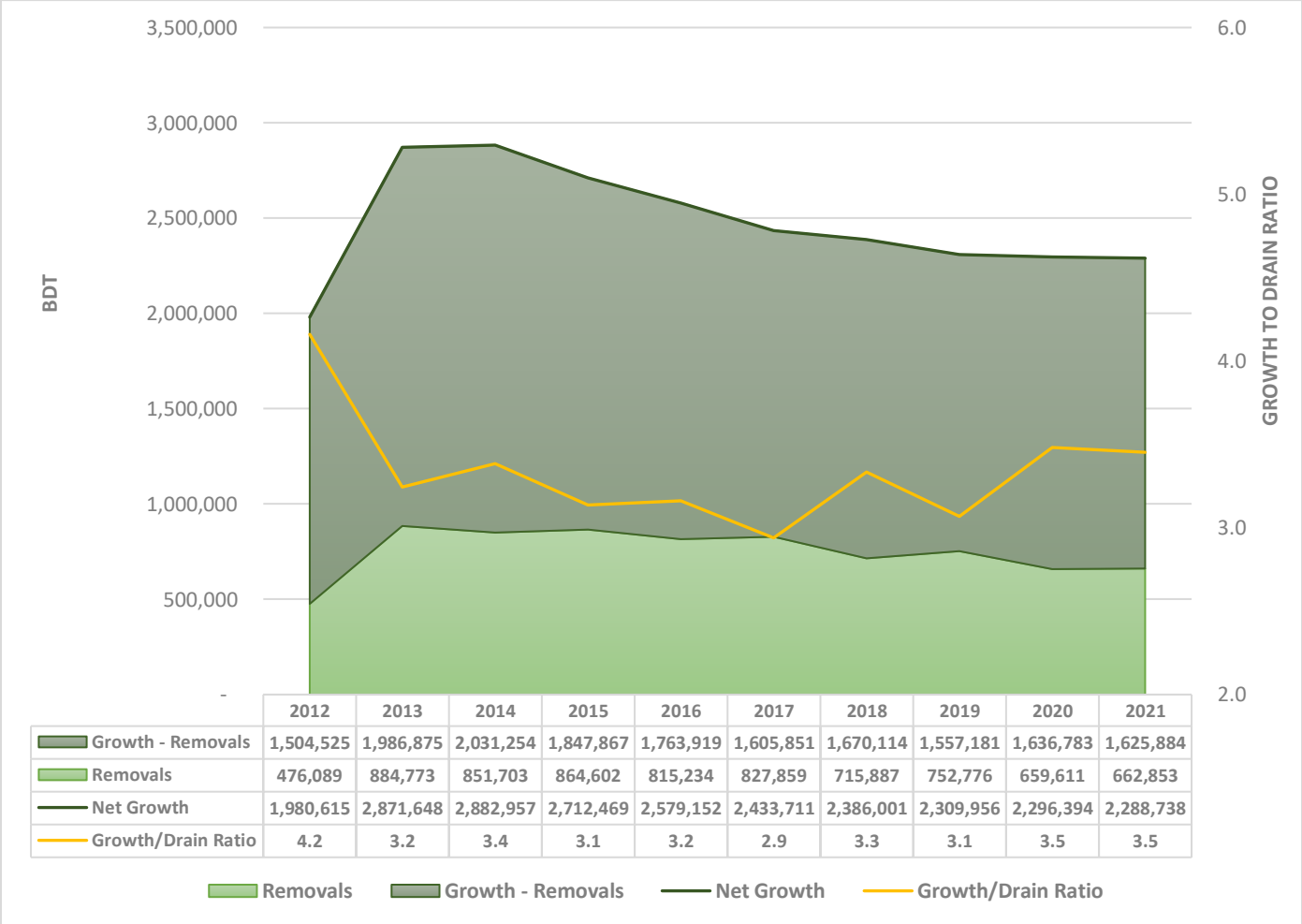
[2] fpr.vermont.gov/harvest-reports

[3] Ibid.

Figure B-2 illustrates annual net growth, removals, and growth-to-drain ratio in the BDO Zone.[4] Both the annual net growth of pulpwood-sized trees and removals decreased slightly since 2013; however, the resulting growth-to-drain ratios[5] increased slightly from 3.2 to 3.5. Overall, the high growth-to-drain ratio indicates the high availability of pulpwood in the BDO Zone for future biomass projects. To maintain a healthy forest, the growth-to-drain ratio should be at least 1.2.

Assuming that the same net growth and removal values are maintained, it is safe to assume that approximately **1.6 million bdt/yr** of pulpwood (70/30 hardwood/softwood proportion) could be technically available for a new project. However, sustainable harvesting practices constrain harvesting the entire technically available pulpwood quantity (i.e., net growth minus removals). A third of this quantity, or **500,000 bdt/yr,** would most likely provide a realistic and practical opportunity for a new pulpwood customer in the Caledonia BDO Zone while maintaining a sustainable growth-to-drain ratio above 1.5.

**Figure B-2. FIA Historical Pulpwood Net Growth, Removals, and Growth-to-Drain Ratios for Pulpwood in the Caledonia BDO Zone**




| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|---|---|---|---|---|
| Growth - Removals | 1,504,525 | 1,986,875 | 2,031,254 | 1,847,867 | 1,763,919 | 1,605,851 | 1,670,114 | 1,557,181 | 1,636,783 | 1,625,884 |
| Removals | 476,089 | 884,773 | 851,703 | 864,602 | 815,234 | 827,859 | 715,887 | 752,776 | 659,611 | 662,853 |
| Net Growth | 1,980,615 | 2,871,648 | 2,882,957 | 2,712,469 | 2,579,152 | 2,433,711 | 2,386,001 | 2,309,956 | 2,296,394 | 2,288,738 |
| Growth/Drain Ratio | 4.2 | 3.2 | 3.4 | 3.1 | 3.2 | 2.9 | 3.3 | 3.1 | 3.5 | 3.5 |

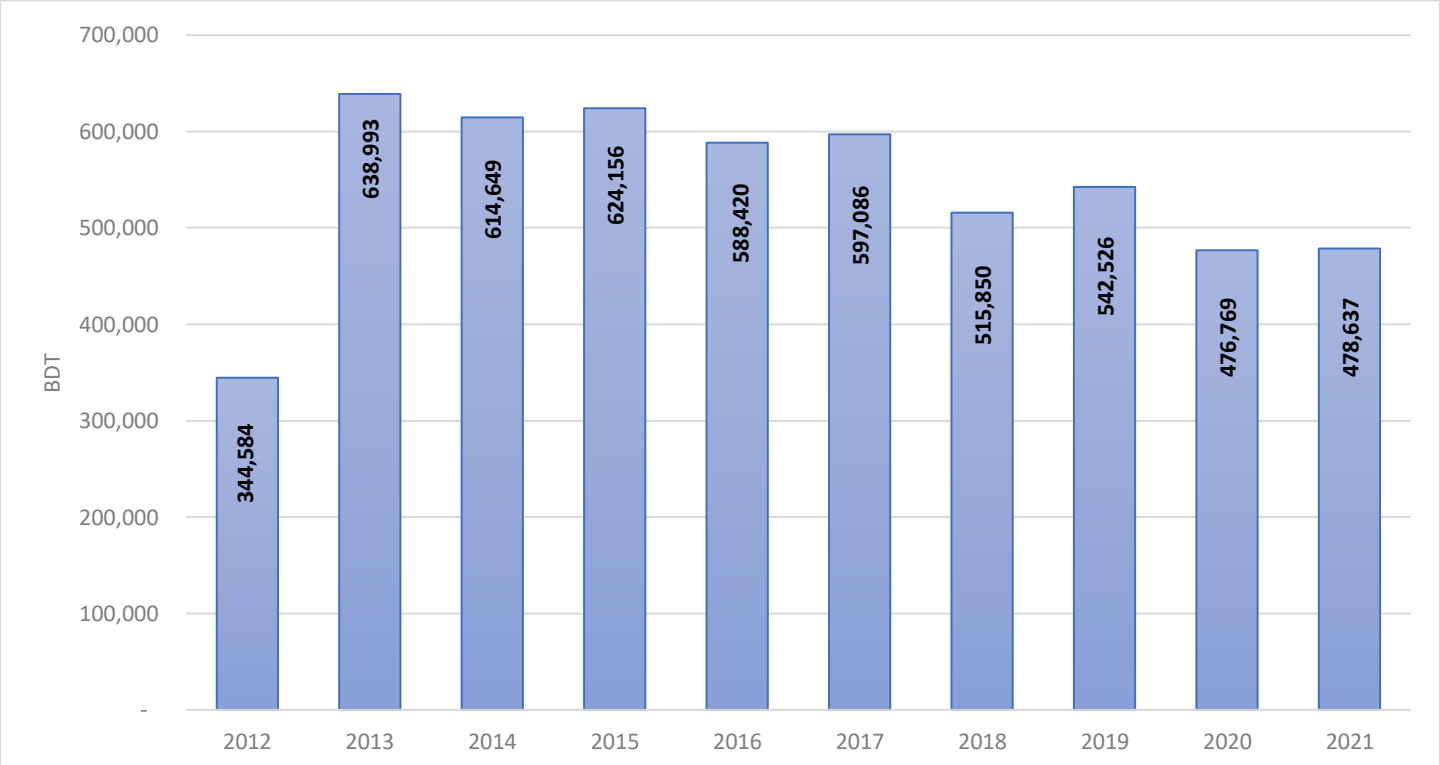
[4] apps.fs.usda.gov/fiadb-api/evalidator

[5] Ratio between the annual net growth and annual removal. A growth to drain ration above 1.2 indicates healthy, sustainable harvesting practices.

### *Forest Residues*

Figure B-3 shows the historical generation of forest residues in the Caledonia BDO Zone using an average waste factor of 0.29.[6] Assuming a similar forest residue volume will be generated today, approximately **480,000 bdt/yr** could be technically available in the BDO Zone. However, considering that the vast majority of forest residues are not harvested and utilized and in-wood chipping/grinding will require significant investments and/or scale-up efforts, it would be safe to assume that only a quarter or **120,000 bdt/yr** would be available to a new project. This quantity could increase significantly if a new project would encourage forest residue utilization.

**Figure B-3. Historical Forest Residue Quantities Produced in the Caledonia BDO Zone**




[6] The waste factor is the ratio between the weight of forest residues and weight of harvested timber. A waste factor of 0.29 for the Caledonia BDO Zone was applied from www.nvda.net/files/SuttonBurkeSiteFeasibilityStudyAllPhasesJune2009FINAL.pdf

### *Sawmill Residues*

There are 17 sawmills ranging in annual capacity between 5 MMBF and 80 MMBF located in or close vicinity to the BDO Zone (Map B-2). The vast majority of sawmills are located more than 55 miles from Lyndonville, VT, which indicates a potential increase in transportation costs to ship sawmill residues to Lyndonville, the center of the BDO Zone.

**Map B-2. Sawmills in the Caledonia BDO Zone**

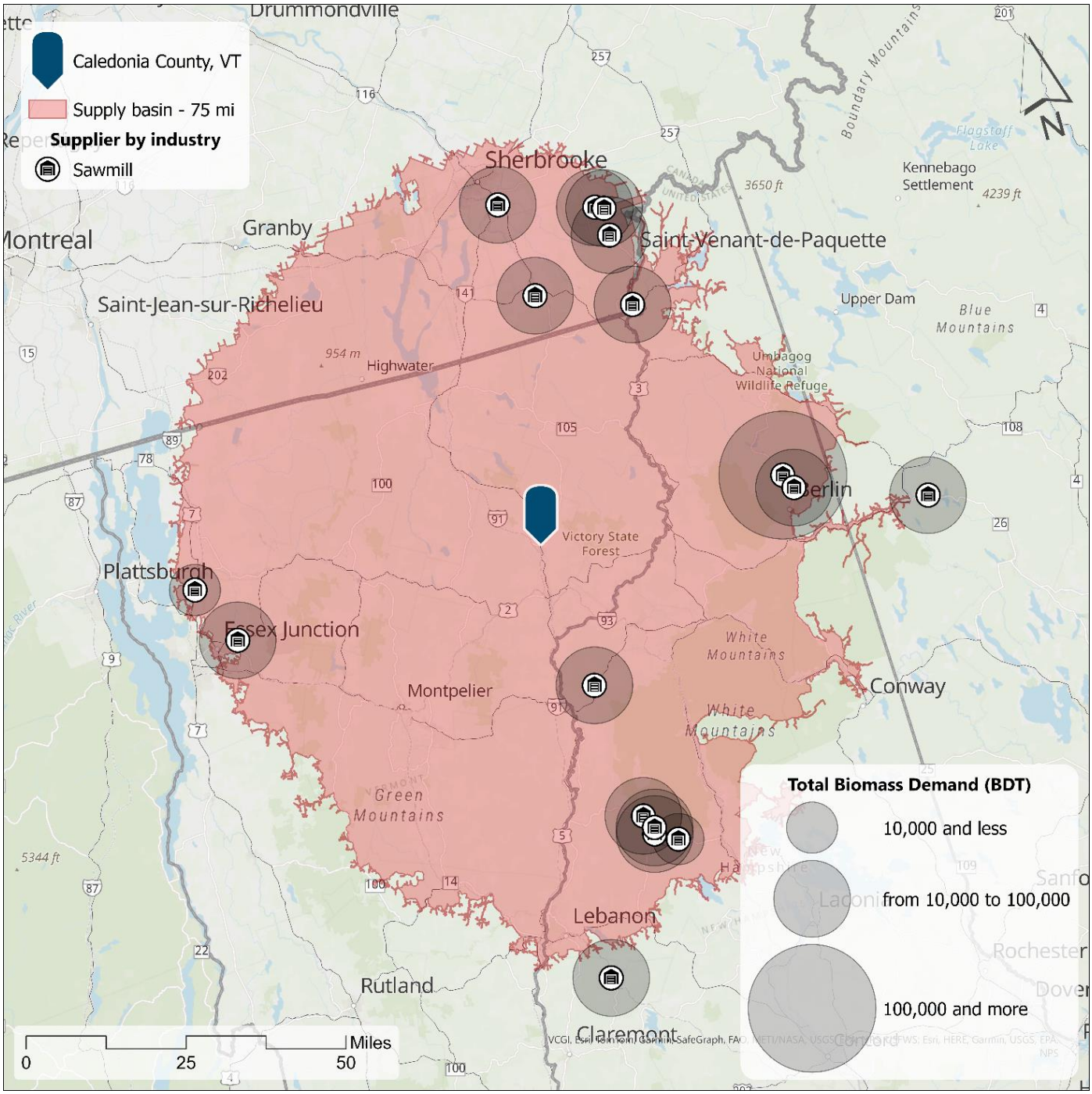


Figure B-4 displays the operational sawmills and historical lumber production capacity in the BDO Zone from 2011 to 2024 and shows that the total production capacity increased by 3% or 11 MMBF since 2011. From 2011 to 2016, changes in production capacity were influenced by the addition of 20 MMBF in total capacity of two sawmills. Additionally, a fire resulted in the permanent closure of one sawmill. Despite the relative stability in the total count of mills and production capacity since 2016, notable capacity shifts have occurred. These include upgrades to existing mills, temporary production halts, and the resumption of operations at a sawmill following a three-year hiatus due to a fire incident.

More recently, in the first quarter of 2024, weak sawlog inventories due to poor winter logging conditions forced some sawmills in the BDO Zone to reduce production by 20%, which affected the available quantities and pricing in the sawmill residue markets.[7]

**Figure B-4. Historical Lumber Production Capacity (MMBF) and Operational Sawmill Count in the Caledonia BDO Zone**

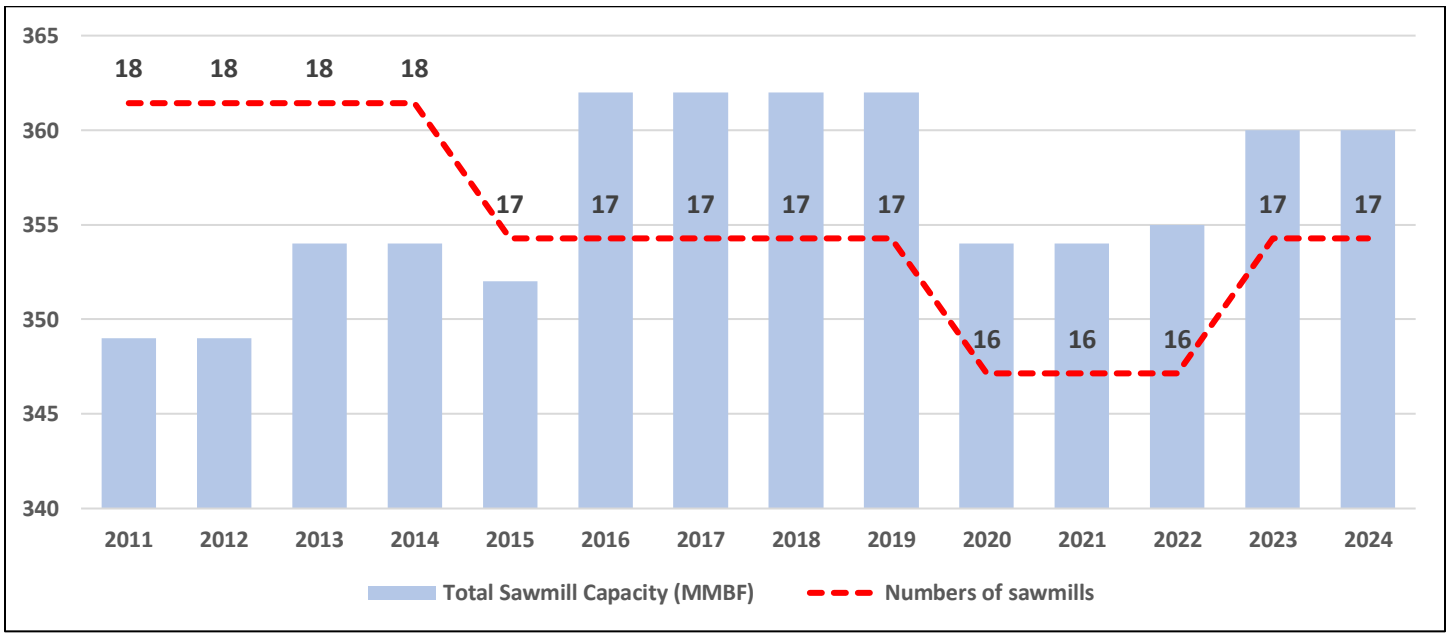



Table B-1 indicates that approximately **359,500 bdt/yr** of sawmill residues are currently generated in the BDO Zone. However, outreach confirmed that a large volume of these residues is contracted out by current competitors located in the vicinity of these sawmills. In the BDO Zone, the market for sawdust is competitive, characterized by the presence of four significant biomass power plants currently in operation alongside seven pellet mills. Furthermore, there are plans for an additional pellet mill, the eighth in the area, with an expected annual production capacity of 90,000 tons, scheduled to commence operations by late 2024. This new facility will be strategically located approximately 25 miles away from the project center point and will be co-located alongside the existing Ryegate biomass power plant, which primarily relies on biomass sourced from local sawmills. Considering the robust demand for sawdust from these local mills, we excluded sawdust from our rated quantities of sawmill residues. Table B-1 shows that only a third of the estimated sawmill residue production, or **106,000 bdt/year**, would be available for a new project.

[7] Based on outreach with forestry expert

**Table B-1. Sawmill Residue Production Estimates in the Caledonia BDO Zone**

| Supplier products | Sawlog-to-biomass conversion factor (% of input sawlog volume) | Total sawmill residue generation in BDO Zone (bdt/yr) | Total sawmill residue available in BDO Zone for future projects (bdt/yr) |
|---|---|---|---|
| Wood chips | 28% | 198,500 | 64,000 |
| Sawdust | 6% | 40,000 | ------ |
| Shavings | 9% | 63,000 | 20,000 |
| Bark/Hog fuel | 8% | 57,000 | 22,000 |
| **Total** | **51%** | **358,500** | **106,000** |

## COMPETITION ANALYSIS

In the Caledonia County BDO Zone (Map B-3), 21 consumers of pulpwood and sawmill residues include combined heat and power (CHP), biopower, bioheat, wood pellet, and pulp and paper facilities.

**Map B-3. Competitors for Biomass in the Competition Zone**

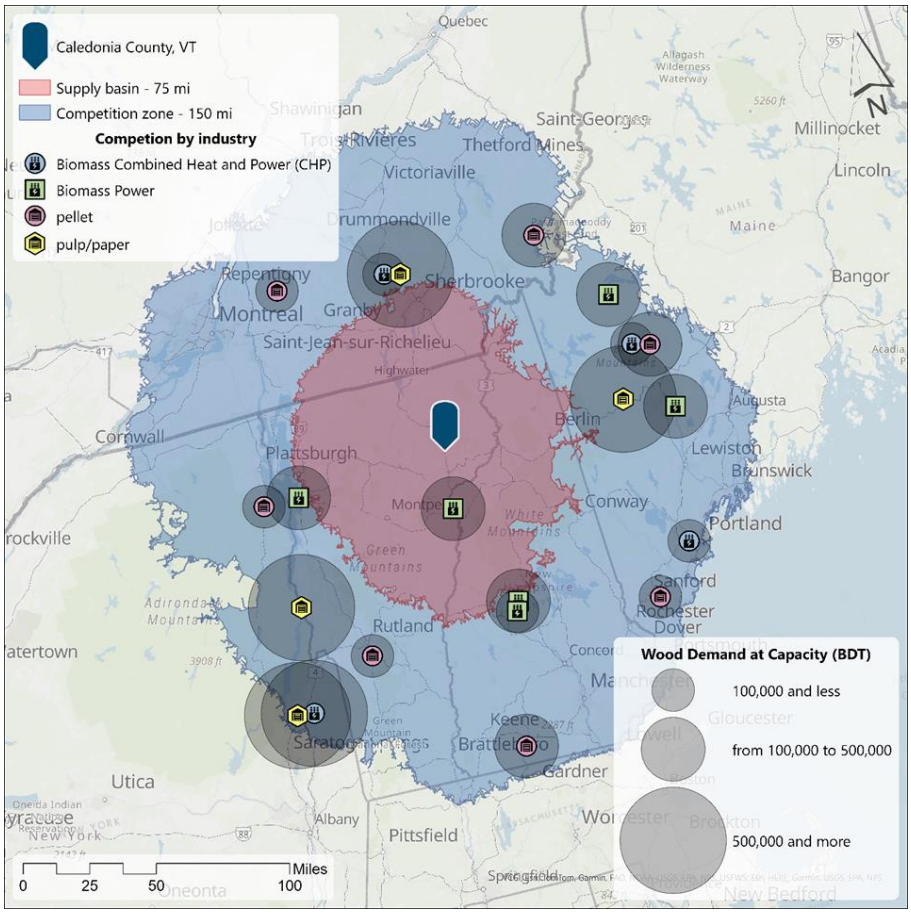
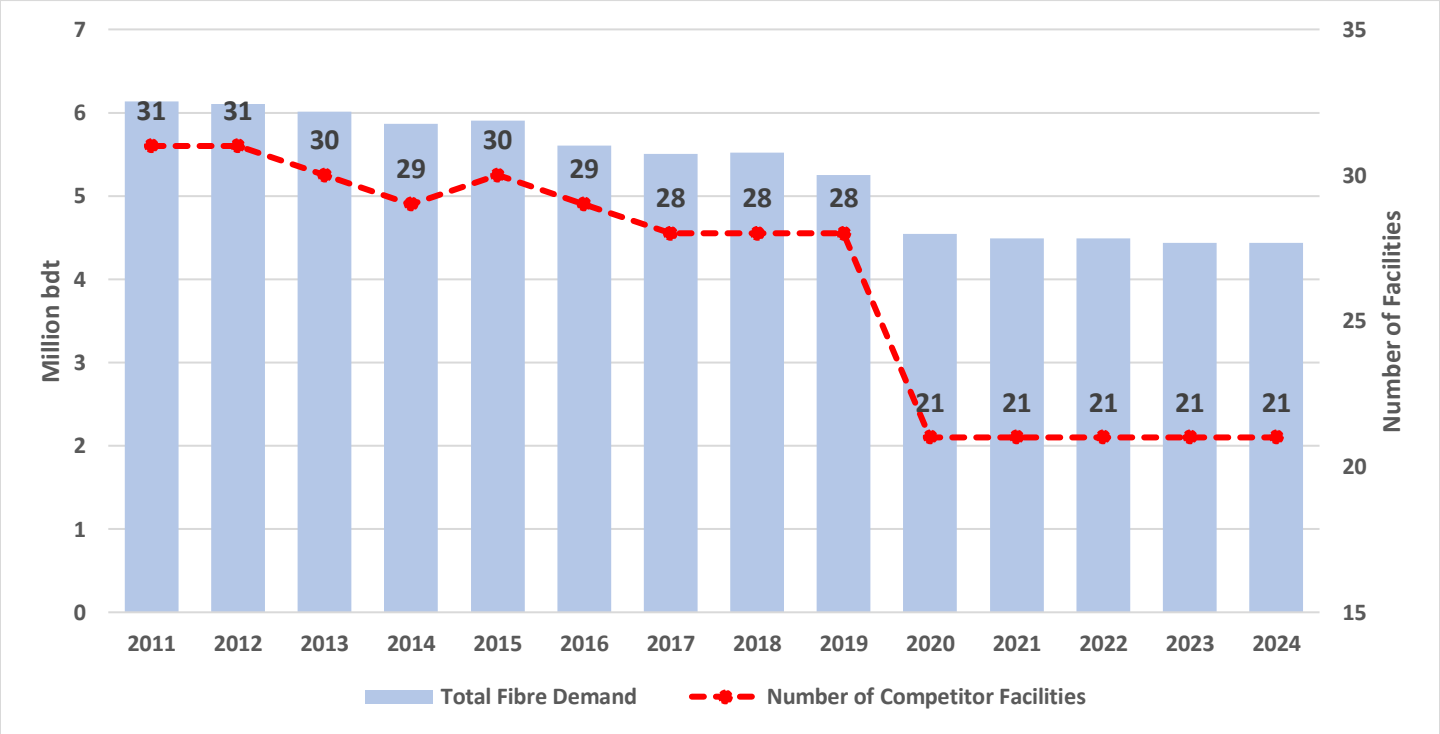


Figure B-5 shows the number of operational wood processing facilities and their historic biomass consumption between 2011 and 2023. Consumption within the Competition Zone declined by 28% or 1.7 million bdt/yr from 2011. Production curtailments and biomass power plant shutdowns occurring during this timeframe were caused by a weak wholesale energy market and low prices of renewable energy credits. As a result, 8 of 13 biomass power plants in the Competition Zone were forced to shut down or stagger production. These events had notable ramifications on biomass consumption, a considerable decrease in the utilization of forest biomass, and renewable electricity generation capacity within the region. The Governor's veto of New Hampshire House Bill 183 played a significant role in these closures, as the bill was designed to offer financial support to struggling facilities.

Additionally, wood pellet plants within the BDO Zone experienced capacity declines, partly due to increased production in Quebec and Maine. The shutdown of a pulp mill in Maine further exacerbated challenges within the wood industry across the region. Overall, the biomass and wood sectors in New Hampshire and its adjacent areas encountered significant challenges and underwent notable transformations during this timeframe. Table D-6 (see Section E) provides a detailed overview of key plant closures and the associated consumption losses within the BDO Zone from 2011 to 2024.

**Figure B-5. Historical Wood Fiber Demand and Number of Competitor Facilities in the Competition Zone**




Furthermore, within the Competition Zone, there is a notable demand for fiber from firewood and bioheat (i.e., biomass boilers) consumers (see Figure D-3). Additionally, three mulch producers were identified (Table D-3); however, their fiber demand from the BDO Zone was irrelevant to this study. Table B-2 offers an overview of the feedstock demand and supply from the BDO Zone across six competitor categories: combined heat and power (CHP), biomass power, wood pellets, pulp and paper, bioheat, and firewood. Estimating the feedstock demand from the BDO Zone factored in the geographic proximity of competitors to the BDO Zone (i.e., demand decreased proportionate to the distance from the BDO Zone). It was thus estimated that, from a total demand of 5.3 million bdt/yr, approximately 769,000 bdt/yr was procured from the BDO Zone (see Table B-2).

**Table B-2. Biomass Demand by Competitor Category**

| Competitor category | Total feedstock demand (bdt/yr) | Feedstock demand from the BDO Zone* (bdt/yr) |
|---|---|---|
| CHP | 112,000 | 25,000 |
| Biomass Power | 1,060,000 | 350,000 |
| Wood Pellets | 424,000 | 18,000 |
| Pulp & Paper | 2,857,000 | 258,000 |
| Bioheat | 115,000 | 17,000 |
| Firewood | 708,000 | 101,000 |
| **Total** | **5,276,000** | **769,000** |

* Adjusted proportionally to the distance from Lyndonville to each competitor

## RATED QUANTITIES AND PRICING

We employed a Biomass Availability Multiple (BAM) to the technical availability values (Table B-3) to ensure adequate feedstock redundancy due to uncertainties associated with future feedstock availability, economic uncertainties, forest fires, floods, and logistical constraints. A BAM value of 3.2 for pulpwood was selected to maintain a sustainable growth-to-drain ratio above 1.5 and provide sufficient room for a new entrant to expand or for other new entrants to compete. The BAM value of 4.0 for forest residues reflects the challenging history of in-wood grinding/chipping operations in the area. The BAM value of 3.4 for sawmill residues was the result of the supply/competition analysis and outreach interviews, which indicated that only a third of the sawmill residue generated in the BDO Zone was available for a new project.

**Table B-3: Potential and Rated Quantities of Low-Risk Biomass Available**

| Biomass Types | Technical Quantity (bdt/yr) | Rated Quantity[8] (bdt/yr) | Biomass Availability Multiple (BAM) |
|---|---|---|---|
| Pulpwood | 1,600,000 | 500,000 | 3.2 |
| Forest residues | 480,000 | 120,000 | 4.0 |
| Sawmill residues[9] | 358,500 | 106,000 | 3.4 |

Table B-4 shows the price ranges of pulpwood, forest residues,[10] and sawmill residues delivered to an average of 55 miles from Lyndonville and indicate to a new project proponent both current and long-term local market conditions. The upper prices for pulpwood and forest residues were based on outreach to local industry professionals, while the lower prices were based on market prices[11] corroborated with outreach. The delivered price range for sawmill residues reflects the differences between hog fuel prices (low price) and wood chips (high price).[12]

[8] Rounded values

[9] Rated quantities of sawmill residues excludes sawdust shavings as this residue is deemed to be unavailable based on existing demand.

[10] Forest residue delivered price ranges include in-woods grinding/chipping costs.

[11] Forisk Wood Fiber Review, 2024 Q1, Volume 27, Issue 1

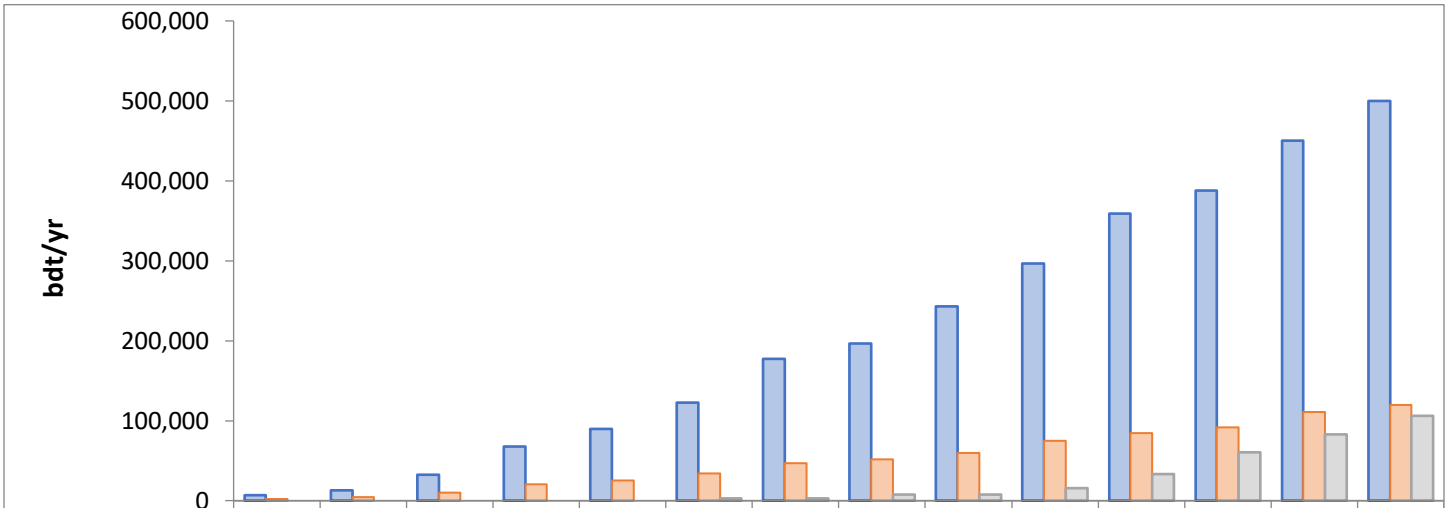
[12] All prices were converted from $ per green ton to $ per bdt assuming a moisture content of 50% (by weight, wet basis) for pulpwood and forest residues, and sawmill residues except shavings, which were assumed to have a 20 % moisture content.

**Table B-4. Delivered Price Ranges for Pulpwood, Forest Residues, and Sawmill Residues**

| Biomass Type | Price Range ($/bdt) |
|---|---|
| Pulpwood | $117-$135 |
| Forest Residues | $66-$100 |
| Sawmill Residues | $50 - $135 |

Figure B-6 presents the availability of these feedstock types at 10-mile distance increments from Lyndonville, VT. Approximately 60% of the rated pulpwood and forest residue quantities are available within a 55-mile drive distance from Lyndonville. Due to the location of most sawmills on the outskirts of the BDO Zone, only 15% of sawmill residue quantities are available within the 55-mile drive distance.

**Figure B-6. Supply Curves of Rated Quantities of Pulpwood, Forest, and Sawmill Residues**

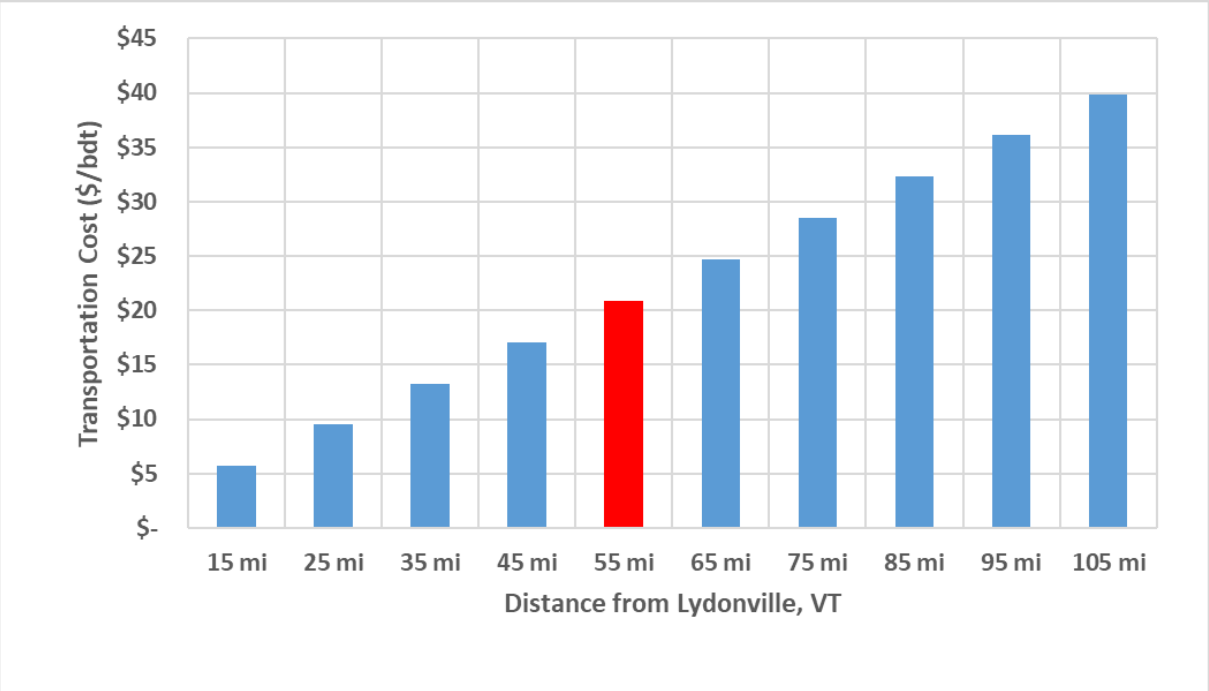



| | <10 mi | <15 mi | <20 mi | <25 mi | <30 mi | <35 mi | <40 mi | <45 mi | <50 mi | <55 mi | <60 mi | <65 mi | <70 mi | <75 mi |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pulpwood | 6,672 | 12,855 | 32,343 | 67,629 | 89,655 | 122,570 | 177,606 | 196,727 | 243,166 | 296,873 | 359,036 | 387,524 | 450,168 | 500,000 |
| Forest Residue | 2,164 | 4,120 | 9,951 | 20,280 | 25,481 | 33,647 | 46,910 | 51,356 | 59,324 | 74,587 | 84,102 | 91,747 | 110,918 | 120,000 |
| Sawmill Residue | 0 | 0 | 0 | 0 | 0 | 2,944 | 2,944 | 7,361 | 7,361 | 15,606 | 33,272 | 60,656 | 82,739 | 106,000 |

Price ranges presented in Table B-3 include transportation costs to a driving distance of 55 miles from Lyndonville.[13] The average transportation cost amounts to $21/bdt. Figure B-7 depicts transportation costs for various haul distances that can be applied for distances above and below 55 miles.

[13] $0.19 per loaded mile per ton

**Figure B-7. Transportation Cost by Distance from Lyndonville, VT**



## OPERATIONAL CONSIDERATIONS

### *Pulpwood*

The rated quantity of pulpwood was **500,000 bdt/yr,** and the delivered price range was **$117-$135/bdt**. If a new project located in Lyndonville, VT, was capable of utilizing the rated quantity, approximately 32 logging trucks[14] and 30 logging crews[15] would be required. Local logging operators suggested that this high-level scale-up estimate was achievable.

A significant portion of logging operations in the BDO Zone (71%) utilize conventional tree-length systems with chainsaws and skidders. Concurrently, 66% of the total harvesting volume is generated by mechanized companies employing cut-to-length or whole-tree-harvesting systems, which include chipping.[16] While most logging firms possess their own harvesting equipment and trucks, the sector also relies on specialty subcontractors to address limitations in labor or equipment capacity. For instance, logging crews may hire a feller buncher for cutting, skidding, and sorting tasks before coordinating with a chipping contractor for wood chipping and a trucker for roundwood delivery. A recent survey revealed that over 75% of logging contractors have subcontracted portions of their trucking requirements.[17]

Loggers have an average of close to 24 years of experience, with the average logging operation owner having at least 30 years of experience.[18] Two-thirds of the logging companies in the BDO Zone operate conventional tree-length systems with chainsaws and skidders, whereas close to 25% use mechanized systems (feller-buncher–grapple skidder or processor-forwarder).[19] Despite conventional tree-length systems being the most widely adopted system, mechanized companies using cut-to-length or whole-tree harvesting (with chipping) systems produce 66% of the harvesting volume.[20] New Hampshire has a significantly higher amount of mechanized logging than Vermont.

The closure of low-grade timber facilities in the biomass and pulp sectors has resulted in surplus logging capacity. Mill closures freed additional biomass supply, and according to local loggers, there is still sufficient labor, equipment, and expertise within the BDO Zone. Outreach also confirmed approximately 300 logging companies with an average of 1-3 trucks per crew[21] and 20-30 mobile chippers in the BDO Zone, indicating strong capacity and expertise to support a biobased project. Overall, the region hosts approximately 614 loggers across Vermont and New Hampshire.[22,23] However, mill shutdowns and curtailments negatively affected loggers' confidence, and certain assurances, including off-take and price agreements, are recommended for a new project to secure the rated pulpwood quantity.

Furthermore, the logging sector has been experiencing a declining employment trend, with the median age of loggers in the BDO Zone of 50, suggesting an impending shortage of skilled workers. To address this, the region offers various job-specific training centers and vocational/technical schools for the forestry industry, such as the Vermont Forest Products Program, Logger Education and Professionalism (LEAP) certification, Master Logger certification, and the Northern Vermont University (NVU) Center for Professional Studies.

[14] Estimates converted from green tons, as follows: 30 load/wk./crew x 28t/load = 840 t/wk./crew = 420 bdt/wk./crew

[15] Estimates converted from green tons as follows: 28t/load/truck x 4 loads/day/truck x 280 days/yr = 31,360 t/yr/truck = 15,680 bdt/yr/truck

[16] fpr.vermont.gov/sites/fpr/files/Forest_and_Forestry/Vermont_Forests/Library/NEFA13_Econ_Importance_VT_final_web_Jan29.pdf

[17] fpr.vermont.gov/sites/fpr/files/doc_library/2021 Harvest Report.pdf

[18] https://www.tandfonline.com/doi/10.1080/14942119.2006.10702527

[19] https://www.tandfonline.com/doi/10.1080/14942119.2006.10702527

[20] https://fpr.vermont.gov/sites/fpr/files/Forest_and_Forestry/Vermont_Forests/Library/NEFA13_Econ_Importance_VT_final_web_Jan29.pdf

[21] nsrcforest.org/sites/default/files/uploads/benjamin10.pdf

[22] nefainfo.org/files/2021%20forest

[23] Estimated number of loggers within BDO Zone based on interview with forestry industry expert

### *Forest Residues*

The rated quantity of forest residues was **120,000 bdt/yr,** and the delivered price range was **$66-$100/bdt**. The high price, validated through outreach, offers a sustainable pricing model for securing the rated quantities of forest residues for a new project. This price fully covers the costs of comminution and transporting forest residues to Lyndonville. However, discussions with local experts indicated that the current market price of $66/bdt, and at times significantly lower, does not fully cover production and transportation costs. This situation led to a significant strain on existing supply chains, leading to the closures of several logging companies and underscores the necessity of a pricing structure that ensures long-term viability for all stakeholders involved.

### *Sawmill Residues*

The rated quantity of sawmill residues was **106,000 bdt/yr,** and the delivered price range was **$50-$135/bdt**. The sawdust market is very competitive, with four large biomass power plants and seven pellet mills currently operating in the BDO Zone. Additionally, a proposed pellet mill near Lyndonville is expected to begin operations in late 2024. The majority of the sawmills in the BDO Zone have a long-standing relationship with their clients based on informal contracts. Several sawmills in the BDO Zone own their own truck and chip van fleet to deliver sawmill residues to existing clients. While some sawmills possess sufficient truck fleets to transport their entire residual output, others rely on third-party trucking outfits. Consequently, the associated risk with sawmill residue transportation equipment is low. Biomass aggregators, often equipped with their fleet and processing facilities, source residues from mills, subsequently channeling them into markets like mulching and commercial/industrial boilers. Outreach information strongly suggests establishing off-take agreements for the bulk of the sawmill residue supply, especially during the first years of the project.

### *General Considerations*

For the rated volume of pulpwood, forest residues, and sawmill residues of 726,000 bdt/yr, a facility will need approximately 47 trucks[24] and approximately 173 deliveries per day.[25] Local industry experts state that given how important forestry and biomass are to the community, major opposition is unlikely. Additionally, truckers are aware of possible nuisance areas and are trained to avoid them.

The BDO Zone overlaps Vermont and New Hampshire, where there are no uniform truck weight limitations across the states for the most common configuration of trucks used in forest products hauling: the 6-axle tractor-trailer and the 4-axle log truck. The smaller truck configuration of 4 axles is generally 60,000 lbs. in both states. As a result of a joint state study in 2015 between Vermont and New Hampshire, Vermont now allows 6-axle tractor trailers up to 99,000 lbs. gross weight on all roads in the State, including the federal highway system. For New Hampshire, 99,000 lbs. gross weight is allowed on the state highway system, but only 80,000 lbs. are allowed on the federal highway system in New Hampshire. Having different truck weights in adjacent states can present a challenge; truckers are well versed in these limitations and work around them to haul legally in all states when traveling with forest products from one state to another.

[24] Assumptions: 30 tons per load; average 4 loads per truck per day; 280 operational days per year: 30 tons x 4 loads x 280 operating days = tons per year per truck; where moisture content is assumed at 50% therefore: tons per year per truck/2 = bdt per year per truck; Where rated quantity of feedstock is 726,000 therefore: rated quantity of feedstock/bdt per truck per year = # of trucks required to service rated quantities.

[25] 30 tons per load @ 50% moisture content = 15 bdt per load; 726,000 bdt/yr rated quantity/15 bdt per load = 33,872 loads per year; 280 days operating per year; rated quantity/operating days per year = loads per day

# SECTION C: RISK INDICATOR SCORING METRICS

## CATEGORY 1.0: SUPPLIER RISK

### *1.1 Risk Factor: Credit-Worthiness/Future Solvency of Suppliers*

*1.1.1 Longevity & History of Supplier Performance*

**Rationale:** Number of years in business is a positive indicator of future solvency. Historical performance is an indicator of future performance.

**Risk Information:** The forest industry within the BDO Zone has a deep-rooted and extensive history, with a notable presence of family-owned sawmills spanning multiple generations. The sawmills in operation have an average age of 55, with the oldest mill surpassing the century mark (116 years). Local logging operations have supported this extensive operational longevity, which is a testament to the enduring resilience of the forest industry and its integral role in the regional economy. Risk is deemed low.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **16** |

### *1.2 Risk Factor: Conflicts of Interest/Vested Interest with Competing Market(s)*

*1.2.1 Suppliers' Dependence on, or Preference for, Competing Markets*

**Rationale:** Suppliers may have a vested interest or preference in supplying specific competitors with biomass feedstock. Preferences may be due to historical, long-term, or personal relationships, less stringent feedstock quality requirements, more flexible operating hours by competing markets, or suppliers' dependence on competing markets to accept or purchase other products/by-products. During periods of feedstock shortage, such suppliers may be more likely to allocate the scarce supply to competitors, resulting in supply disruptions for the Issuer.

**Risk Information:** The BDO Zone in Caledonia County possesses a considerable surplus of pulpwood and forest residue (see Figures B-2 and B-3), mitigating the risk of supply shortages. Hence, suppliers' preferences for competing markets are unlikely to impact the local supply significantly. These factors suggest that new entrants into the market within the Caledonia County BDO Zone can expect a reliable feedstock supply. As such, the risk is deemed low.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **16** |

| Mitigation/Notching | Notch |
|---|---|
| *RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | NN |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | 16 |

### *1.3 Risk Factor: Supplier Control Over Production and Transportation*

#### *1.3.1 Ownership of Land/Means of Production*

**Rationale:** Suppliers that own land or a production facility where feedstock is produced tend to have better control of supply chains and present lower degrees of supply risk.

**Risk Information:** Approximately 87% of the forests in the BDO Zone are privately owned, with around 48,000 acres under working forest conservation easements. Despite the prevalence of smaller individual and family-owned woodland averaging 84 acres, the area also hosts a legacy of large industrial forestry ownership, with many large parcels now serving as long-term, private, working forest investments.[26,27] Notably, the region hosts the state's largest industrial forestland parcel exceeding 56,000 acres).

Among the 17 sawmills identified within the BDO Zone, some are fully integrated and own significant timberland, such as Wagner Forest Products, which owns 2 million acres of timberland overlapping portions of the BDO Zone. Many family-owned sawmills, spanning generations, manage and own their production facilities, ensuring control over sawmill residual quantity and quality. These factors indicate supportive land ownership for new biomass projects in the Caledonia County BDO Zone. Risk is deemed low.

| Raw Risk Likelihood (RRL) | Score |
|---|---|
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | 4 |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | 4 |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | 16 |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | NN |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | 16 |

[26] fpr.vermont.gov/sites/fpr/files/doc_library/2021 Harvest Report.pdf

[27] vermontwood.com/client_media/files/supply-chain-brochure.pdf

### *1.3.2 Ownership of Equipment*

**Rationale:** In most cases, suppliers that own or lease equipment for harvest, collection, and processing feedstock are at lower risk than those that are not. For example, third-party harvesting equipment may not be available when required. Short harvest windows may be missed if a farmer and contractor cannot schedule convenient harvest times, and quantity shortages can result. However, in some circumstances, reliance on third-party equipment to harvest or produce feedstock can decrease supply chain risk. For example, when harvesting agricultural residues such as corn stover, using a third-party company with standard equipment specializing in harvesting, collection, and transportation may decrease quality variations (e.g., ash content) of the final feedstock.

**Risk Information:** Approximately 37 logging crews and 40 trucks would be needed to supply the rated quantities of pulpwood and forest residues, achievable by training/hiring new operators and investing in additional equipment, if necessary, or assigning full-time crews to thinning activities. However, these challenges could be overcome considering that approximately 300 logging and trucking contractors operate in Vermont, with a comparable number in New Hampshire.[28] A significant change in equipment ownership status is improbable across the majority of these enterprises. Logging remains a substantial industry and is expected to persist. Risk is assessed as low.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **16** |

### *1.3.3 Ownership of Transportation/Logistics*

**Rationale:** In most cases, suppliers that own or lease transportation equipment necessary to transport biomass from forests or fields are at lower risk than those that do not. However, in some circumstances, reliance on third parties to transport biomass is common practice and does not contribute to risk.

**Risk Information:** There are nearly 300 logging companies in the BDO Zone, each crew having an average of 1-3 trucks. The transportation of sawmill residues typically involves walking-floor or standard chip vans. While some sawmills possess sufficient truck fleets to transport their entire residual output, others rely on third-party trucking outfits. Consequently, the associated risk with bark and chip transportation equipment is deemed low. Biomass aggregators, often equipped with their fleet and processing facilities, source residues from mills, subsequently channeling them into markets like mulching and commercial/industrial boilers.

[28] https://fpr.vermont.gov/sites/fpr/files/Forest_and_Forestry/Forest_Based_Business/Library/Northeast%20Wood%20Markets%20Retention%20Initiative%20Section%20II.pdf

Pulpwood transportation commonly utilizes log trailers owned by logging companies. Truckers are often affiliated with logging firms, especially smaller ones. Contracts are awarded to independent log truckers or those associated with forestry companies to transport timber products from forests to mills. Biomass power plants typically utilize whole tree wood chips, which are chipped in woods and transported in box tractor trailers. Currently, the market possesses adequate log trailers to fulfill transportation needs, with outreach indicating sufficient infrastructure to support scaling up for new biomass projects.

In summary, ownership of logging trucks and chip vans is relatively evenly distributed among logging contractors, sawmills, and third-party transportation service providers, with no foreseen transportation ownership risks. As such, the risk is deemed low.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **16** |

### *1.3.4 Feedstock as a Secondary Transformation*

**Rationale:** Secondary transformation is dependent upon the production of primary products. Forest residues, corn stover, bark, and sawmill chips (unless from a dedicated chip mill) are all secondary transformations of a primary product.

Risks are higher if the feedstock is a secondary transformation of a primary, more valuable product. In the absence of markets for the primary product, it may not be economical for suppliers to produce biomass on their own. For example, a supplier may produce dimensional lumber as its primary product and wood chips as a by-product, therefore relying on the health of the housing market for production levels. If the demand for dimensional lumber drops, so can the availability of sawmill residues.

In the case of agricultural feedstocks, such as corn stover, the feedstock is a by-product of a primary crop. Since the primary crop is significantly more lucrative than the residue, it will be a priority for the producer. If the production of the primary crop requires resources to be taken away from the production of the secondary crop (e.g., shorter harvesting windows due to weather), the secondary feedstock supply will suffer. In times of stretched resources, suppliers may also perceive the harvest and collection of the feedstock as a nuisance, potentially decreasing production levels.

Understanding the economic drivers for suppliers' primary products can help gauge risk levels for secondary transformation biomass products.

**Risk Information:** All three feedstocks are either by-products of or dependent on a secondary transformation: lumber manufacturing and/or logging. As presented in Section C—Operational Considerations, scaling up to the rated quantities, while possible, will require mutually advantageous off-take agreements between project proponents and suppliers. Given the intermediate fluctuations in sawmill capacities and logging and in-wood chipping supply chain uncertainties presented, the risk is deemed moderate.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **6** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed medium, therefore the RRI is 6 out of 10. | **6** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 36 out of 100. | **36** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. | **36** |

### *1.4 Risk Factor: Supplier Experience*

#### *1.4.1 Fundamental Feedstock Production Experience*

**Rationale:** Risk is higher when suppliers have limited experience with planting, growing, harvesting, processing, and/or collecting biomass. Limited experience may be common for stover or forest residue supply chains where farmers or forestry producers may have no previous experience.

**Risk Information:** Well-established supply chains exist in the BDO Zone for pulpwood, forest residues, and sawmill residues. Modern forestry practices encompassing planting, growth, harvesting, and biomass collection have been applied for decades. Consequently, given that the experience in feedstock production is both relevant and extensive in the BDO Zone, the risk associated with feedstock production expertise was deemed low.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |

| Loaded RI Score | Score |
|---|---|
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | 16 |

### *1.4.2 Production Scale Experience*

**Rationale:** Scale-up entails risk. Risk is higher when suppliers have limited experience producing the required quantity of feedstock.

**Risk Information:** Historically, the BDO Zone has maintained robust levels of pulpwood processing. While downturns in demand resulting from biomass power plants and pulp and paper mill closures may have reduced the number of concentration yards and loggers in the region, suppliers still possess significant and relevant scale-up experience, logging/trucking equipment, and capacity to support a new project. Scale-up may require investments in new equipment, particularly for logging operations, but forestry professionals in the BDO Zone support new projects. The longstanding operational history of local forestry operations suggests that production scale experience is not of a significant concern.

| Raw Risk Likelihood (RRL) | Score |
|---|---|
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | 4 |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | 4 |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | 16 |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | NN |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | 16 |

## *1.5 Risk Factor: Supplier Harvesting/Collection/Processing Capacity*

### *1.5.1 Supplier's Equipment Efficiency*

**Rationale:** Equipment efficiency significantly influences the supplier's feedstock production capacity. Understanding the supplier's equipment capability enables understanding of their ability to produce feedstock of suitable quality.

**Risk Information:** Logging and trucking are well established in the BDO Zone, as the forest products industry has been active for over 100 years, and suppliers have well-established knowledge of harvesting, handling, and transporting wood products. Logging and chipping/grinding operations utilize high efficiency equipment. The closure of low-grade timber facilities in biomass and pulp sectors have resulted in surplus logging capacity. Outreach confirmed strong capacity and expertise to support a biobased project. Some investment in equipment will still be necessary. As such, we attribute a low moderate risk.

| Raw Risk Likelihood (RRL) | Score |
|---|---|
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | 4 |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed medium, therefore the RRI is 6 out of 10. | 6 |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 24 out of 100. | 24 |

| Mitigation/Notching | Notch |
|---|---|
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 24 out of 100. | **24** |

### *1.6 Risk Factor: Supplier Motivation*

#### *1.6.1 Feedstock Production Priority*

**Rationale:** When biomass feedstock is a secondary or non-core line of business, a by-product, or a residual from a more valuable product, suppliers may not put in sufficient effort for consistent production. The risk of breach increases when feedstock production and/or delivery compromise a supplier's ability to make a primary product.

When biomass feedstock is a by-product of another main higher margin or main product such as corn stover (e.g., corn) or forest residues (e.g., pulpwood), supply may not be a top priority for a supplier.

**Risk Information:** Sawmill residues are byproducts of the lumber manufacturing process and traditionally have had a higher priority and influence over pulpwood and forest residues. As described in RI 1.3.4, this situation poses a medium risk to the availability of large volumes of pulpwood and forest residues located in the BDO Zone. However, all three biomass resources will be available in appropriate quantities as long as healthy and sustainable forest practices, businesses, and sawlog harvesting, continue to exist in the BDO Zone.

| Raw Risk Likelihood (RRL) | Score |
|---|---|
| The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **6** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed medium, therefore the RRI is 6 out of 10. | **6** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 36 out of 100. | **36** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. | **36** |

## CATEGORY 2.0: COMPETITOR RISK

### *2.1 Risk Factor: Influence on Feedstock Supply of Existing Markets*

#### *2.1.1 Competitors' Locations and Overall Geographical Influence*

**Rationale:** Competitors' locations relative to siting locations within a BDO Zone can affect the viability of procuring feedstock and the cost of that feedstock. Accurate and detailed competitor mapping provides an understanding of a

competitor's geographical influence on new plants within a BDO Zone, including competitive advantages such as short hauling.

**Risk Information:** The primary markets for the feedstocks generated in the BDO Zone are situated beyond the 55-mile drive distance from Lyndonville, VT. Pulp mills in the region average a haul distance of 121 miles, and the closest pulp mill is over 90 miles away from Lyndonville. Except the Ryegate biomass power plant located in the BDO Zone, all the other biomass power plants are located at an average drive distance of 92 miles. Despite its proximity to Lyndonville, the Ryegate power plant has experienced significant capacity curtailments. As such, the geographical influence of competitors is deemed low.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)** | **Score** |
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **16** |

### *2.1.2 Current and Historical Consumption of Feedstock Quantity*

**Rationale:** Clear understanding of feedstock consumption by key competitors for each rated feedstock type in the BDO Zone is essential to quantifying competitor risk.

Understanding current consumption and historical trends of feedstock utilization can provide valuable information about feedstock price elasticity during shortages and insight into events that may impact future supply conditions. It can enable more accurate estimates of the sensitivity of feedstock availability to potential future consumption levels or the impact of external events (e.g., weather events, structural economic changes, seasonality, or policy change).

**Risk Information:**

Between 2011 and 2023, overall pulpwood consumption in the BDO Zone declined by 28% due to plant closures and production reductions. Similarly, biomass power plants experienced production curtailments and shutdowns influenced by weak wholesale energy markets and declining renewable energy credit prices. The declining trends across major pulpwood-consuming sectors have increased the supply of low-grade wood available for new projects, leading to a low risk related to historical pulpwood consumption.

Historically, significant forest residue has been consumed in the BDO Zone, particularly by biomass power plants. Despite continued consumption, biomass consumption declined by close to 900,000 bdt/yr from 2011 to 2023 (Figure B-5). Further plant shutdowns within this segment are likely due to reduced demand and fragile economics, resulting in a low risk related to historical forest residual consumption.

Regional biomass power plants and industrial boiler installations in the BDO Zone consume up to 25% of their fuel requirements from sawmill residues, primarily wood chips and bark. Pulp mills in Quebec and Maine consume sawmill residues from the BDO Zone.

A medium risk was assigned due to the growing firewood and chipped wood demands/markets.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **Score**<br>**6** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed medium, therefore the RRI is 6 out of 10. | **Score**<br>**6** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 36 out of 100. | **Score**<br>**36** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. | **Score**<br>**36** |

### *2.1.3 Competitor Pricing and Price Sensitivity*

**Rationale:** Understanding how much competitors pay (or receive) for different feedstock types is essential in determining the Issuer's competitiveness and accurately assessing the delivered cost range in the BDO Zone rating.

Current and historical prices paid/received by competitors provide insight into their procurement behaviors and exert pressure on suppliers in the BDO Zone, such as the ability/willingness to pay premiums for feedstock during times of feedstock shortage or reduce prices (or cut-off deliveries) during gluts. Competitors that have the ability to offer higher prices for feedstock during feedstock shortages can pose a significant risk to the Issuer.

Knowledge of competitor pricing and price sensitivity is also an essential prerequisite to formulating a feedstock cost curve, which can enable predictions of feedstock redundancy, i.e., how much feedstock could become available at different pricing levels (see Category 3–Supply Chain Risk 3.1.3).

**Risk Information:** Figure D-6 provides current and historical delivered pricing for pulpwood, chips, and forest residues in the U.S. Northeast, including Vermont and New Hampshire. From 2015 to 2021, lower pulpwood prices resulted from a strong sawlog market, which subsidized pulpwood harvesting costs. Also, a surplus of chip volumes occurred due to plant closures and production curtailments. However, as described above, a new project may need to pay higher prices than the current market prices to secure the rated quantity of pulpwood.

The current pricing for forest residues, as described above, highlights how the supply chain has been operating at near breakeven, driving some logging operations bankrupt. To cover the true cost of chipping/grinding and transportation, a higher price than the current market price may be needed to secure the rated quantity.

Wood chips are a commodity prone to price fluctuations (Figure D-6) and are strongly influenced by regional competition. Shavings are priced below chips and are mainly sold to wood pellet plants and animal bedding markets.

Bark prices are the lowest priced sawmill residue and are sold to biomass power plants, bioheat markets, and seasonally for mulch. Sawmills base pricing decisions primarily on local market choice and transportation distance. Price fluctuations, as demonstrated in Figure D-6 exist and should be monitored by new entrants. Risk is deemed moderate.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **6** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed medium, therefore the RRI is 6 out of 10. | **6** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 36 out of 100. | **36** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. | **36** |

### *2.1.4 Impacts of Future Demand on Feedstock Availability and Price by Current Competitors*

**Rationale:** Feedstock utilization in a BDO Zone can change over time. Expansion of feedstock demand by current competitors can put additional pressure on feedstock and lead to higher prices, feedstock disruptions, shortages, supplier breaches, or other types of supply chain disruption.

If current markets for feedstock have been publicly signaling the potential for increased demand for feedstock (in the case of a sawmill adding a shift or pulp mill potentially expanding into the production of renewable chemicals, for example), high interest in a supply zone can make suppliers overconfident, leading to a supplier-controlled market where short-term contracting becomes the norm and supply chain reliability is compromised for the Issuer. If and when it occurs, increased demand on feedstock may decrease availability and increase cost for new plants within the BDO Zone.

**Risk Information:** The two major competitors for the feedstocks produced in the BDO Zone are biomass power plants and pulp and paper facilities. However, mill closures also occurred that freed additional biomass supply. The Ryegate power plant owners announced plans to build a pellet mill of 90,000 tons/yr capacity located 25 miles from Lyndonville. This expansion may pose risks for sawmill residues. However, despite ongoing declines in the pulp and paper industry, CHP plants, and biomass power plants, there remains sufficient market capacity for new projects. The regional pellet market is expected to grow, supported by large supplies of low-cost sawdust and wood chips from local sawmills. Even with the addition of a large competitor, the healthy BAM factor applied to the available quantities deems the risk of this indicator a low rating.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching** | **Notch** |

| | |
|---|---|
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **Score**<br>**16** |

### *2.1.5 Soft Supply Influence of Existing Markets*

**Rationale:** In some cases, existing markets for feedstock may be able to exert high degrees of pressure over local suppliers, effectively enabling control of feedstock, especially during times of shortage. This control can derive from qualitative or "soft" factors, such as long previous relationships between local suppliers and existing markets for feedstock.

**Risk Information:** Within the BDO Zone, landowners and forestry contractors prioritize selling to the highest bidder. Pulpwood procurement mainly relies on spot market purchases or short-term contracts, typically lasting up to a year with flexible terms and volume limitations.[29] Some contracts are linked to prevailing market rates, while shorter contracts for individual logging jobs may have fixed prices for about a month.

Historical consumption of forest residues in the BDO Zone, especially by biomass power plants, indicates a strong demand. Outreach with logging companies suggests that the complementary demand for pulpwood would benefit landowners by facilitating access to forest residues at favorable prices. However, outreach also suggests that the capacity of the supply chain for forest residues, particularly chipped wood, is eroding due to the fact that logging companies operate at or near breakeven levels, given the sustained low delivery pricing for forest residues.

Feedback from sawmills and loggers indicates that a new project willing to pay a premium can secure adequate sawmill residues. The higher pricing in the price ranges for each feedstock type in the rated pricing in Table B-4 reflects the expected costs for a new project to obtain the necessary woody feedstock. Based on feedback from outreach, establishing a negotiated contract for the bulk of supply in the initial years will be crucial. Implementing a gate price could incentivize participation from smaller mills, serving as a foundation for building supply resilience through smaller contracts. Additionally, surpluses of low-grade wood in many areas can support new projects.

The current contracting practices are unlikely to significantly impact the availability of rated quantities for new projects. Risk is assessed as low.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **Score**<br>**4** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed low, therefore the RRI is 4 out of 10. | **Score**<br>**4** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **Score**<br>**16** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment. | **Notch**<br>**NN** |

[29] Based on interviews conducted as part of outreach activities.

| |
|---|
| *RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). |
| **Loaded RI Score** **Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. **16** |

### *2.1.6 Temporary Market-Driven Markets*

| |
|---|
| **Rationale:** Alternative, non-traditional, market-driven competitors for feedstock can drive feedstock demand in unusual circumstances. A BDO Zone Rating Issuer based on corn stover as a feedstock, for example, would not typically compete with higher-end animal feed markets due to quality issues. However, in times of significant hay shortage (e.g., during drought), farmers use corn stover in place of hay, driving the price of feedstock and decreasing availability for bio-projects.[30] |
| **Risk Information:** Mulch (seasonal) and animal bedding are non-traditional markets for sawmill residues like shavings, wood chips, and bark, but their influence on the wood supply is limited due to their small market size. Two larger mulch providers operate within 50 and 150 miles of Lyndonville, VT (see Table D-3). Overall, the mulch market is relatively small compared to traditional competitors in the BDO Zone. While the mulching market impacts some sawmills seasonally, this demand has been factored into our assessment, resulting in a low-risk rating. |
| **Raw Risk Likelihood (RRL)** **Score**<br>The risk likelihood is deemed low, therefore the RRL is 4 out of 10. **4** |
| **Raw Risk Impact (RRI)** **Score**<br>The risk impact is deemed low, therefore the RRI is 4 out of 10. **4** |
| **Gross Risk Indicator (GRI)** **Score**<br>The Gross Risk Indicator (RRL X RRI) is 16 out of 100. **16** |
| **Mitigation/Notching** **Notch**<br>*RRL Mitigation (Notch)* **NN**<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). |
| **Loaded RI Score** **Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. **16** |

## *2.2 Risk Factor: Specific Competitors' Competitive Advantage*

### *2.2.1 Relative Inventory Capacity*

| |
|---|
| **Rationale:** The more inventory a competing biomass facility is able to store, the more competitive pressure it can exert on supply. Ability to store large inventories allows competitors to purchase inventory when the prices are low, potentially giving it an economic advantage. Additionally, the ability to store inventory during feedstock supply surpluses can enable competitors to continue to intake feedstock when the Issuer's plant (with lesser inventory capacity) may be forced to put suppliers on quota. Larger inventory capacity on the part of competing markets creates supplier loyalty and can make it more difficult for new projects to secure supply without paying a significant premium. |
| **Risk Information:** The majority of biomass power plants stockpile fuel throughout the year and run continuously in the winter when energy prices are high. The wood chip piles are limited in size and are monitored to ensure they do not |

[30] Bergtold, 2018.

reach the early stages of decomposition. The wood fuel is consumed on a first-in, first-out basis to control the age of the material.

Many facilities maintain wood receiving yards on their premises and have log storage capabilities both onsite and at offsite locations. Chipping contractors are employed as needed to process these logs. However, there is a low likelihood that competitors could store significant amounts of pulpwood and sawmill residues for long periods of time.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **Score**<br>**4** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed low, therefore the RRI is 4 out of 10. | **Score**<br>**4** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **Score**<br>**16** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **Score**<br>**16** |

### *2.2.2 Relative Accessibility/Delivery Hours and Wait Times*

**Rationale:** The value attributed by suppliers to local competing markets for biomass is often directly related to the degree of flexibility the market provides in terms of delivery hours, and the more efficient discharge can occur.

**Risk Information:** According to local experts, there are currently no facilities experiencing substantial wait times for unloading. Most biomass-utilizing facilities have established delivery quotas for contracted loggers, aligning with their operational needs and unloading capacities.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed very low, therefore the RRL is 2 out of 10. | **Score**<br>**2** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed very low, therefore the RRI is 2 out of 10. | **Score**<br>**2** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 4 out of 100. | **Score**<br>**4** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 4 out of 100. | **Score**<br>**4** |

### *2.2.3 Relative Specification Advantages*

**Rationale:** When choosing a market for biomass feedstock, suppliers not only look at price, but also at relative quality requirements or specifications. It is important to understand feedstock quality specifications for competing markets within the BDO Zone, in order to accurately quantify the risk that competitors can exert on the Issuer's supply chain.

**Risk Information:** Within the BDO Zone, low-grade wood harvest material is allocated to four distinct end-use markets. These markets include whole tree wood chips for power production, bole wood chips for heating, pulp for paper manufacture, and unchipped logs for firewood. It is important to note that biomass power plants normally utilize complete tree chips as fuel, which are not suitable for other wood chip applications like heating and pellet manufacture. This is attributed to the elevated bark content present in the material. Debarking logs before chipping is necessary for efficient usage in wood heating or wood pellet plants, although it incurs extra expenses. The utilization of top and limb material would be limited, preventing the complete usage of the entire tree chip material by the expansion of pellet manufacture and wood chip heating. Overall, the BDO Zone has the experience of processing and producing different grades of woody biomass suitable for future biomass projects.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **16** |

### *2.2.4 Demand for Competitors' Products*

**Rationale:** Increased demand for the competitor's final product can cause an increased demand for feedstock by the competitor. For example, an increased demand for wood pellets due to high energy prices in Europe or for biofuels due to a favorable clean fuels policy can cause increased pellet/biofuel production by competing markets. Thereby driving demand for feedstock within a BDO Zone.

**Risk Information:** Wood boiler installations are expected to increase within the BDO Zone as the Vermont government aims to meet 35% of its thermal energy needs from advanced wood heat by 2030. A new pellet mill is set to come online in the BDO Zone in Q4 2024, potentially increasing demand and competition for sawmill residues. As the sawmill residue market tightens, pellet mills may start sourcing pulpwood if pellet demand continues to rise. Note that this risk has been addressed by the BAM of 3.4 applied to sawmill residues (see Table B-3). No future demand is anticipated from biomass power plants or pulp and paper facilities given trending downturns in both markets. Mulch production from pulpwood and sawmill residues is also expected to increase. Consequently, the risk was deemed medium-low.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **6** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |

| Gross Risk Indicator (GRI) | Score |
|---|---|
| The Gross Risk Indicator (RRL X RRI) is 24 out of 100. | 24 |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | NN |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 24 out of 100. | 24 |

## CATEGORY 3.0: SUPPLY CHAIN RISK

### *3.1 Risk Factor: Feedstock Availability*

#### *3.1.1 Biomass Availability Multiple (BAM)*

**Rationale:** Biomass Availability Multiple (BAM) indicates the degree of redundancy in an Issuer's supply chain in relation to the rated quantity in the BDO Zone. BAM is the mean ratio of biomass feedstock available to a project in relation to delivered cost, divided by the Issuer's mean rated quantity. BAM is a strong indicator of supply chain resilience when stressed by supply shortage and/or supplier breach. BAMs of 1.5 or higher are generally signals of lower feedstock risk for new projects in BDO Zones.

**Risk Information:** The Biomass Availability Multiple (BAM) provides a conservative redundancy to ensure higher confidence in project-ready estimates and rely on assumptions about future biomass supply and demand. Table B-3 indicated large BAMs for all three rated feedstocks due to factors such as accuracy of existing inventory (FIA data), scale-up readiness, historical harvesting practices and volumes, and constraints like forest fires, floods, and logistics. Also, other unforeseen factors, such as new competitors, weather-related events, and shifts in economic conditions, could impact these assumptions and subsequently affect biomass availability. Thus, the risk was set to low/medium.

| Raw Risk Likelihood (RRL) | Score |
|---|---|
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | 4 |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed medium, therefore the RRI is 6 out of 10. | 6 |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 24 out of 100. | 24 |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | NN |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 24 out of 100. | 24 |

#### *3.1.2 Feedstock Supply Curve/Marginal Cost Curve*

**Rationale:** The greater the feasible transport distance, the more feedstock is accessible to the Issuer, but at a higher delivered cost. The feedstock supply curve, sometimes referred to as the marginal cost curve, is a function of feedstock

availability over its cost, which is primarily, but not exclusively, a function of distance. The feedstock supply curve is used to determine the availability of redundant feedstock at various price points, and the cost of replacing feedstock with substitutes located at different distances.

Feedstock cost curves are useful in determining supply chain resilience; they provide information about the cost of feedstock availability in times of supply disturbance. Biomass supply chains are prone to supply disturbances over time; suppliers can become insolvent, or weather events can temporarily disrupt feedstock availability. When a disturbance occurs, the Issuer may need to source replacement feedstock from different suppliers at different locations and costs. A biomass supply curve indicates quantities of feedstock available at various price levels from suppliers generally located further away than the core supplier.

**Risk Information:** The supply curve for the rated quantities of pulpwood, forest residues, and sawmill residues (Figure B-6) was constructed to better understand the availability of these three feedstock types at 10-mile distance increments from Lyndonville, VT. Approximately 60% of the rated pulpwood and the forest residue, and 15% of sawmill residue quantities are available within the 55-mile drive distance from Lyndonville. Due to higher transportation costs necessary to access remote feedstocks we attribute a medium risk to this indicator.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **Score**<br>**6** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed medium, therefore the RRI is 6 out of 10. | **Score**<br>**6** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 36 out of 100. | **Score**<br>**36** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. | **Score**<br>**36** |

### *3.1.3 Seasonal Feedstock Supply Variation*

**Rationale:** Biomass supply can present significant seasonal supply variations. Seasonal supply variations combined with limitations associated with longer-distance transportation and storage can lead to BDO Zone biomass supply imbalances[31] and can manifest in shortages and higher costs for Issuers.

**Risk Information:** During the rainy season, logging operations are sometimes temporarily suspended. In July 2023, severe flooding in the BDO Zone caused significant economic loss for Caledonia County's forestry economy. Disruptions to supply chains led to delayed output, a 70% drop in logger sales, and extended travel times for log truckers. Sawmills also faced wood shortages. More recently, in the first quarter of 2024, weak sawlog inventories due to poor winter logging conditions forced some sawmills to reduce production by up to 20%, which has affected the available quantities and increased pricing of sawmill residues.

[31] Golecha & Gan, 2016.

Vermont is addressing climate-related risks in the logging industry by encouraging loggers to relocate to suitable areas for wet weather operations, prioritizing road maintenance, tailoring timber harvesting systems to local conditions, and establishing short-haul, local concentration yards. The unpredictable weather patterns and wet ground conditions are causing altered harvesting schedules and procurement challenges. Risk is deemed moderate.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **6** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed medium, therefore the RRI is 6 out of 10. | **6** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 36 out of 100. | **36** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. | **36** |

### *3.1.4 Year-to-Year Variation in Feedstock Availability*

**Rationale:** Biomass can have significant year-to-year supply variations due to variability in yield from biomass harvesting operations, particularly with agricultural biomass.

**Risk Information:** Year-to-year pulpwood availability has been relatively consistent for the past decade (Figure B-2). Historic pulpwood removals for the BDO Zone have shown a slight drop over the past ten years, reflecting plant shutdowns and production curtailments within the pulp and paper and biomass power plant markets. The considerably high growth-to-drain ratio value recorded in 2021, indicates that significant pulpwood volumes may be harvested sustainably in the BDO Zone.

From 2011 to 2024 the total production capacity among suppliers identified increased by 3% or 11 MMBF since 2011 which slightly benefits the sawmilling residue availability for a new project in the BDO Zone (Figure B-4). More recently in the first quarter of 2024, weak sawlog inventories due to poor winter logging conditions have forced some sawmills in the BDO Zone to reduce production by up to 20% which has affected the available quantities and pricing in the sawmill residue markets.[32]

The above considerations support a low risk.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching** | **Notch** |

[32] Based on outreach with forestry expert

| | |
|---|---|
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **Score**<br>**16** |

### *3.2 Risk Factor: Historical Issues*

#### *3.2.1 Historical Feedstock Price Variations*

**Rationale:** If the historical feedstock price shows volatility, then the risk of future price fluctuation is elevated. If feedstock prices have historically exceeded the price at which the Issuer would have to cease operations or breach a financial covenant (i.e., the "red line" feedstock cost), then mitigation measures should be put in place.

**Risk Information:** From 2021 to 2023, the average annual delivered pulpwood, forest residue, and residual chip prices increased sharply, with residual wood chip prices increasing by close to 80% (Figure D-6). Additionally, during this period, pulpwood prices increased by 37% and forest residues by 53%. This increase was attributed in part to higher natural gas and diesel fuel prices. Due to these sharp increases, a medium risk was deemed for this indicator.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **Score**<br>**6** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed medium, therefore the RRI is 6 out of 10. | **Score**<br>**6** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 36 out of 100. | **Score**<br>**36** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. | **Score**<br>**36** |

#### *3.2.2 Low Historical Demand for Feedstock in the BDO Zone*

**Rationale:** If Issuer BDO Zone does not have a history of developed large-scale feedstock procurement, suppliers may not have sufficient expertise in feedstock production to ensure reliable supply, especially in the early years. This can be particularly true for forest residues, where typically, the infrastructure for collection, processing, and delivery is immature.

Where supply chains are not well-established, risk can be mitigated when new bio-based plants control a higher degree of feedstock processing. For example, if a BDO Zone rating is issued for clean wood chips and the historical demand in the Zone has been exclusively for pulpwood, then supply chain risk will be decreased for new bio-based plants that intake pulpwood and manage log debarking and chipping internally. Rather than requiring inexperienced suppliers to deliver debarked wood chips.

**Risk Information:** The region has a rich and extensive history of forestry and the utilization of natural resources. Suppliers identified within the BDO Zone have been in operation for an average of 55 years, while the sawmill industry in the state has been active for more than two centuries. There is significant experience in the practice of harvesting forest residues in the region, specifically for biomass power plants within the Competition Zone. As such, the risk was deemed very low.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed very low, therefore the RRL is 2 out of 10. | **2** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed very low, therefore the RRI is 2 out of 10. | **2** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 4 out of 100. | **4** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 4 out of 100. | **4** |

### *3.2.3 History of Production/Feedstock is a New/Secondary Crop or By-Product*

**Rationale:** If feedstock is a new/secondary crop or a by-product, suppliers may either lack sufficient experience to mitigate risk or be unable to react to such risk. Secondary crop or by-product producers may be less likely to prioritize production.

For new crop types, inexperience in planting, harvest, collection, and yield data may pose higher levels of risk.

If feedstock is a secondary transformation (i.e., wheat straw, corn stover, or forest residue), then production can be subject to variables beyond suppliers' control (e.g., changing demand for sawtimber, or primary crop prices).

**Risk Information:** The ability of new bio-projects to secure the rated quantities is not expected to be adversely affected by changes in lumber or pulpwood markets due to the high BAM values. Moreover, historical data indicates that sawmilling capacities will continue to grow, while biomass power plant closures and production curtailments would leave ample opportunities for new entrants to take advantage of pulpwood volumes.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)* | **NN** |

No adjustment.

The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch).

| **Loaded RI Score** | **Score** |
|---|---|
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **16** |

### *3.3 Risk Factor: Non-Weather Based Externalities*

#### *3.3.1 Consumer Price Index (CPI) and Producer Price Index (PPI)*

**Rationale:** CPI and PPI can impact feedstock cost of harvest and collection over time. Sensitivities to worst-case scenarios should be run.

**Risk Information:** General economic conditions play a significant role in determining the price of delivered feedstock. Indicators like the Producer Price Index or Consumer Price Index offer insights into price trends that impact biomass logistics operations and associated costs, encompassing fuel, labor, equipment parts, and administrative expenses. Figure D-2 illustrates the CPI fluctuations over the past three years in the Northeastern Region, indicating a surge in inflation from September 2020 to July 2022, followed by a gradual decline thereafter. Such trends bear implications for biomass logistics management and cost considerations.

Diesel fuel is a significant component of biomass harvesting and delivery. Comparing diesel prices (Figure D-1) to the trend in CPI between 2020 and 2023 (Figure D-2) reveals that fuel prices have a strong response to general economic trends. The price of delivered pulpwood also tracks the CPI. Such variations in CPI and diesel prices can have a significant impact on the price of feedstock types such as pulpwood and forest residues that may need to be transported from long distances.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **6** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed medium, therefore the RRI is 6 out of 10. | **6** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 36 out of 100. | **36** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. | **36** |

#### *3.3.2 Currency Risk*

**Rationale:** Where feedstock is purchased in a currency different than that which a new bio-based plant will locate in a BDO Zone, currency exchange rates and volatility can constitute risk exposure. BDO Zones that cross the US-Canada border, for example, which intake feedstock from both countries, are exposed to such currency risk.

**Risk Information:** The six Quebec-based suppliers in the BDO Zone make up 38% of the total sawmill residues produced. When taking into account all rated quantities from pulpwood, forest residues, and sawmill residues, the actual feedstock exposure to currency risk is 8% of the total rated feedstock quantity.

| |
|---|
| The USD/CAD exchange rate fell against the Canadian dollar, reducing its value and creating additional revenues for Canadian lumber companies. The more the exchange rate falls below parity, the greater the return to Canadian softwood lumber exporters. At a USD/CAD exchange rate of 0.90, Canadian exporters receive 11% more revenue than U.S. competitors. A rise in the CAD may also have adverse effects on 38% of the total sawmill residue supply that is sourced from mills in Quebec (Table D-1). Furthermore, the appreciation of the CAD would also likely encourage more wood flows, including pulpwood, across the border into Canada. However, based on historical exchange rates (Figure D-8), it has been nearly 10 years since the USD was at or below parity with the CAD and has since had an average exchange rate of $1.27. Risk is deemed moderate. |
| **Raw Risk Likelihood (RRL)** **Score**<br>The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. **6** |
| **Raw Risk Impact (RRI)** **Score**<br>The risk impact is deemed medium, therefore the RRI is 6 out of 10. **6** |
| **Gross Risk Indicator (GRI)** **Score**<br>The Gross Risk Indicator (RRL X RRI) is 36 out of 100. **36** |
| **Mitigation/Notching** **Notch**<br>*RRL Mitigation (Notch)* **NN**<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). |
| **Loaded RI Score** **Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. **36** |

### *3.3.3 Border Risk*

| |
|---|
| **Rationale:** Where feedstock is transported cross-border to another country, risk exposure to border closures and crossing delays becomes present. The availability of trucks willing to do cross-border runs is limited, which can decrease supply chain flexibility and resilience. Plants near the US-Canada border, which intake feedstock from both countries, are exposed to these risks. |
| **Risk Information:** A small portion of sawmill residues and pulpwood are sourced from Quebec under annual contracts. Vermont and Quebec have 15 staffed border crossings, one unstaffed border crossing, and six rail border crossings. The Canada Border Service Agency (CBSA) processes commercial goods entering Canada through primary inspection lines at highway ports of entry, which are ~45 minutes long. The CBSA processed 5,323,945 commercial conveyances and met the service standard 97.86% of the time. U.S. Customs and Border Protection wait times from Quebec to Vermont have minimal delays.[33] Thus risk was deemed low. |
| **Raw Risk Likelihood (RRL)** **Score**<br>The risk likelihood is deemed low, therefore the RRL is 4 out of 10. **4** |
| **Raw Risk Impact (RRI)** **Score**<br>The risk impact is deemed low, therefore the RRI is 4 out of 10. **4** |
| **Gross Risk Indicator (GRI)** **Score**<br>The Gross Risk Indicator (RRL X RRI) is 16 out of 100. **16** |
| **Mitigation/Notching** **Notch**<br>*RRL Mitigation (Notch)* **NN** |

[33] www.cbsa-asfc.gc.ca/bwt-taf/menu-eng.html

No adjustment.

*RRI Mitigation (Notch)*
No adjustment.

The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch).

| **Loaded RI Score** | **Score** |
|---|---|
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **16** |

### *3.3.4 Temporary Externality-Driven Markets for Feedstock*

**Rationale:** Alternative, non-traditional, externality-driven competitors for feedstock can drive feedstock demand (and cost) in unusual circumstances. For example, an Issuer using corn stover as a feedstock would not typically compete with the higher-end animal feed market. However, in times of significant hay shortage (e.g., during drought), farmers may use corn stover as hay replacement, driving the price of stover feedstock and decreasing its availability for bio-projects.[34]

**Risk Information:** The feedstock supply chains and manufacturing processes within the BDO Zone already include strong firewood and bioheat markets and are well established. The probability of temporary external factors impacting the BDO Zone is assessed as very low.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed very low, therefore the RRL is 2 out of 10. | **2** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed very low, therefore the RRI is 2 out of 10. | **2** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 4 out of 100. | **4** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 4 out of 100. | **4** |

## *3.4 Risk Factor: Risks Related to Feedstock Production, Harvest, and Collection*

### *3.4.1 Harvest & Collection Practices & Schedules*

**Rationale:** Differences in harvest timing and practices used can create risk to both the quantity and quality of feedstock. For example, feedstock harvested by different suppliers in different windows can undergo varying levels of exposure to sun, wind, and moisture, leading to variations in delivered feedstock quality.

For example, agricultural feedstocks and energy crops have optimal harvesting windows to ensure minimal moisture content. In certain BDO Zones, these harvesting windows may coincide with heightened weather risks, such as frost or rain.

[34] Bergtold, 2018.

For forestry biomass, unsightly clear-cuts and slash piles (even on plantation forests and especially when located near communities) can provoke unwanted public backlash even when suitable and sustainable replanting regimes are followed.

**Risk Information:** As presented in Section B—Operational Considerations, supply chains in the BDO Zone benefit from established and robust harvest, collection, and scheduling practices. Moreover, Vermont has established stringent procurement standards for biomass power plants under the Certificate of Public Good process. These standards include adherence to specific silvicultural practices, retention of downed woody material, and detailed harvest plans. Furthermore, professional foresters are tasked with monitoring harvests to ensure compliance with these forest management guidelines.

However, unforeseen factors such as adverse weather conditions or extended periods of impassable roads can introduce risk to the supply chain and affect logging production. Despite these challenges, increasing the volume of forest residue harvest is not expected to negatively impact the harvest of pulpwood or sawtimber. This is because forest residue collection occurs in a separate operation after the primary timber harvest. Risk is deemed low.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **16** |

### *3.4.2 Harvesting & Collection Equipment*

**Rationale:** Different types of harvesting and collection equipment used by suppliers in a BDO Zone can have a significant impact on the quality and availability of feedstock. Using different types and combinations of harvesting, collection, and processing equipment among suppliers can lead to non-homogeneous feedstock. Equipment that is not designed specifically for biomass cultivation, harvesting, and collection can increase feedstock quality risks.

Relevant equipment should be specified for the sake of product consistency and risk reduction.

**Risk Information:** All equipment employed in the regional forestry supply chain has been assessed as posing no risk to wood fiber quality and availability. Harvesters are utilized for felling, delimbing, and sectioning trees into logs, while forwarders are responsible for hauling logs to the roadside. Logging trucks and chip vans are then used to transport logs and chipped forest residues to their destinations. It is important to note that, when managed and operated properly, none of this equipment presents a risk to feedstock quality or availability.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |

| **Gross Risk Indicator (GRI)** | **Score** |
|---|---|
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **16** |

### *3.4.3 Variation in Densification Methods Among Different Suppliers*

**Rationale:** The shape and density of the unit in which feedstock is supplied can impact feedstock cost and quality. Standard feedstock densification modes for biomass consist of round or square bales, pellets, cubes, chips, or grindings. The size of wood fiber processed in a grinder is less homogenous than if a chipper is used.

Bales of different densities can absorb moisture at different rates. In certain cases, round bales have been viewed as problematic due to their uneven moisture content distribution.[35]

**Risk Information:** Woody biomass in the BDO Zone is produced in formats acceptable by the biomass processing and conversion companies. No densification methods exist. Risk is very low.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed very low, therefore the RRL is 2 out of 10. | **2** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed very low, therefore the RRI is 2 out of 10. | **2** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 4 out of 100. | **4** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 4 out of 100. | **4** |

### *3.4.4 Availability of Labor for Feedstock Production*

**Rationale:** Skilled labor shortages can be difficult to remedy in the short term. The availability of suitable labor in an area can impact the ability to procure sufficient feedstock quantities on required schedules. Labor risks are higher where supply chains are not yet active or for Issuers for whom large feedstock requirements or the development of new (or expanded) supply chains demand significant additions to the local labor force.

[35] Huhnke, 2018.

**Risk Information:** The labor and equipment requirements for the rated quantities are approximately 37 logging crews and 47 trucks. Local logging operators suggested that this scale-up estimate was achievable. With the recent downsizing of markets due to biomass power plant shutdowns, many crews have retired their chippers; however, there are currently as many as 30 mobile chippers within the BDO Zone. Furthermore, there are close to 300 loggers within the BDO Zone.

Nonetheless, the logging sector is experiencing a declining employment trend, with the median age of loggers in the BDO Zone nearing 50, suggesting an impending shortage of skilled workers. To address this, the region offers various job-specific training centers and vocational/technical schools for the forestry industry.

The risk was deemed medium.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **6** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed medium, therefore the RRI is 6 out of 10. | **6** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 36 out of 100. | **36** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. | **36** |

## *3.5 Risk Factor: Transportation*

### *3.5.1 Feedstock Transportation Costs*

**Rationale:** Transportation can be one of the most significant cost components of biomass supply chains. The average transport cost and percentage of total feedstock cost attributable to transport should be known.

Transport distances of 80-120 km for biomass feedstocks are typical, but larger distances can be common. Where the average transport distance from suppliers to Issuers is high, the supply chain is subject to greater sensitivities to risks, such as increases in diesel cost, weather impacts, mechanical breakdown, and the demand for scarce feedstock from competitors closer to the source.

Understanding average transport distance can help flag higher-risk BDO Zones where transport distance materially exceeds the average.

**Risk Information:** Transportation costs account for 20-50% of the total biomass delivered price, depending on the type of biomass, the distribution of the biomass in the BDO Zone, and the supply/demand dynamics in the region. Fuel costs have the largest impact on the haul rates. Each $/gal increase in fuel costs increases the average haul cost by about $0.74/ton. Refer to Figure B-7 for transportation costs based on distance.

As per Risk Indicator 3.1.2, less than 50% of the total rated quantities is located more than > 55-mile drive distance from Lyndonville, which will increase transportation costs. Risk was deemed medium.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **6** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed medium, therefore the RRI is 6 out of 10. | **6** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 36 out of 100. | **36** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. | **36** |

### *3.5.2 Diesel Cost Impacts*

**Rationale:** Changes in diesel costs impact transport costs over time. Sensitivities to worst-case scenarios should be run.

**Risk Information:** Diesel fuel prices in the US New England region have generally tracked upward for the past two decades (Figure B-2), with a low of just below $1.07 per gallon in 1999 and a high of $6.26 in 2023. These price fluctuations closely parallel the national average price of diesel. Changes in diesel prices could have a significant effect on the delivered cost of biomass.

Transportation companies commonly apply a fuel surcharge when diesel costs exceed a predetermined threshold, referred to as the fuel price baseline. Between 2021 and 2022, diesel prices experienced a significant rise, prompting fuel surcharges ranging from 15% to 40%. Consequently, the delivery cost of biomass escalated by $3 to $8 per bone dry ton for delivery within 55 miles. Considering that 60% of the pulpwood and forest residues are located within a distance of less than 55 miles from the project center point, the impact of this increase can be assessed as moderate.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **6** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed medium, therefore the RRI is 6 out of 10. | **6** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 36 out of 100. | **36** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. | **36** |

### *3.5.3 Transportation of Feedstock Requires Specialized Equipment*

**Rationale:** Requirements for specialized transport equipment (e.g., walking-floor trailers) can increase supply chain risk. Where there is low availability of required transportation equipment, equipment owners have increased leverage over transportation prices and supply chain resiliency can be lower.

**Risk Information:** Logging trucks (6-axle and 4-axle), chip vans, possum belly trailers, walking-floor trailers, and self-unloading trailers are generally available. Many logging truck companies have multiple trailer types and can switch trailers relatively easily in response to demand. Forest residues, when collected, can utilize large chip vans. Transporting sawmill residues with chip vans pose no challenges as the majority of sawmills in the BDO Zone are currently using them for their deliveries. Overall, no specialized equipment is needed for harvesting and transporting the three rated feedstock types. Risk is deemed low.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **16** |

### *3.5.4 Delivery Routes through Local Communities*

**Rationale:** Transportation of biomass can become a nuisance to local communities, especially if a large number of trucks pass through residential and school areas. Local communities often have the power to force regulations regarding truck transport, impeding the ability of BDO Zone suppliers to transport feedstock.

**Risk Information:** Forestry is a major industry in the region. Most rural communities are familiar with and accept logging and logging truck traffic. Local experts in the industry state that given how important forestry and biomass are to the community, major opposition is unlikely. Additionally, truckers are aware of possible nuisance areas and have been trained to avoid them.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)* | **NN** |

| |
|---|
| No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). |
| **Loaded RI Score** — **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. — **16** |

### *3.5.5 Transportation Regulations & Local Weight Limits*

| |
|---|
| **Rationale:** In many BDO Zones, transportation is regulated based on seasonal road conditions. These regulations (e.g., "frost laws") often take the form of weight restrictions or limits on the number of trucks allowed on roads. Such regulations can impede the project's ability to source sufficient feedstock or increase the cost of doing so at certain times of the year. |
| **Risk Information:** As described in Section B – Operational Considerations, having different truck weights in adjacent states can present a challenge. However, truckers are well versed in these limitations and have worked around them to haul legally across states. Risk is deemed moderate. |
| **Raw Risk Likelihood (RRL)** — **Score** |
| The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. — **6** |
| **Raw Risk Impact (RRI)** — **Score** |
| The risk impact is deemed medium, therefore the RRI is 6 out of 10. — **6** |
| **Gross Risk Indicator (GRI)** — **Score** |
| The Gross Risk Indicator (RRL X RRI) is 36 out of 100. — **36** |
| **Mitigation/Notching** — **Notch**<br>*RRL Mitigation (Notch)* — **NN**<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). |
| **Loaded RI Score** — **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. — **36** |

### *3.5.6 Road Infrastructure*

| |
|---|
| **Rationale:** Feedstock cost and availability can be a function of road infrastructure, in particular the accessibility the infrastructure provides to feedstock. Issues with road networks will translate directly to risks to feedstock supply. |
| **Risk Information:** Vermont and New Hampshire have robust road infrastructure that facilitates the transportation of timber from forests to processing facilities. Vermont has a lower number of public roads on the north/south axis of the Green Mountains. The northeastern region of Vermont has very few public roadways, primarily due to extensive private holdings. These sparsely populated regions do not pose a significant obstacle for biofuel projects, as privately owned roads provide access to the most isolated areas in the BDO Zone, where timber is abundant and reachable. Spring break-up, occurring from April to May, makes driving more difficult due to wet roads and decreased logging operations but truck drivers are well versed in dealing with these situations. The risk is deemed low. |
| **Raw Risk Likelihood (RRL)** — **Score** |
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. — **4** |
| **Raw Risk Impact (RRI)** — **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. — **4** |
| **Gross Risk Indicator (GRI)** — **Score** |

| | |
|---|---|
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **Score**<br>**16** |

### *3.5.7 Transportation Redundancy*

**Rationale:** Transport equipment redundancy is important for dealing with seasonally variable feedstock supplies as well as the risk of equipment breakdowns.

**Risk Information:** Our estimations suggest that for the total rated quantities of pulpwood, forest, and sawmill residues, it would require approximately 47 trucks (Section C – Operational Considerations). Mill closures, a slowly recovering saw timber market, two warm winters, a major flood in 2023, and persistent precipitation over the last 18 months have resulted in sustained periods of idle logging capacity. Although this has led to reduced harvesting capacity, idled equipment, and layoffs, there is likely sufficient transportation capacity that can be utilized. Outreach confirms this and adds that with stable wood demand and the right pricing, this should be feasible. Risk is deemed medium.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **Score**<br>**6** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed medium, therefore the RRI is 6 out of 10. | **Score**<br>**6** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 36 out of 100. | **Score**<br>**36** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. | **Score**<br>**36** |

## *3.6 Risk Factor: Supply Chain Resiliency*

### *3.6.1 Size, Number, and Location of Suppliers*

**Rationale:** In general, a supply portfolio involving multiple suppliers of various sizes (and from multiple BDO Zones) is important for ensuring steady and uninterrupted feedstock supply with minimal price fluctuations. If a small number of large suppliers provides a high proportion of total feedstock, a disruption or supplier breach will have greater impact on the supply chain. In such cases the risk of disruption is lower, but the impact of those disruptions is higher. Conversely, many small suppliers are less likely to have the capacity to withstand internal disruptions and thus may be more likely to breach. Here, risk of disruption is higher, but their likely impact is lower. The number of suppliers as well as the ratio of small to large suppliers should be optimized.

There is no pre-determined number or optimal ratio of suppliers, although having too many or too few can both pose higher degrees of risk.

**Risk Information:** Approximately 59% of the rated pulpwood and 62% of the forest residue, and 15% of sawmill residue quantities are available within the 55-mile drive distance from Lyndonville, VT with the remaining located at distances up to <75-miles where higher costs of transportation (Figure B-7) are incurred.

The average distance from the center point to sawmills is 64 miles. Approximately 57% of the total sawmill residues are produced within a 65-mile drive distance from Lyndonville. Sawmills in Quebec represent 38% of total sawmill residue production, whereas New Hampshire sawmills make up 57% of total sawmill residual production (Table D-1, Figure B-6). Risk is deemed low.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **16** |

### *3.6.2 Suppliers Subject to Same External Risk Factors*

**Rationale:** When a single risk event can impact the feedstock production ability of all (or most) suppliers, then feedstock risk is higher and supply chain resiliency is lower. Resilience is maximized when biomass supply chains exhibit diversity in spatial location (i.e., geography), production practices and other elements of supply chain structures such that the impact of single high-risk events have varying impacts on suppliers.

**Risk Information:** Over the past decade, there has been a decline in the extraction of pulpwood (as shown in Figure B-2), forest residues, and sawmill residues, largely due to market downturns and capacity reductions. This has impacted the sustainability of sawmills, affecting the availability of saw timber and forest residues for harvesting. Additionally, rising natural gas prices pose a significant risk, as facilities often incinerate their own residues, resulting in reduced availability and increased costs for potential projects.

Seasonal weather conditions such as precipitation, storms, and flooding can cause intermediate disruptions throughout the supply chain. For example, flooding can interrupt the flow of sawtimber supply to sawmills thereby causing mills to temporarily curtail production and thus, the supply of available sawmill residues. Furthermore, this weather can slow down or interrupt the harvesting of pulpwood and forest residues as a result of road conditions.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **6** |
| **Raw Risk Impact (RRI)** | **Score** |

| | |
|---|---|
| The risk impact is deemed medium, therefore the RRI is 6 out of 10. | **6** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 36 out of 100. | **Score**<br>**36** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. | **Score**<br>**36** |

### *3.6.3 Land Ownership Structures*

**Rationale:** The ownership (or control) of the land base on which feedstock is produced can have a significant impact on the Issuer's feedstock risks. Risk of long-term variation in stumpage cost for wood fiber (i.e., the cost that one pays to a landowner for the right to cut and purchase their wood fiber), for example, is much higher in the US, where >90% of the land is private, and thus stumpage cost is determined on a competitive auction basis. Conversely, in Canada, >90% of the land is owned by the Crown, and stumpage is allocated by the government.

**Risk Information:** Approximately 73% of the BDO Zone area is designated as timberland. The vast majority (87%) of this land is privately owned. Most of the land in this area consists of smaller individual and family-owned private woodlands, averaging around 84 acres. There is also a history of large industrial forestry ownerships in the region, with several large parcels now being held as long-term, private, working forest investments.[36] The region is home to the state's largest parcel of industrial forestland, over 56,000 acres, and the largest conservation project, the Silvio O. Conte National Wildlife Refuge, which covers over 130,000 acres. Ownership fragmentation and procuring low-grade roundwood from new harvesting activity on smaller private woodlots carry a moderate level of risk.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **Score**<br>**6** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed low, therefore the RRI is 4 out of 10. | **Score**<br>**4** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 24 out of 100. | **Score**<br>**24** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 24 out of 100. | **Score**<br>**24** |

[36] www.nvda.net/files/2015%20Chapter%201%20Land%20Use.pdf

## *3.7 Risk Factor: Climate and Natural Risks*

### *3.7.1 Seasonal Weather Impacts on Feedstock Supply*

**Rationale:** Seasonal weather impacts are defined as those deriving from natural weather variations (i.e., spring thaws, rainy seasons, or dry seasons – as opposed to from singular weather events like fires, droughts, or hurricanes). Seasonal weather changes can be a significant risk factor affecting feedstock availability, quality, and price.

Given the major influence that weather has on multiple aspects of growing, harvesting, and transporting biomass, it is difficult to predict the availability of biomass at a specific location at different points in the future with a high degree of certainty. However, it is still possible, using past data and statistical models, to generate reasonable upper/lower bound estimates of biomass production in any given year in a wider supply zone. Such estimates are important in assessing feedstock risk and enable accurate assessment of the efficacy of Issuer's mitigation methods.

**Risk Information:** Timber harvests in Vermont are influenced by seasonal weather conditions, with increased precipitation in winter and spring causing temporary disruptions. Loggers are moved to areas better suited for wet weather during these seasons, such as higher ground or soil types. In autumn, less rainfall allows mills to gather stock for winter and spring. However, flooding in July 2023 caused a 70% drop in gross sales and intermediate production declines of up to 20%, impacting the forestry supply chain. To avoid disruptions, acceptable management practices (AMPs) are implemented, minimizing discharge risks and enhancing soil health. These measures are not required for discharge, stream alteration, stormwater, and Wetland Rules.[37] They also aim to protect aquatic habitats and wildlife, maintain natural water temperature, and prevent erosion. There is a surplus of timber available that surpasses the current demand, which helps to minimize any potential risks related to seasonal fluctuations in feedstock.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **6** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed high, therefore the RRI is 8 out of 10. | **8** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 48 out of 100. | **48** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>There is a surplus of timber available that surpasses the current demand, which helps to minimize any potential risks related to seasonal fluctuations in feedstock. A bio-based project can establish storage and build up feedstock inventory to help mitigate risk in times when feedstock shortages occur resulting from seasonal weather events.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is 25%. | **Notch**<br>**25%** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. | **36** |

### *3.7.2 Long-Term Weather and Climate Trends*

**Rationale:** In certain BDO Zones, climatic trends and significant potential changes to future weather patterns can create feedstock risk.

[37] fpr.vermont.gov/sites/fpr/files/Forest_and_Forestry/Forest_Management/Library/AMP%20final%20version%207-17-18.pdf

**Risk Information:** Climate change is expected to intensify floods and droughts in Caledonia County BDO Zone, increasing vulnerability to springtime flooding and wildfires. Vermont's Climate Action Plan outlines strategies to address these consequences, including hazard mitigation, forest management optimization, monitoring forestry operations, and advancing new forest plantation stock.[38] Long-term weather and climate changes in Vermont have increased forest productivity but may decrease towards the end of the century due to higher summer temperatures, drought, and soil nutrient depletion. Given the correlation between wood and lumber prices and weather patterns, climate change is likely to impact price volatility.[39] As such, the risk is deemed moderate.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **6** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed medium, therefore the RRI is 6 out of 10. | **6** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 36 out of 100. | **36** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. | **36** |

### *3.7.3 Forest/Crop Fire*

**Rationale:** Forest/crop fires, especially when occurring on a large scale, destroy feedstock and create shortages.

Fire-prone conditions are predicted to increase across Canada. This could potentially result in a doubling of the amount of area burned by the end of this century compared with amounts burned in recent decades. Boreal forests, which have been historically greatly influenced by fire, will likely be especially affected by this change.

Other climate change impacts that could add damaged or dead-wood to the forest fuel load (e.g., as a result of insect outbreaks, ice storms, or high winds) may increase the risk of fire activity. New research is aimed at refining these climate change estimates of fire activity and investigating adaptation strategies and options to deal with future fire occurrences. There is growing consensus that as wildfire activity increases, fire agency suppression efforts will be increasingly strained. However, analyses of fire history suggest that the effect of climate variability on precipitation regimes is the primary reason for the decreasing fire activity in the southern BDO Zone of Canada.

**Risk Information:** Wildfire threats in the BDO Zone are low, with the worst conditions occurring in spring, late summer, and early fall. Drought increases the risk, and open burning bans are often enacted when drought conditions are deemed severe. In 2022, Vermont experienced 86 wildfires, compared to 103 in New Hampshire. Vermont focuses on preparedness and response phases, with open burning requiring a 'Permit to Kindle Fire' from the Town Forest Fire Warden. Local communities are preparing Community Wildfire Protection Plans (CWPPs) to lessen interface wildfire impacts.

[38] climatechange.vermont.gov/sites/climatecouncilsandbox/files/2021-12/Initial%20Climate%20Action%20Plan%20-%20Final%20-%2012-1-21.pdf
[39] resources.environment.yale.edu/files/biblio/YaleFES-00000277.pdf

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **Score**<br>**4** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed low, therefore the RRI is 4 out of 10. | **Score**<br>**4** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **Score**<br>**16** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **Score**<br>**16** |

### *3.7.4 Risk of Infestation*

**Rationale:** Risk of future infestation, including its estimated consequences on feedstock supply, should be calculated into the overall risk profile.

Since forest insect populations are influenced by environmental conditions, future changes in climate can be expected to significantly alter the outbreak dynamics of certain forest insect species. In some cases, larger and more frequent insect outbreaks may occur, but in other cases, recurring outbreaks may be disrupted or diminished. As climate continues to change, we can expect more situations, particularly at the margins of tree ranges, where sub-optimal conditions for tree growth and reduced tree vigor can lead to outbreaks of forest insects.

**Risk Information:** Invasive insects, like the emerald ash borer, Asian long-horned beetle, and hemlock woolly adelgid, present a substantial risk to Vermont's forests. These pests pose a significant threat to 14 different tree species, which include maple, elm, horse chestnut, willow, ash, poplar, European mountain ash, hackberry, and hemlock. Vermont's forests have a diverse composition, which helps manage insect infestations. These infestations progress gradually, giving enough time for biomass supply chains to adapt and make necessary adjustments. The Vermont Department of Forests, Parks, and Recreation and the Vermont Agency of Agriculture, Food, and Markets work with USDA agencies to conduct surveys and manage non-native forest pests. Preventative measures involve implementing Best Management Practices (BMP) and enforcing a firewood quarantine to control the import of untreated firewood into the state. In 2016, a firewood quarantine was implemented to safeguard the forest's health.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **Score**<br>**4** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed high, therefore the RRI is 8 out of 10. | **Score**<br>**8** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 32 out of 100. | **Score**<br>**32** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)* | **Notch**<br>**NN** |

| |
|---|
| No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). |

| **Loaded RI Score** | **Score** |
|---|---|
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 32 out of 100. | **32** |

### *3.7.5 Risk of Hail*

**Rationale:** Hail has negligible impact on forestry biomass but is one of the principal destroyers of agricultural crops in North America.

There is much uncertainty about the effects of anthropogenic climate change on the frequency and severity of extreme weather events like hailstorms and their subsequent economic losses. Some studies indicate a strong positive relationship between hailstorm activity and hailstorm damage, as predicted by minimum temperatures using simple correlations. This relationship suggests that hailstorm damage may increase in the future if global warming leads to further temperature increases.

**Risk Information:** Hail is not a relevant risk in the BDO Zone.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed not relevant, therefore the RRL is not rated (NR). | **NR** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed not relevant, therefore the RRI is not rated (NR). | **NR** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is not rated. | **NR** |
| **Mitigation/Notching** | **Notch** |
| The Total Notch (RRL Notch) X (RRI Notch) is NR (Not Rated). | **NR** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is not rated. | **NR** |

### *3.7.6 Risk of Flood*

**Rationale:** Floods can cause catastrophic disruption and delay in feedstock supply. Where there is high risk of flood and thus negative impact to feedstock supply, the BDO Zone rating should account for this risk.

**Risk Information:** Flooding is the most common recurring hazard event in the BDO Zone, with increasing intensity and severity in recent years. Floods have occurred in at least 20 of the last 28 recorded natural disasters in Caledonia County.[40] As a result of flooding that occurred in June and July of 2023, some loggers experienced a 70% reduction in gross sales compared to the same period in 2022. Several sawmills faced wood shortages lasting more than a week, while log truckers dealt with reduced work availability and extended travel times to reach logging operations. Caledonia County reported the second highest level of economic loss among affected counties, with the forestry industry facing minimum losses of $500,000.[41]

In consideration of the above-mentioned, this risk is deemed high.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed high, therefore the RRL is 8 out of 10. | **8** |
| **Raw Risk Impact (RRI)** | **Score** |

[40] www.augurisk.com/risk/state/vermont/caledonia-county/50005

[41] fpr.vermont.gov/sites/fpr/files/documents/FE_Survey_2023.pdf

| | |
|---|---|
| The risk impact is deemed medium, therefore the RRI is 6 out of 10. | **6** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 48 out of 100. | **Score**<br>**48** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>Understanding the potential for flooding in the area is crucial for any bio-based project to effectively plan and implement risk management strategies. By being aware of this risk, the project can take necessary precautions to minimize the negative impact of flooding. These measures concerning the project site include building flood barriers, implementing stormwater management systems, elevating structures, and establishing a flood evacuation plan.<br><br>The industrial site's location is located outside the 100-year flood plan. It has been protected through natural measures like stormwater retention ponds and wetlands roadways. Consequently, the impact is adjusted by 25%.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is 25%. | **Notch**<br>**25%** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. | **Score**<br>**36** |

### *3.7.7 Risk of Drought*

**Rationale:** Droughts can cause significant disruptions to feedstock supplies across entire BDO Zones for extended periods of time, especially in case of agricultural residues and energy crops. Parts of Western Canada are experiencing more frequent and severe droughts, and scientists expect drought to affect new areas across Canada going forward.

Tree species are adapted to specific moisture conditions. Having less water available through drought has a range of negative impacts on the health of forest ecosystems. Direct impacts include reduced growth, increased tree mortality, and failure to regenerate. Indirect impacts include reduced ability to defend against insects and disease and increased fire risk. These impacts can affect the availability of wood fiber for an Issuer.

**Risk Information:** The northeast United States is susceptible to rapid-onset droughts with intense dry periods of about 2-6 months followed by a period of above-normal precipitation. The BDO Zone has a highly variable, unpredictable climate, making droughts a potential concern. A lack of sufficient precipitation can cause both immediate and long-term stress to trees.

While severe droughts are possible, moderate and mild droughts are more common. No significant risks of drought or interruptions to the forestry industry were flagged within the BDO Zone. If a prolonged drought does occur, it is unlikely to have a significant effect on the wood supply. As such, risk is deemed low to moderate.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **Score**<br>**4** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed medium, therefore the RRI is 6 out of 10. | **Score**<br>**6** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 24 out of 100. | **Score**<br>**24** |
| **Mitigation/Notching** | **Notch** |

| | |
|---|---|
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 24 out of 100. | **Score**<br>**24** |

### *3.7.8 Risk of Hurricanes, Tornadoes, and Strong Winds*

**Rationale:** Hurricanes, tornadoes, and strong winds can destroy timber stands, crops, and feedstock piles. They can also delay forestry and agricultural operations. Hurricanes and tornadoes can indirectly cause temporary shortages of available transportation as available trucking moves to handle higher-value disaster-related contracts. For example, Katrina cleanup limited availability of live-bottom trailers in the North and South-East of the US for several months as truckers shifted operations to handle more lucrative government contracts.

Although scientists are uncertain whether climate change will lead to an increase in the number of hurricanes, warmer ocean temperatures and higher sea levels are expected to intensify their impacts.

Recent analyses conclude that the strongest hurricanes occurring in some BDO Zones, including the North Atlantic, have increased in intensity over the past two to three decades.

**Risk Information:** Hurricanes and tropical storms can significantly impact Vermont and the BDO Zone, such as inundation flooding, and fluvial erosion. Thunderstorms can produce downburst winds, reaching speeds over 80 mph, with spring and summer being the most common times for severe thunderstorms. Vermont has experienced 49 tornadoes since 1950, causing property damage and power outages to over 35,000 utility customers. Within the BDO Zone in 2010, wind across the Green Mountains caused damaging downslope winds, while Tropical Storm Irene caused flooding and damaging north winds. In 2019, strong winds affected the BDO Zone, causing downed tree limbs, power outages, and uprooted trees.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **Score**<br>**6** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed medium, therefore the RRI is 6 out of 10. | **Score**<br>**6** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 36 out of 100. | **Score**<br>**36** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. | **Score**<br>**36** |

### *3.7.9 Risk of Low Temperatures*

**Rationale:** Low temperatures can cause crop failure, leading to shortages of biomass. Additionally, low temperatures can have adverse impacts on the operations of feedstock processing equipment in Northern BDO Zones.

**Risk Information:** Although temperatures in the BDO Zone can occasionally drop to low levels, anecdotal evidence suggests that they have not been severe enough to significantly hinder forest activities for long periods. Extreme cold temperatures generally do not cause major problems with woody biomass unless non-indigenous species are deliberately cultivated to achieve fast growth. The typical temperature range for Caledonia County, VT, throughout the year is between 12.2°F and 81°F. Consequently, we expect minimal threats to the supply chains due to low temperatures.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **16** |

## *3.8 Risk Factor: Political and Social*

### *3.8.1 Government Subsidies for Feedstock Production or Utilization*

**Rationale:** Feedstock that is directly subsidized through government programs can pose greater long-term risk than feedstock that is not. Subsidies may be subject to amendment or repeal, sometimes with minimal notice.

*NOTE: This risk indicator refers to direct feedstock subsidies only; it does not apply to government subsidies that pertain indirectly to the Issuer's operations, such as Loan Guarantees, or to the markets for products produced by the Issuer*.

**Risk Information:** While there are rebates and incentives available in Vermont for wood heating appliances and/or systems of all sizes for both residential and commercial customers, there are no direct feedstock subsidies. As far as we are aware, there are no government subsidies available to incentivize feedstock production in the BDO Zone. Therefore, suppliers do not depend on government funding to produce feedstock.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)* | **NN** |

No adjustment.

*RRI Mitigation (Notch)*
No adjustment.

The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch).

| **Loaded RI Score** | **Score** |
|---|---|
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **16** |

### *3.8.2 Local, Provincial, & National Laws, Regulations, & Permitting Pertaining to Biomass*

**Rationale:** Feedstock whose production is directly dependent on local, provincial, or national laws or government regulations can pose greater long-term risk than feedstock that is not, since laws and regulations may be subject to amendment or repeal.

If biomass utilization requires specific permits (e.g., percentage removal of forest residues or corn stover, allowable cut limits, air emission, storage permits, rights-of-way, overweight permits for trucks, cross-border permitting for shipment of biomass, chain of custody, or certification of sustainability), the likelihood of obtaining such permits and/or complying with permitting requirements should be examined.

**Risk Information:** A new bio-based project would require Act 250 land use permits, which assess environmental and community impact factors. Municipal permits are also needed for manufacturing and biomass acquisition, with additional permissions for wetlands operations. Regular audits ensure logging operations comply with acceptable management practices, exempting them from certain permits. Section 248 of Act 250, managed by the Vermont Public Utility Commission, requires biomass power plants to obtain a Certificate of Public Good before construction. This involves strict environmental criteria and wood procurement policies, including approvals and inspections. According to outreach with logging professionals, the forestry department's wood procurement requirements as part of Section 248 are not realistically viable and onerous. All these forest operation laws complicate long-term fiber production and use. As such, the risk is deemed high or moderate.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed high, therefore the RRL is 8 out of 10. | **8** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed medium, therefore the RRI is 6 out of 10. | **6** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 48 out of 100. | **48** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>The industrial park leverages an existing Act 250 master permit, providing tenants with a streamlined avenue to pursue amendments within the current regulatory framework. This offers the opportunity for accelerated permitting procedures, consequently minimizing associated timelines and enhancing operational efficiency.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is 25%. | **25%** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. | **36** |

### *3.8.3 Backlash Against Biomass Development, Procurement, or Usage in the Region*

**Rationale:** Public backlash against biomass development in the Issuer BDO Zone can directly impact Issuer's ability to procure, transport, trans-load, store, or utilize feedstock by affecting local policies, regulations, and Issuer's ability to obtain necessary permitting.

**Risk Information:** Opposition to large-scale biomass power plants in Vermont and New England presents significant risks driven by ecological, economic, and environmental concerns. Local resistance often leads to project delays and increased costs.

Act 250, as detailed in 3.8.2, allows community participation in project reviews, adding uncertainty and cost to new bio-based projects. The permitting process evaluates "public need" and "public benefit" alongside ten environmental criteria. In regions with established opposition to biomass projects, Act 250 further complicates the approval process.

Examples such as the Joseph C. McNeil Generating Station in Burlington and Dartmouth College's abandoned biomass heating plant proposal demonstrate the challenges faced due to public opposition. A growing conservation movement among private landowners also influences forestry practices.

To mitigate risks, new bio-based project developers should align with community values and emphasize responsible forest management practices. Establishing an environmentally conscious and community-oriented image is crucial for acceptance and collaboration within the Caledonia County BDO Zone.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed high, therefore the RRL is 8 out of 10. | **8** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed high, therefore the RRI is 8 out of 10. | **8** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 64 out of 100. | **64** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>Given these considerations, new operators must emphasize the positive impact of their projects on the environment and prioritize sustainable forestry methods. Effectively addressing concerns and overcoming potential issues related to pulpwood consumption requires operators to demonstrate responsible forest stewardship while aligning their strategy with local values. Establishing a reputation as environmentally and community-conscious partners would help to garner greater acceptance and cooperation in the Caledonia County BDO Zone. Consequently, the likelihood is adjusted by 50%.<br><br>*RRI Mitigation (Notch)*<br>Through engagement initiatives such as open houses within the community and with stakeholders a project can tailor its communications on economic development, job security, and operations sustainability, and the proponent can help mitigate the risk related to potential backlash against feedstock use. As such, the impact is adjusted by 25%.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is 44%. | **44%** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. | **36** |

### *3.8.4 Consent of, and Cooperation with, Indigenous Communities and First Nations*

**Rationale:** Where new project development on or near Indigenous or First Nation land, or where near Indigenous or First Nations exert influence over feedstock producing areas, consent of, and cooperation with, Indigenous communities and First Nations decreases Issuer risk.

**Risk Information:** There are no Indigenous reserves or federally recognized Native American tribes in the BDO Zone. New Hampshire has the New Hampshire State Commission on Native American Affairs, but there are no state-recognized tribes. In Vermont the Abenaki First Nations and their four associated bands are recognized. No risks are associated with these bands.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed very low, therefore the RRL is 2 out of 10. | **2** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed very low, therefore the RRI is 2 out of 10. | **2** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 4 out of 100. | **4** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 4 out of 100. | **4** |

### *3.8.5 Food Security Concerns*

**Rationale:** Despite the fact that any significant correlation between food prices and biofuel production is unclear, claims that biofuel production has driven up food prices, taken food from communities or had a negative impact on land use can fuel public backlash. For example, the removal of biomass may raise public concerns relating to food security if Issuer feedstock requires the use of land that would otherwise be used for growing food.

**Risk Information:** Not relevant.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed not relevant, therefore the RRL is not rated (NR). | **NR** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed not relevant, therefore the RRI is not rated (NR). | **NR** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is not rated. | **NR** |
| **Mitigation/Notching** | **Notch** |
| The Total Notch (RRL Notch) X (RRI Notch) is NR (Not Rated). | **NR** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is not rated. | **NR** |

## *3.9 Risk Factor: Sustainability and Environmental Concern*

### *3.9.1 Feedstock Sustainability*

**Rationale:** Public concerns about the sustainability of feedstock production can jeopardize biomass feedstock operations. Sustainability certification schemes should be utilized where applicable to ensure that feedstock comes from sustainable sources.

Canada leads all countries with 166 million hectares of certified forests, a figure that is nearly four times more than second-place United States at 47 million hectares.

**Risk Information:** The projected annual availability of pulpwood for the new project is estimated at 1.6 million bdt/yr. However, to ensure sustainable harvesting and maintain a growth-to-drain ratio above 1.5, the operational quantity has been conservatively rated at 500,000 bdt/yr. This conservative estimate mitigates the risk of overharvesting and promotes long-term forest health.

Regular audits are conducted to ensure adherence to Acceptable Management Practices (AMPs), which help mitigate environmental risks associated with logging. Certifications from reputable programs like the Forest Stewardship Council (FSC), Vermont Family Forests, Sustainable Forestry Initiative (SFI), and Vermont Tree Farm Program validate forestry operations, reducing the risk of reputational damage. Vermont's Use Value Appraisal tax program for forestland covers over 16,000 parcels and 2 million acres, providing economic incentives for sustainable management. Proactive management, including regular revision of management plans by licensed foresters, ensures adherence to silvicultural standards and sustainable timber production. Climate change is expected to intensify floods and droughts in the Caledonia County BDO Zone, increasing vulnerability to springtime flooding and wildfires.

Vermont has established stringent procurement standards for biomass power plants under the Certificate of Public Good process. These standards require adherence to specific silvicultural practices, retention of downed woody material, detailed harvest plans, acceptable management practices, soil quality preservation, and agreements on wildlife and invasive species. Professional foresters are tasked with monitoring harvests to ensure compliance with these forest management guidelines.

Vermont's Climate Action Plan outlines strategies to address climate change's consequences, including hazard mitigation infrastructure, forest management optimization, monitoring forestry operations, and advancing new forest plantation stock. Furthermore, the state has set rigorous procurement standards for biomass power plants, requiring silvicultural practices, harvest plans, soil quality preservation, and wildlife agreements, with professional foresters monitoring harvests.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment. | **NN** |

| |
|---|
| The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). |
| **Loaded RI Score** — **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. — **16** |

### *3.9.2 Risk to Soil Quality*

**Rationale:** Soil sustainability can be defined as the management of soil in a way that does not exert any negative or irreparable effects either on the soil itself or any other systems. There is a diversity of approaches to soil sustainability in jurisdictional guidelines for forest biomass harvesting and production. For different feedstock types, there are also different thresholds at which feedstock removal causes significant negative consequences on the soil.

Poor soil quality that negatively impacts the long-term sustainability of the feedstock can entail long-term feedstock risk. Sub-optimal soil management can leave exposed soil post residue-harvest, which can lead to soil wash-off and soil carbon loss from precipitation and wind. Over-harvesting of biomass also depletes the carbon stock in the soil and creates a negative feedback loop that can degrade the soil and its nutrients.

**Risk Information:** Vermont's Acceptable Management Practices (AMPs) aim to maintain soil health, prevent sediment discharge, and mitigate erosion in wooded areas. Key practices include delaying summer harvests, logging under frozen conditions, avoiding spring harvests, limiting post-harvest access networks, and considering invasive plant populations' response to soil disturbances like timber harvesting. A 2011 evaluation by the Department of Forests, Parks, and Recreation (FPR) showed minimal soil disturbance in timber harvesting and forest resource management, indicating the effectiveness of AMPs in maintaining soil sustainability and preventing soil damage from tree cutting. Risk is considered low.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)** | **Score** |
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)* | **NN** |
| No adjustment. | |
| *RRI Mitigation (Notch)* | |
| No adjustment. | |
| The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **16** |

### *3.9.3 Risk to Surface and Groundwater*

**Rationale:** Excessive nutrient runoff from biomass feedstock production can accumulate in surface waters and result in algal blooms and hypoxia, which can lead to habitat loss for aquatic species higher up the food chain and alter aquatic ecosystem food webs. Damage to aquatic ecosystems can cause social and regulatory backlash. Water intake issues can also increase risk.

**Risk Information:** Mitigating risk to soil health due to forestry operations is one of the primary goals of Vermont's forestry Acceptable Management Practices ("AMPs"). A 2011 assessment of timber harvesting and forest resource management compliance by the Department of Forests, Parks, and Recreation indicated the following: in 78% of

observations, logging did not impact the stream's condition. For 60% of observations, the stream buffer widths were deemed sufficient. At 78% of stream crossings, there was no sign of sedimentation. However, only 42% of skid trails had drainage structures installed at the recommended frequency according to the AMPs for maintaining water quality on logging Jobs in Vermont.[42] Landowners and loggers are required to implement AMPs. Failure to comply can result in penalties under the Vermont Water Pollution Control Act.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **16** |

### *3.9.4 Water Use*

**Rationale:** Biomass feedstock operations can have significant impacts on the hydrological flux (infiltration, groundwater recharge, interception, and transpiration) of ecosystems. This can lead to water shortages, lower yields, and backlash from regulatory bodies if management plans are not properly instituted.

**Risk Information:** Not relevant.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed not relevant, therefore the RRL is not rated (NR). | **NR** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed not relevant, therefore the RRI is not rated (NR). | **NR** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is not rated. | **NR** |
| **Mitigation/Notching** | **Notch** |
| The Total Notch (RRL Notch) X (RRI Notch) is NR (Not Rated). | **NR** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is not rated. | **NR** |

### *3.9.5 Pesticide Risk to Human and Ecosystem Health*

**Rationale:** Application of pesticides (i.e., herbicides, fungicides, and insecticides) on agricultural and forest landscapes can result in adverse health effects for humans and ecosystems. If pesticide application is required in feedstock production, the impact must be considered in the BDO Zone rating.

**Risk Information:** The use of pesticides in timberlands is regulated by the state of Vermont and requires a permit and adherence to Best Management Practices. As such, the risk is deemed very low.

[42] https://fpr.vermont.gov/sites/fpr/files/Forest_and_Forestry/Vermont_Forests/Library/2017_VT_ForestActionPlan_ForestProducts.pdf

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed very low, therefore the RRL is 2 out of 10. | **Score**<br>**2** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed very low, therefore the RRI is 2 out of 10. | **Score**<br>**2** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 4 out of 100. | **Score**<br>**4** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 4 out of 100. | **Score**<br>**4** |

### *3.9.6 Risk to Wildlife and Landscape*

**Rationale:** Biomass production and supply chain operations with negative impacts on wildlife and landscape are at a greater long-term risk of encountering project setbacks and disruptions.

**Risk Information:** Vermont's Forestry Department has developed Voluntary Harvesting Guidelines, which include Best Management Practices for private landowners in managing biodiversity and wildlife habitats. These guidelines emphasize the importance of leaving 15-30% of harvestable biomass as coarse, woody debris to protect wildlife habitats. To comply with Vermont's renewable energy credit program, proponents must pass forestry and wildlife habitat standards, with habitats for bats and deer being key issues.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **Score**<br>**4** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed low, therefore the RRI is 4 out of 10. | **Score**<br>**4** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **Score**<br>**16** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **Score**<br>**16** |

### *3.9.7 Biomass Classified as Genetically Modified Organism (GMO)*

**Rationale:** There are various risks associated with GMOs, such as migration or dispersion across the landscape, which can generate community backlash and create supply chain risk. GMOs can also be heavily regulated. If planning to grow or procure GMO feedstocks, especially purpose-grown energy crops, it is important to understand the risks.

**Risk Information:** Not relevant.

| Raw Risk Likelihood (RRL) | Score |
|---|---|
| The risk likelihood is deemed not relevant, therefore the RRL is not rated (NR). | NR |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed not relevant, therefore the RRI is not rated (NR). | NR |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is not rated. | NR |
| **Mitigation/Notching** | **Notch** |
| The Total Notch (RRL Notch) X (RRI Notch) is NR (Not Rated). | NR |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is not rated. | NR |

## CATEGORY 4.0: FEEDSTOCK SCALE-UP RISK

### *4.1 Risk Factor: Feedstock Scale-Up*

#### *4.1.1 Feedstock Quality at Production Scale*

**Rationale:** The physical and chemical properties of feedstock used in lab, pilot and field testing can fail to be representative of feedstock generated by large-scale operations.

It is important to conduct tests on feedstock representative of that which will be produced by large-scale operations. Failure to adequately test the full range of parameter values can result in severe problems during scale-up.

**Risk Information:** Establishing clear quality specifications and strong communication with suppliers in the BDO Zone is vital for meeting standards. Continuous improvement and innovation in biomass management and processing techniques will enhance the quality and sustainability of biomass energy, reducing long-term operational risks. The existing suppliers have already been providing woody biomass to regional clients, each with their own quality specifications. Thus, the risk was deemed low.

| Raw Risk Likelihood (RRL) | Score |
|---|---|
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | 4 |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | 4 |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | 16 |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | NN |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | 16 |

#### *4.1.2 Capacity of Supply Chain Components & Equipment to Scale*

**Rationale:** Scale-up risk increases if supply chain components, or underlying feedstock infrastructure necessary for these components, cannot scale to handle Issuer feedstock requirements and throughput capacity. Capacity to scale should be demonstrated.

**Risk Information:** The BDO Zone's forestry sector has faced challenges due to the closure of low-grade timber facilities in the biomass, pulp, and paper sectors. This has led to unused capacity in the logging infrastructure, affecting suppliers and resulting in decreased equipment values and equity losses. Despite these challenges, logging and chipping contractors have invested in equipment to meet the rising demand for quality woodchip heating fuel. However, feedback suggests that plant shutdowns and curtailments have left loggers feeling "burnt," having already made investments in equipment to service the procurement needs of these plants. The forestry economy in the BDO Zone is supported by around 300 loggers, with demand from large biomass power plants driving significant harvesting of pulpwood and forest residue. While the region's infrastructure may have weakened due to reduced demand for low-grade wood and slow saw timber market recovery, sufficient capacity and expertise remain to support bio-based project implementation.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **6** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed medium, therefore the RRI is 6 out of 10. | **6** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 36 out of 100. | **36** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. | **36** |

## CATEGORY 5.0: INFRASTRUCTURE RISKS

### *5.1 Risk Factor: Physical Infrastructure*

#### *5.1.1 Land Parcel/Industrial District*

**Risk Information:** The project site is located in the St. Johnsbury/Lyndon Industrial Park, specifically on Lot #3, encompassing 7.7 acres of greenfield space. Positioned within the heart of the industrial park on the St. Johnsbury side, it benefits from a central location just 2.5 miles south of Lyndonville.

Zoning within the industrial park primarily designates lots for commercial and industrial use, with nearby areas featuring commercial, residential, and industrial zoning. Notably, a 124-acre golf course zoned for commercial use lies approximately 580 meters southeast of the project site, while an 11.7-acre parcel hosting a commercial garage sits about 550 meters southwest. Adjacent to the project site are undeveloped rural residential parcels along the north and eastern sides of the industrial park. Existing businesses in the industrial park include UPS, Lyndon Furniture, Vermont Aerospace, NSA Industries, Northeast Processing, and a 5-star-rated Daycare.

Given the size of the lot (7.7 acres), it may not be compatible with large-scale bio-based projects processing the rated quantities of woody biomass or 726,000 bdt/yr. However, there are several other potential site locations available in the vicinity that offer a suitable footprint to accommodate large-scale bio-based projects. As such, the risk is deemed moderate.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|

| | |
|---|---|
| The risk likelihood is deemed medium, therefore the RRL is 6 out of 10. | **6** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed medium, therefore the RRI is 6 out of 10. | **Score**<br>**6** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 36 out of 100. | **Score**<br>**36** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. | **Score**<br>**36** |

### *5.1.2 Ownership of Land*

**Risk Information:** The Northeastern Vermont Development Association (NVDA) owns the industrial park and its associated parcels, including the proposed project location. NVDA serves the 55 municipalities in this northeastern corner of Vermont as the regional planning commission and supports the development of new business in the land parcel. Lots within the industrial park are available for purchase or lease.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **Score**<br>**4** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed low, therefore the RRI is 4 out of 10. | **Score**<br>**4** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **Score**<br>**16** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **Score**<br>**16** |

### *5.1.3 Permitting Description*

**Risk Information:** Vermont's Act 250 legislation evaluates development proposals against ten criteria to protect the state's ecology, community well-being, and aesthetic integrity. The permitting process requires a review of "public need" and "public benefit," with feedstock suppliers required to adhere to a Public Utilities Commission-approved wood gathering policy. New construction and renovations require approval from the town Planning Commission, and processing timelines can range from months to over a year. Vermont's environmental and land use legislation includes permits for air pollution control, water discharge, stormwater discharge, potable water supply, and wastewater.

Studies and outreach indicate that the permitting environment poses a significant barrier to project development in Vermont. A 2023 study by Renewable Energy Vermont (REV) highlighted key obstacles, including delays in the review process, inconsistent rule application, and subjective evaluation criteria, which are increasingly prevalent concerns for renewable energy projects in the state.[43] However, the risks are mitigated by the fact that the industrial park benefits from an established Act 250 master permit, enabling tenants to seek amendments within the existing framework. This presents the potential for expedited permitting processes, reducing associated timelines.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed high, therefore the RRL is 8 out of 10. | **8** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed medium, therefore the RRI is 6 out of 10. | **6** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 48 out of 100. | **48** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>The industrial park benefits from an established Act 250 master permit, enabling tenants to seek amendments within the existing framework. This presents the potential for expedited permitting processes, reducing associated timelines.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is 25%. | **Notch**<br>**25%** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 36 out of 100. | **36** |

### *5.1.4 Environmental Issues*

**Risk Information:** The industrial site's location is without issues and outside the 100-year flood plan. It has been protected through natural measures like stormwater retention ponds and wetlands roadways. No known rare or irreplaceable natural or fragile areas are on or near the industrial site.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **16** |

[43] www.revermont.org/wp-content/uploads/No-Good-Reason-REV-Regulatory-Report_Final.pdf

## *5.2 Risk Factor: Utilities*

### *5.2.1 Natural Gas Availability*

**Risk Information:** Natural gas is not available at the site; however, a propane delivery operation is located in the same industrial park. The 2023 average natural gas rates in Lyndonville are $7.53/per 1000 ft$^3$ for commercial and $5.69/per 1000 ft$^3$ for industrial applicants.[44] The residential and industrial natural gas rates in the BDO Zone are 11% and 19% more expensive than the national average rates, respectively. Commercial natural gas rates, however, are close to 45% less expensive in the BDO Zone than the national average.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed high, therefore the RRL is 8 out of 10. | **8** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed high, therefore the RRI is 8 out of 10. | **8** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 64 out of 100. | **64** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 64 out of 100. | **64** |

### *5.2.2 Electric Availability*

**Risk Information:** A three-phase electricity connection exists at the site. The power company is Lyndonville Electric, which has a substation located at 867 Industrial Parkway within the St. Johnsbury/Lyndon Industrial Park. The high-side voltage starts at 34.5 kilovolts (kV) and is reduced to 12,470 volts using a 3.7 megavolt-ampere (mVa) transformer. Voltage regulation is controlled by 167 kilovolts (kV) GE regulators connected to the bus. This substation does not have SCADA communication.

Vermont has a regulated electricity market. The average electricity rates for Lyndonville are $15.92/MWh for commercial and $13.63/MWh for industrial. [45] The industrial average electricity rate in Lyndonville, Vermont, is 17% higher on average than the state rate and 40% higher than the national average.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment. | **NN** |

[44] https://www.eia.gov/dnav/ng/ng_pri_sum_dcu_nus_a.html

[45] findenergy.com/vt/caledonia-county-electricity/; Note that averages were taken from the period ending in Sept /2023

| | |
|---|---|
| *RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **Score**<br>**16** |

### *5.2.3 Water Availability*

**Risk Information:** The St. Johnsbury public water supply system serves the industrial park. An 8-inch line serves the spur roads with hydrants at each end. The industrial park's lots are connected to the town of Lyndon's wastewater collection and treatment system. Gravity sewers with manholes and three small pumping stations provide public sewer service. Installation of stormwater piping along with three stormwater retention ponds and associated site work has been completed in preparation for the creation and development of approximately 13 new lots in the industrial park. Risk is deemed very low.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed very low, therefore the RRL is 2 out of 10. | **Score**<br>**2** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed very low, therefore the RRI is 2 out of 10. | **Score**<br>**2** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 4 out of 100. | **Score**<br>**4** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 4 out of 100. | **Score**<br>**4** |

### *5.2.4 Waste Disposal*

**Risk Information:** Lyndonville is part of the Northeast Kingdom Waste Management District (NEKWMD), with waste disposal primarily reliant on one operating lined landfill located approximately 38 miles away in Coventry. Owned and operated by New England Waste Services of VT, Inc., this landfill manages about 75% of Vermont's waste, with the remaining 25% sent to disposal facilities in neighboring states (New Hampshire, New York, and Massachusetts).

Additionally, there is one transfer station, the Hyde Park Transfer Station, situated 38 miles from the project center point, and one construction and demolition landfill in Colchester, Vermont. Four haulers provide waste and recycling collection services from the site.[46]

Tipping fees are approximately $110 per ton, excluding collection and hauling costs. When factoring in these additional expenses, Vermont's average commercial waste collection cost is around $145 per ton. This cost structure influences operational expenses and financial considerations for regional waste management.[47]

[46] www.lyndonvt.org/Recycling_Sanitation.html

[47] dec.vermont.gov/sites/dec/files/wmp/SolidWaste/Documents/trash-renegotiation.pdf

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **Score**<br>**4** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed low, therefore the RRI is 4 out of 10. | **Score**<br>**4** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **Score**<br>**16** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **Score**<br>**16** |

### *5.2.5 Internet Availability*

**Risk Information**: With respect to the industrial site, three residential fiber providers cover approximately 13.53% of the area around Lyndonville, offering average speeds of up to 6,151 Mbps. Tilson Broadband provides the most extensive coverage (7.73%), with average speeds reaching 10,240 Mbps. Kingdom Fiber (3.60%) and Spectrum (2.02%) are the other primary broadband providers in the county. While options like Starlink offer higher speeds, they come with a higher cost.

Vermont's internet coverage and average speeds lag behind the national average. To address this issue, a one-million-dollar Rural Forest Economy Partnership Grant from the Northern Borders Regional Commission (NBRC) has been allocated to expand broadband infrastructure in the state. This initiative aims to improve rural coverage and enhance internet access for residents in Vermont.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **Score**<br>**4** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed low, therefore the RRI is 4 out of 10. | **Score**<br>**4** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **Score**<br>**16** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **Score**<br>**16** |

## *5.3 Risk Factor: Transportation/Logistics*

### *5.3.1 Road/Highway Access*

**Risk Information:** The industrial park is located less than a mile south of Lyndonville. The industrial park is south of the split of Interstate 91, which runs along the west side of the industrial park going south, and US Route 5 runs east of the industrial park. US Route 5 is an important north-south connecter. Note that Interstate 91 is the primary north-south thoroughfare in the region's western part. Its southern terminus is in New Haven, Connecticut, at I-95, while the northern terminus is in Derby Line, Vermont, at the Canada–United States border. US Route 5 is an important north-south connector that serves as a major collector connecting central and Southern Vermont through Newbury to the south and the Canadian Border in Derby at Derby Line. US Route 2 is one of only three east-west routes across Vermont (the others being US Route 4 and 9) and is just over 5 miles from the project site.

The industrial site is situated in proximity to major paved roadways, both north-south and east-west. That said, no access roads or culverts are on the site (greenfield). Heavy traffic and access for logging trucks and chip vans could face local backlash and remains a concern, although feedback received from outreach was that this should not be an issue.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **16** |

### *5.3.2 Rail Access*

**Risk Information:** Table D-7 outlines some of the central railways within the BDO Zone and their distance from the industrial site. Passenger service is unavailable in the BDO Zone, but residents can access Amtrak services in White River Junction or Montpelier, located 67 and 43 miles from Lyndonville, respectively. The St. Lawrence and Atlantic Railway (SL&A) operates 30.65 miles of track in Vermont, handling approximately 26,000 annual carloads. The Washington County Railroad (WACR) Connecticut River Division also connects with various railways, including the CMQ in Newport, NECR, PAR, and the Claremont Concord Railroad in White River. The CMQ operates 24.4 miles in Vermont, managing 3,077 car loadings annually. The Maine Central Railroad (MEC)/Twin State Railroad (TSR) runs 19.7 miles from St. Johnsbury to Gilman, Vermont, although the entire length within Vermont is inactive. Rail infrastructure is critical to the region's competitiveness, offering a 56% efficiency advantage over heavy single-unit and combination trucks.

Rail access is deemed a valuable asset for new development, thus presenting a low risk. For a map of the railroad infrastructure within the BDO Zone, refer to Map D-1.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |

| | |
|---|---|
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **Score**<br>**16** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **Score**<br>**16** |

### *5.3.3 Airport Access*

**Risk Information:** Vermont has 16 public airports, 12 of which are designated under the National Plan of Integrated Airport Systems (NPIAS). The Burlington International Airport (BTV) is the state's primary commercial hub, classified as a small hub. Flight scheduling at BTV is concentrated between 6 and 10 a.m. to facilitate connecting flights at larger hub airports, resulting in capacity constraints in both the terminal and airport parking positions.

The Northeast Kingdom hosts four state-owned airports: John H. Boylan State Airport, Island Pond Vermont, Caledonia County State Airport, and Newport State Airport. While primarily utilized by private pilots, these airports could be upgraded to accommodate air freight delivery services.

Northeast Kingdom International (EFK) in Newport, situated 32 miles (approximately 36 minutes' drive time) from Lyndonville, features two asphalt runways and recorded 9,452 aircraft operations in 2015 (averaging 19 per day). Caledonia County (CDA) Airport, located in Lyndonville, offers a single runway and logged 4,690 aircraft operations in 2007 (averaging 12 per day). Burlington International (BTV), approximately 80 miles (about 1 hour 45 minutes' drive time) from Lyndonville, witnessed 687,436 passenger boardings in 2019. As the sole airport in Vermont offering mainline commercial service, BTV plays a critical role in the state's air transportation network.[48]

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **Score**<br>**4** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed low, therefore the RRI is 4 out of 10. | **Score**<br>**4** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **Score**<br>**16** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score** | **Score** |

[48] https://www.btv.aero/

| | |
|---|---|
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **16** |

### *5.3.4 Water Freight Access*

**Risk Information:** The eastern seaboard of the U.S. is within relative proximity to the BDO Zone and provides access to several deep-water ports. A significant set of ports are accessible for a bio-based project. On the Atlantic, key ports include Newark, NJ; New York, NY; Boston, MA; Portsmouth, NH; and Portland, ME. Additionally, there is Albany, NY, up the Hudson River with a deep-water port, and via Lakes Erie and Ontario, it goes into the St. Lawrence Seaway through Montreal. Figure D-4 highlights some key ports and their distance from Lyndonville, VT.

Accessible ports are a benefit for a bio-based project that wants to access markets for biofuels through any of the major eastern seaboard seaports.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)** | **Score** |
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **16** |

## *5.4 Risk Factor: Social Infrastructure*

### *5.4.1 Healthcare (Local)*

**Risk Information:** The BDO Zone has two full-service healthcare centers, the North Country Hospital in Newport and the Northeastern Vermont Regional Hospital in St. Johnsbury (NVRH). NVRH is a 25-bed critical access hospital with multiple primary care practices, specialty and surgical services, a birth center, and a 24-hour physician-staffed emergency department. The region also has small medical clinics and physician offices. Ambulance services in Lyndon provide medical first aid, CPR training, non-emergency medical transportation, and backup service to neighboring areas. There are two nursing homes and four residential care homes.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)** | **Score** |
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment. | **NN** |

| | |
|---|---|
| *RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **Score**<br>**16** |

### *5.4.2 Education (Schools)*

**Risk Information:** The region offers diverse educational opportunities, ranging from K-12 schools to colleges such as Lyndon Institute and Northern Vermont University. Lyndon Institute offers a comprehensive curriculum emphasizing academics, arts, and technical programs. Additionally, several colleges in the area provide specialized programs. The merger of Lyndon State College and Johnson State College has formed Northern Vermont University, offering signature programs and career sciences options such as Automotive Technology, Human Services, Precision Machining, and Environmental Stewardship. St. Johnsbury Academy provides courses in various career clusters such as agriculture, business, transportation, and distribution.

Overall, the region's education system is robust and conducive to supporting the development of new industries. Vermont also offers job-specific training centers and vocational/technical schools for the forestry industry, including programs such as the Vermont Forest Products Program, Logger Education and Professionalism (LEAP), and the Northern Vermont University (NVU) Center for Professional Studies.

The NVU Forest Economy Accelerator Program, a three-month intensive program for innovative Forest Product Businesses, aims to create and sustain jobs in rural communities. Furthermore, Vermont's workforce preparation initiatives, such as the Vermont Training Partnership (VTP), offer performance-based grants covering up to 50% of training costs to ensure employees are equipped for future job opportunities.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **Score**<br>**4** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed low, therefore the RRI is 4 out of 10. | **Score**<br>**4** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **Score**<br>**16** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **Score**<br>**16** |

### *5.4.3 Local Transportation*

**Risk Information:** The commute time for employees in Caledonia County, VT, is typically shorter, averaging 24.9 minutes, compared to the average of 26.8 minutes for workers across the United States. In Caledonia County, 3.66% of commuters face the challenge of enduring long commutes that exceed 90 minutes.

RCT is a non-profit organization providing transportation services to Lyndonville and surrounding areas, including shuttle buses, wheelchair-accessible vans, taxis, and volunteer drivers. They also offer access to coach lines in Montpelier (43 miles from Lyndonville) and passenger rail services (Amtrak) in either White River Junction (76 miles from Lyndonville) or Montpelier.

Caledonia County has nearly 39 miles of walkways and four completed rail routes, including the 96-mile Lamoille Valley Rail Trail. Vermont is expanding bicycle infrastructure to create a bike-friendly environment, with a three-mile distance between the industrial site and Lyndonville city center.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **Score**<br>**4** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed low, therefore the RRI is 4 out of 10. | **Score**<br>**4** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **Score**<br>**16** |
| **Mitigation/Notching**<br>*RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **Notch**<br>**NN** |
| **Loaded RI Score**<br>The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **Score**<br>**16** |

### *5.4.4 Public Safety (Local)*

**Risk Information:** Lyndonville has an overall crime rate of 10 per 1,000 residents, close to the average of all cities and towns in America, but it falls slightly below the state of Vermont average.[49]

The region has 21 local fire departments, with most towns having their own fire protection. The St. Johnsbury Fire Department (SJFD) (6 miles from St. Johnsbury/Lyndon Industrial Park) covers the industrial site, with ten full-time employees and 20 paid-on-call firefighters. SJFD offers services like first response, auto extrication, hazardous material incidents, technical rescue, and fire prevention. It is recognized as one of Vermont's regional disaster response teams.

Municipal police departments within Caledonia County are in Hardwick, Lyndon, St. Johnsbury, and Newport City, while Brighton and Canaan use the same officer. County Sheriff's Departments are in St. Johnsbury, Newport, and Lunenburg. Vermont State Police has barracks in St. Johnsbury, providing enhanced 9-1-1 service and four ambulance squads; thus, this is a low-risk associated with public safety.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)**<br>The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **Score**<br>**4** |
| **Raw Risk Impact (RRI)**<br>The risk impact is deemed low, therefore the RRI is 4 out of 10. | **Score**<br>**4** |
| **Gross Risk Indicator (GRI)**<br>The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **Score**<br>**16** |

[49] https://www.neighborhoodscout.com/vt/lyndon/crime

| Mitigation/Notching | Notch |
|---|---|
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | NN |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | 16 |

### *5.4.5 Housing/Cost of Living*

**Risk Information:** In 2002, the median property value in Lyndonville was $168,306, representing 80% of Caledonia County's ($197,700) and 62% of Vermont's ($272,400).[50] Owner-occupied housing units accounted for 49.7% of total housing units in Lyndonville, lower than the percentages observed in Caledonia County (50.3%), Vermont (72.7%), and the U.S. (64.8%).

Renting a two-bedroom unit in Lyndonville costs $960 per month, marking a 32.9% discount compared to the national average ($1,430) and a 34.4% discount compared to the state average ($1,290).[51] However, Lyndonville's average rental vacancy rate was 9.4% in 2022, significantly higher than the rates observed in Caledonia County (3.5%) and Vermont (3.2%).[52] The median household income in Caledonia County is $60,385, reflecting a 22.57% disparity from the state median ($67,674) and a 25% difference from the U.S. median household income ($75,149).[53]

With a Cost-of-Living score of 88.5, Lyndonville's overall expenses for housing, food, childcare, transportation, healthcare, taxes, and other essentials are 11.5% below the U.S. average and 12.2% below the average for Vermont.[54] Risk is deemed low.

| Raw Risk Likelihood (RRL) | Score |
|---|---|
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | 4 |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | 4 |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | 16 |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | NN |
| **Loaded RI Score** | **Score** |

[50] censusreporter.org/profiles/16000US5041950-lyndonville-vt/
[51] www.bestplaces.net/cost_of_living/city/vermont/lyndonville
[52] www.housingdata.org/profile/rental-housing-costs/median-gross-rent
[53] datausa.io/profile/geo/vermont
[54] www.bestplaces.net/cost_of_living/city/vermont/lyndonville

| | |
|---|---|
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **16** |

## *5.5 Risk Factor: Labor*

### *5.5.1 Workforce*

**Risk Information:** Since 2010, the labor force in the Caledonia County has decreased by 16% by 2022, resulting in an unemployment rate of 2.9%, higher than Vermont's overall unemployment rate of 2.2%, but lower than the U.S. rate of 3.9%.[55] The total percentage of the population that is part of the workforce age >16 years and older is 63.7%, which falls short of the state of Vermont's rate of 65.5%.[56]

The median household income in Caledonia County is $60,385, which is 22.57% less than the state's ($67,674) and 25% less than the U.S. median household income ($75,149).[57] Close to 36% of the population in Caledonia County have a high school degree or equivalent.[58]

The main industries for Caledonia County residents are health care and social assistance, educational services, and retail trade.[59] Table D-8 provides a list of some of the largest employers in Caledonia County.

Vermont offers various job-specific training centers and vocational/tech schools for the forestry industry, including the Vermont Forest Products Program, Vermont Technical College Employer Partner Program, Logger Education and Professionalism (LEAP), Northern Vermont University Center for Professional Studies, and the Vermont Training Partnership (VTP). These programs aim to create and sustain jobs in rural communities, provide economic, environmental, and social benefits, and prepare Vermont's employees for future jobs.

| | |
|---|---|
| **Raw Risk Likelihood (RRL)** | **Score** |
| The risk likelihood is deemed low, therefore the RRL is 4 out of 10. | **4** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed low, therefore the RRI is 4 out of 10. | **4** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 16 out of 100. | **16** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br>*RRI Mitigation (Notch)*<br>No adjustment.<br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 16 out of 100. | **16** |

[55] www.workstats.dli.pa.gov/
[56] www.census.gov/quickfacts/fact/table/caledoniacountyvermont/BZA110221
[57] datausa.io/profile/geo/vermont
[58] Ibid.
[59] Ibid.

### *5.5.2 Labor Costs*

**Risk Information:** Vermont's minimum wage is $13.67 per hour; significantly higher than New Hampshire of $7.25 per hour. The per capita income in 2022 was $32,974.[60] Approximately 93.7% of individuals aged 25 or older have a high school diploma or higher, while 31.5% hold a Bachelor's degree or higher.[61] In Lyndonville, the median age is 36.6, with a median household income of $54,688, a 15% decrease from the county level, a 24% decrease from the state level, and a 36% decrease from the national median income. However, the per capita income in Caledonia County has increased by 11% in the last 12 months, but still 26% below the state average.[62] Labor costs are deemed high risk.

| **Raw Risk Likelihood (RRL)** | **Score** |
|---|---|
| The risk likelihood is deemed high, therefore the RRL is 8 out of 10. | **8** |
| **Raw Risk Impact (RRI)** | **Score** |
| The risk impact is deemed high, therefore the RRI is 8 out of 10. | **8** |
| **Gross Risk Indicator (GRI)** | **Score** |
| The Gross Risk Indicator (RRL X RRI) is 64 out of 100. | **64** |
| **Mitigation/Notching** | **Notch** |
| *RRL Mitigation (Notch)*<br>No adjustment.<br><br>*RRI Mitigation (Notch)*<br>No adjustment.<br><br>The Total Notch (RRL Notch) X (RRI Notch) is NN (No Notch). | **NN** |
| **Loaded RI Score** | **Score** |
| The Loaded RI Score ((1-Total Notch) X GRI Score) is 64 out of 100. | **64** |

[60] Ibid.
[61] https://datausa.io/profile/geo/caledonia-county-vt#economy
[62] Ibid.

## SECTION D: TABLES AND FIGURES

**Map D-1. BDO Zone – Infrastructure: Rail, Air, and Sea**

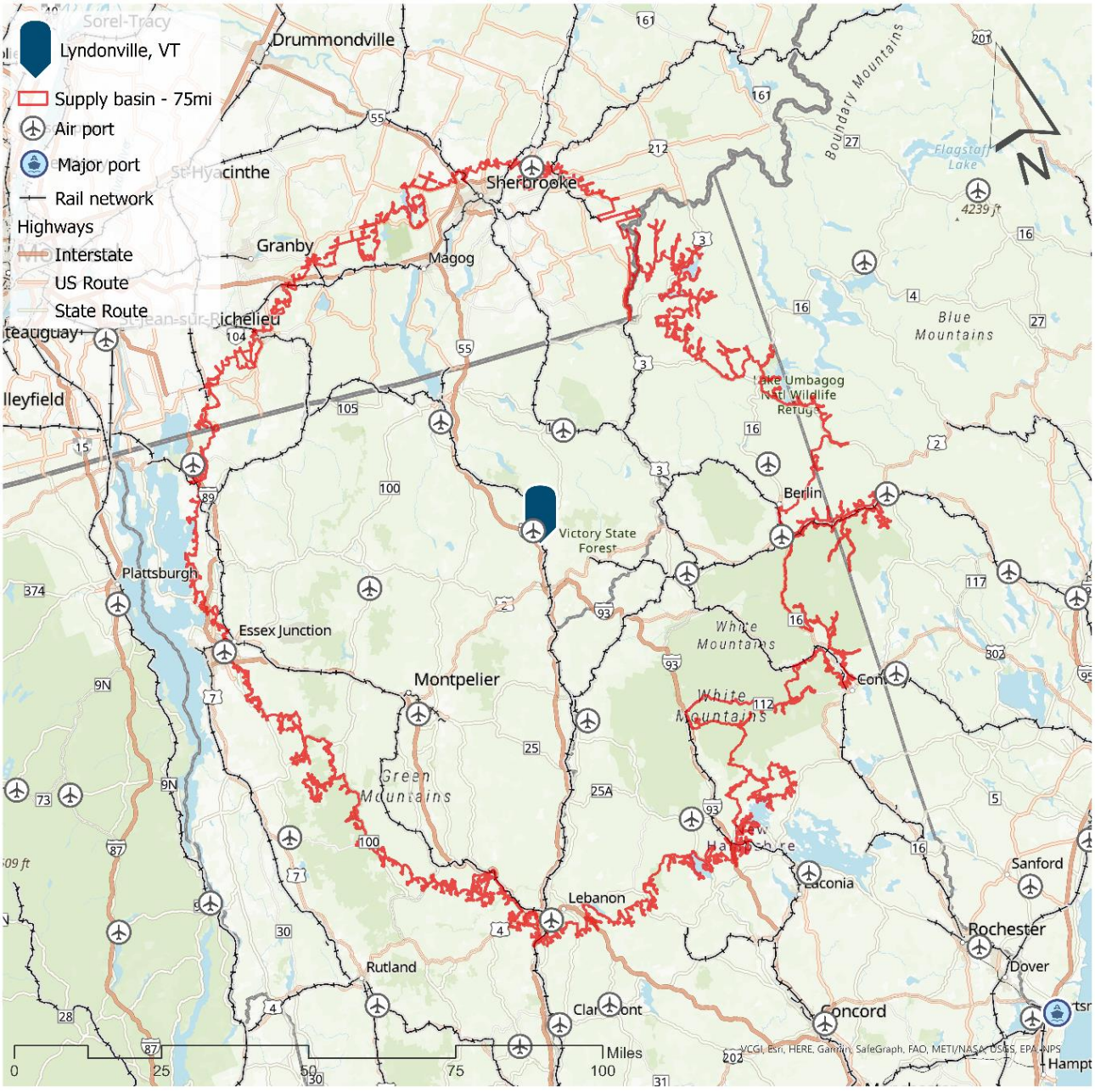


**Table D-1. BDO Zone – Sawmill Residual Production**

| Supplier | Estimated Annual Capacity (MMBF) | State/Province | Driving Distance from Lyndonville, VT (Miles) | Total Sawmills Residues (BDT) |
|---|---|---|---|---|
| Sawmill #1 | 10 | New Hampshire | 32 | 9,972 |
| Sawmill #2 | 25 | Quebec | 65 | 14,958 |
| Sawmill #3 | 80 | New Hampshire | 62 | 27,921 |
| Sawmill #4 | 11 | New Hampshire | 58 | 34,901 |
| Sawmill #5 | 5 | Vermont | 78 | 13,960 |
| Sawmill #6 | 15 | New Hampshire | 67 | 10,969 |
| Sawmill #7 | 5 | Vermont | 63 | 7,977 |
| Sawmill #8 | 15 | New Hampshire | 90 | 79,774 |
| Sawmill #9 | 28 | New Hampshire | 54 | 4,986 |
| Sawmill #10 | 10 | Maine | 76 | 24,929 |
| Sawmill #11 | 35 | Quebec | 57 | 14,958 |
| Sawmill #12 | 35 | Quebec | 69 | 34,901 |
| Sawmill #13 | 14 | Quebec | 57 | 9,972 |
| Sawmill #14 | 15 | Quebec | 48 | 9,972 |
| Sawmill #15 | 10 | Quebec | 70 | 4,986 |
| Sawmill #16 | 39 | New Hampshire | 80 | 38,890 |
| Sawmill #17 | 8 | New Hampshire | 60 | 14,958 |
| | **360** | | **Total**[63] | **359,000** |

- Six Quebec-based mills represent 37% of the total sawmill production capacity and residues production within the BDO Zone. New Hampshire has eight mills, representing 57% of the total sawmill production capacity and residues production within the BDO Zone.
- Two sawmills representing 7% (24,929 bdt/yr) of the total sawmill residues are within 50 miles of Lyndonville, Vermont.
- Thirteen sawmills representing 81% of the sawmill residues or 290,179 bdt/yr fall within the BDO Zone or <75-mile drive distance of Lyndonville, Vermont.
- Four mills fall outside the BDO Zone but were included based on feedback from outreach. Despite their respective drive distances being outside >75-mile drive distance BDO Zone, these sawmills had drive times similar to those within the BDO Zone due to the access to efficient highway infrastructure and routes. These mills represent 19% of total sawmill residues produced by identified suppliers or 68,805 bdt/yr.

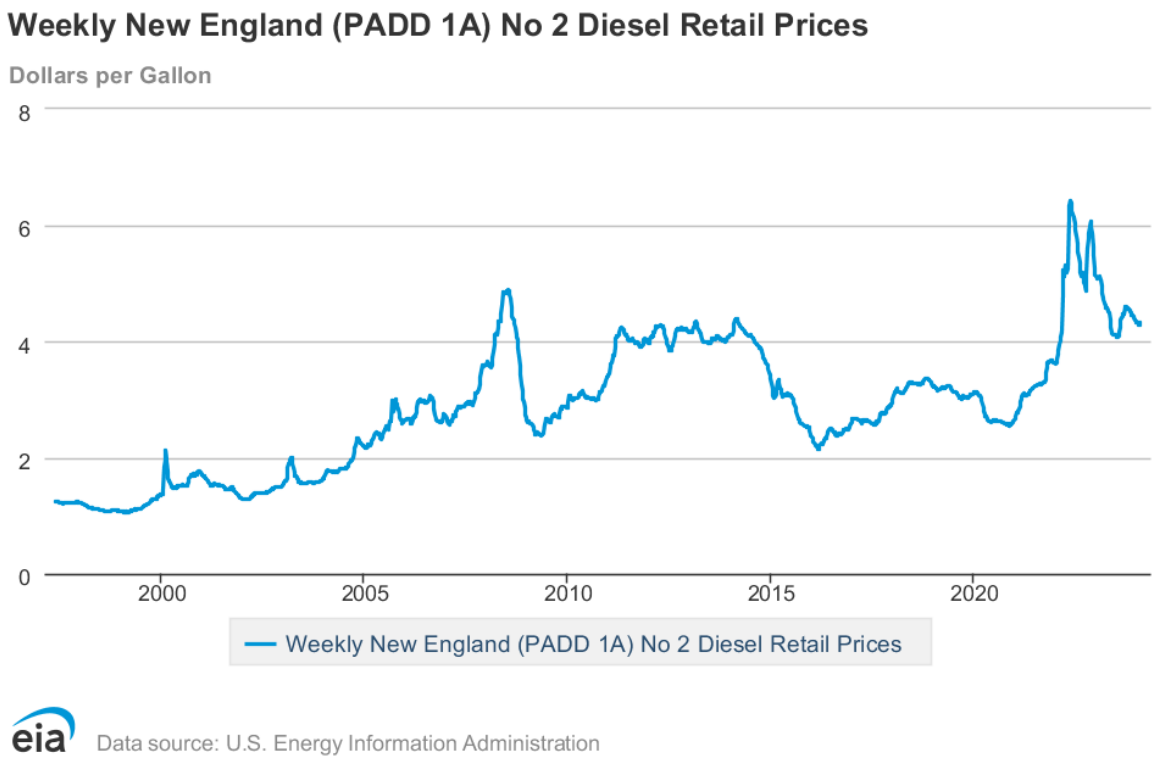
[63] Rounded to the nearest 1,000

**Table D-2. Historical Weighted Average Delivered Biomass Fuel Price for Biomass Power Plants in BDO Zone**

| [64] | LEAST-COST CASE | BASE CASE | HIGH-COST CASE |
|---|---|---|---|
| **FACILITY NAME** | **$/bdt** | **$/bdt** | **$/bdt** |
| **McNeil Station** | $66.64 | $74.30 | $81.86 |
| **ReGenerate Stratton** | $69.34 | $75.70 | $87.30 |
| **Schiller Station *** | $60.18 | $75.10 | $75.10 |
| **Re Energy** | $64.90 | $67.42 | $70.98 |
| **Springfield Power *** | $58.56 | $61.74 | $63.60 |

- (*) Denotes no longer operating
- Based on a biomass resource evaluation completed by the Massachusetts Department of Energy Resources in 2020, the following weighted average delivered biomass fuel price analysis was completed under three scenarios (least, base, and high cost), which provides insight into historical feedstock pricing for the biomass power plants within the BDO Zone.

**Figure D-1. Retail Price Diesel New England[65]**

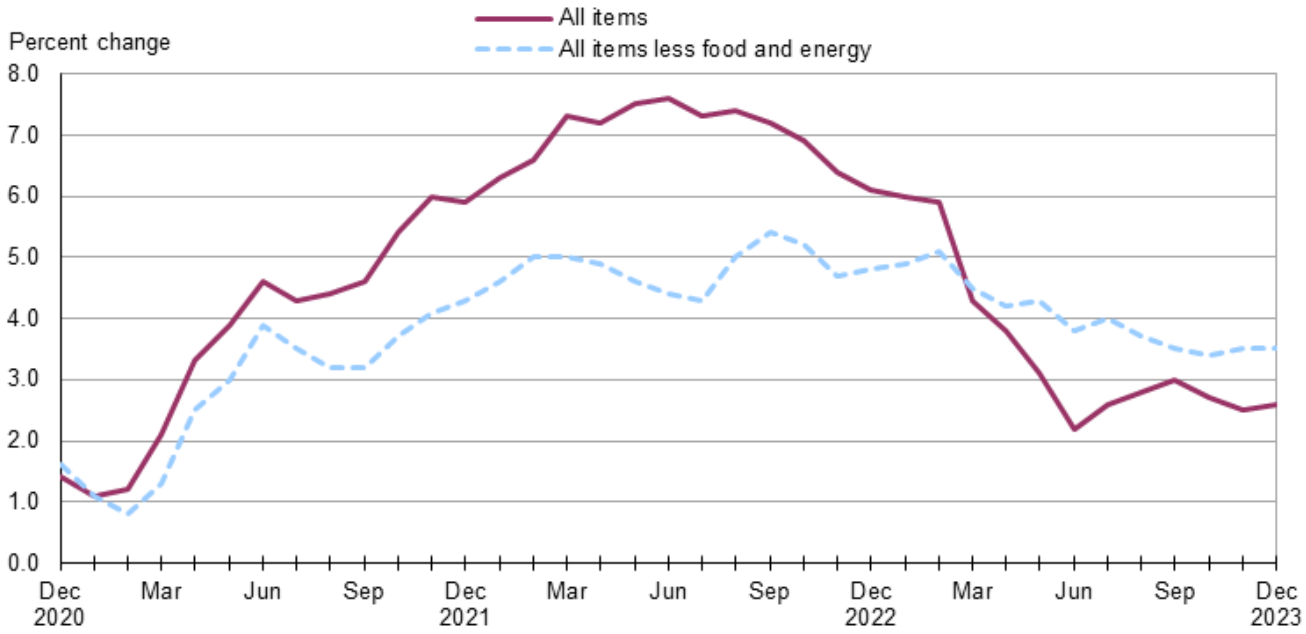



- Retail diesel prices for the US New England region tracked very closely to the national average
- US New England (PADD 1A) retail diesel prices ranged from $1.067/gal to $6.262/gal over the past 20 years

[64] https://www.mass.gov/doc/rps-technical-analysis-of-biomass-appendix-a/download

[65] US Energy Information Administration. https://www.eia.gov/dnav/pet/Accessed Nov 29, 2023.

**Figure D-2. Consumer Price Index – Vermont, Northeastern Region**[66]




- The rate of inflation increased between Oct 2020 to Jun 2022
- Inflation has been steadily falling from Jun 2022 to the present

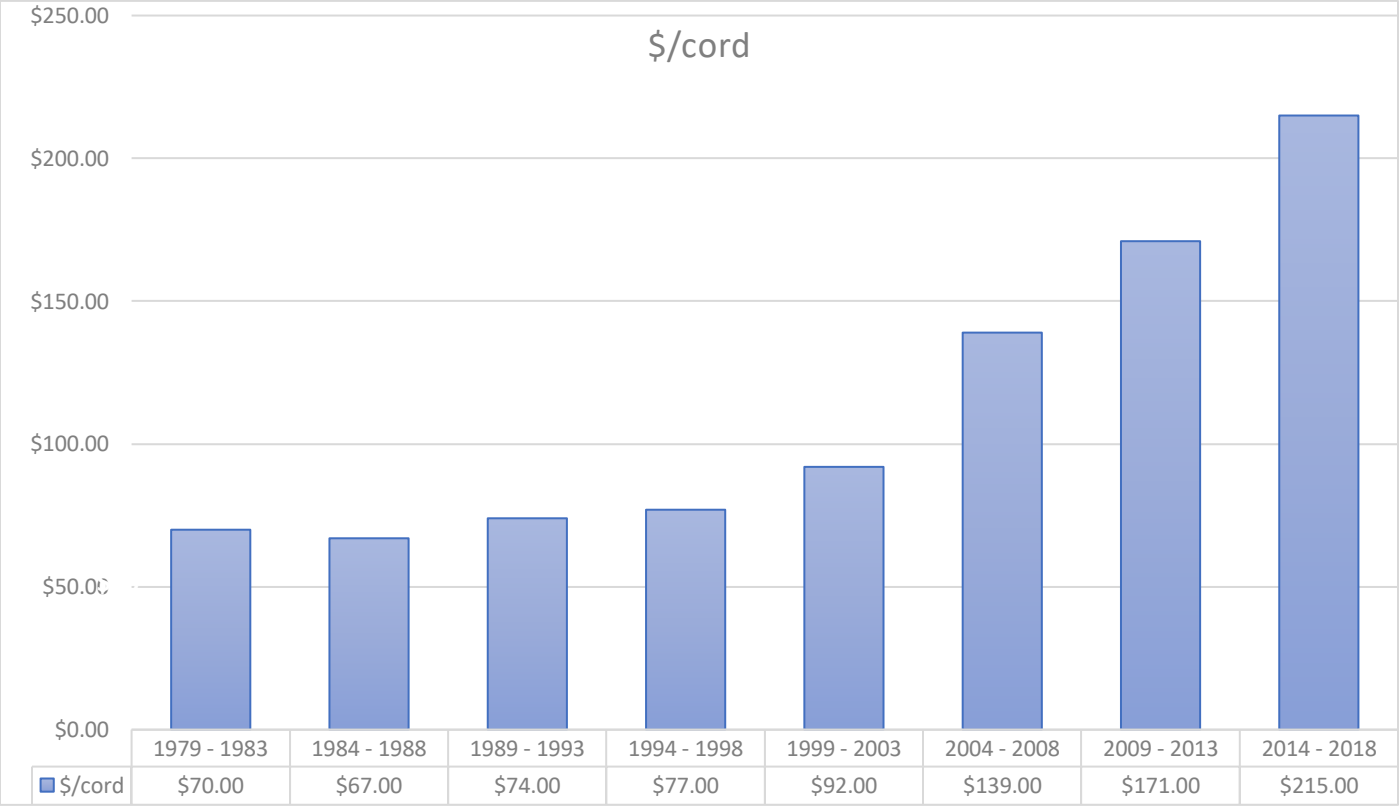
Within the BDO Zone; there were two larger mulch providers identified, both within <50 miles of Lyndonville, VT, and another two located within < 150 miles.

**Table D-3. Select Mulching Companies in Vermont and New Hampshire**

| Mulch Company | Location(s) | Comments |
|---|---|---|
| Mulch Company #1 | Jefferson (NH) 40 miles from Lyndonville, Weare (NH) 130 miles from Lyndonville and Brentwood (NH) 152 miles from Lyndonville | A large integrated company that owns businesses in trucking, mulch production/supply, chipping plants, soil products, and playground cover. It produces close to 82,000 bdt/yr of mulch across all locations, with the majority produced at two locations 130 miles and 152 miles from Lyndonville, respectively. The company utilizes chipped pulp wood and sources sawmill chips and bark from various mills. |
| Mulch Company #2 | Battleboro (VT) 132 miles from Lyndonville | Owned by sawmill. Bark, sawmill chips, and pulpwood. |
| Mulch Company #3 | Derby (VT) 40 miles from Lyndonville | Based in the Northeast Kingdom and utilizes pulpwood, sawmill chips, and bark |

[66] US Bureau of Labor Statistics. https://www.bls.gov/. Accessed Nov 29, 2023.

**Figure D-3. Price History of Firewood in Vermont ($/bdt)[67]**



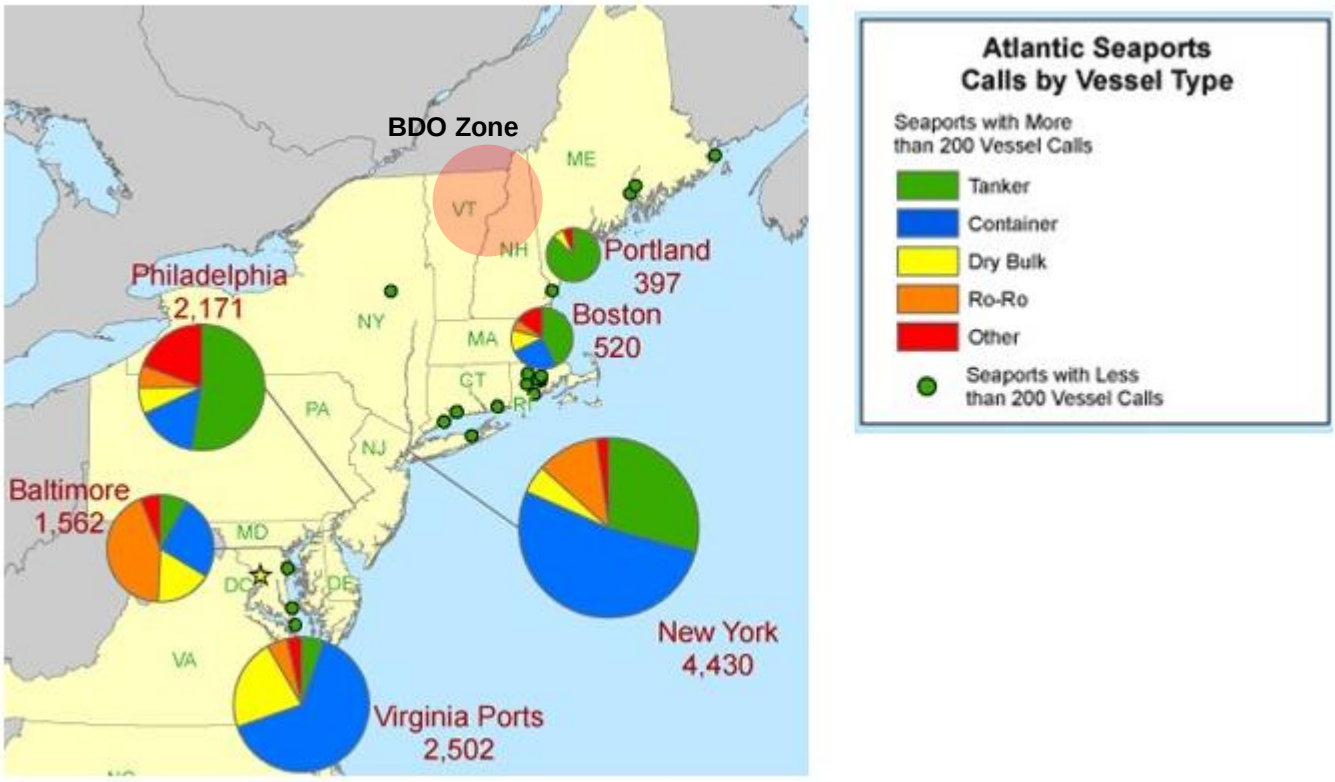

- Original information published in the Chronicle newspaper classifieds for 1979 – 2013 was based on a $ per cord basis and converted to a per bone dry ton basis in the above chart where one cord = 2.5 tons = 1.25 bdt, assuming 50% moisture content. For missing years, data published from the Vermont Department of Public Service is used.[68]
- Pricing data is clustered into average pricing in 5-year increments to allow for longer-term trend analysis
- Because there is pricing variability throughout the year, each year, and the particular published price points did not disclose the month in which they were published, data may not reflect the actual price. However, the data is helpful in providing a trend of gradual pricing increase and growth in the firewood market in Vermont.

Vermont and New Hampshire have significant firewood use, with Vermont consuming close to 400,000 cords/yr and New Hampshire 200,000 cords/yr respectively, equivalent to 750,000 bdt/yr of firewood. Vermont has the highest percentage of households using wood as a primary heating source, with 11.8% relying on it. The state's energy prices are a key driver of demand and price. Orders are often placed for firewood in advance to secure upcoming season's requirements and lower pricing. An estimated 100,000 bdt/yr of firewood is consumed within the BDO Zone.

Vermont also has a thriving woodchip fuel production industry, particularly in the bioheat sector, with around 480 advanced wood heating installations. The Clean Energy Development Fund supports expanding advanced wood heat to meet 35% of thermal energy needs by 2030.

[67] publicservice.vermont.gov/content/fuel-reports/retail-prices-heating-fuels/vermont-fuel-price-report
[68] bartonchronicle.com/drives-price-firewood/

**Figure D-4. Major Atlantic Ports by Size in Northeast US**[69]




Port of Portland, ME - 141 miles from Lyndonville, VT
Port of Boston, MA – 184 miles from Lyndonville, VT
Port of Albany, NY – 198 miles from Lyndonville, VT
Providence, RI – 234 miles from Lyndonville, VT
Portsmouth, NH – 167 miles from Lyndonville, VT

[69] U.S. Bureau of Transportation Statistics 2019

**Table D-4. BDO Zone – Vermont Hazard Assessment**[70]

| Hazard Impacts | Probability | Potential Impact | | | | | Score*: |
|---|---|---|---|---|---|---|---|
| | | Built Environment | People | Economy | Natural Environment | Average: | |
| Fluvial Erosion | 4 | 4 | 4 | 4 | 4 | 4 | 16 |
| Inundation Flooding | 4 | 4 | 4 | 4 | 2 | 3.5 | 14 |
| Heat | 4 | 2 | 4 | 3 | 2 | 2.75 | 11 |
| Wind | 4 | 3 | 2 | 2 | 2 | 2.25 | 9 |
| Snow | 4 | 2 | 3 | 2 | 1 | 2 | 8 |
| Ice | 3 | 2 | 3 | 3 | 2 | 2.5 | 7.5 |
| Drought | 3 | 1 | 3 | 3 | 3 | 2.5 | 7.5 |
| Infectious Disease Outbreak | 3 | 1 | 4 | 4 | 1 | 2.5 | 7.5 |
| Cold | 3 | 2 | 3 | 2 | 2 | 2.25 | 6.75 |
| Invasive Species | 3 | 2 | 1 | 3 | 3 | 2.25 | 6.75 |
| Landslides | 3 | 3 | 2 | 1 | 2 | 2 | 6 |
| Wildfire | 2 | 3 | 3 | 3 | 3 | 3 | 6 |
| Earthquake | 2 | 2 | 2 | 2 | 2 | 2 | 4 |
| Hail | 3 | 1 | 1 | 2 | 1 | 1.25 | 3.75 |

| | **Frequency of Occurrence:** Probability of a plausibly significant event impacting the community or regional scale based on previous occurrences and climate change projections. | **Potential Impact:** Severity and extent of damage and disruption to population, property, environment and the economy |
|---|---|---|
| 1 | Unlikely: <1% probability of occurrence per year. | Negligible: isolated occurrences of minor built or natural environmental damage, potential for minor injuries, health, or well-being impacts, or minimal economic disruption. |
| 2 | Occasionally: 1–10% probability of occurrence per year, or at least one chance in next 100 years. | Minor: isolated occurrences of moderate to severe built or natural environmental damage, potential for injuries or health or well-being impacts, minor economic disruption. |
| 3 | Likely: >10% but <75% probability per year, at least 1 chance in next 10 years. | Moderate: severe built or natural environmental damage on a community scale, injuries, fatalities or impacts to individual and community well-being, short-term economic impact. |
| 4 | Highly Likely: >75% probability in a year. | Major: severe built or natural environmental damage on a community or regional scale, multiple injuries or fatalities or severe long-term impacts to individual and community well-being, significant long-term economic impact. |

[70] vem.vermont.gov/plans/SHMP

The timelines for processing permitting requirements under Act 250, focusing on major applications for bio-based projects are provided in Table D-5 below. The timelines were disclosed as part of the 2022 annual report provided by the Natural Resources Board (NRB) in Vermont.

**Table D-5. Comparison with Prior Years in Average Calendar Days for Permitting Under Act 250**[71]

| Category | Standard | CY 2018 | CY 2019 | CY 2020 | CY 2021 | CY 2022 |
|---|---|---|---|---|---|---|
| All applications: Days of initial application completeness review (internal standard) | 7 days | 5 days | 7 days | 5 days | 9 days | 19 days |
| Major applications: Days from deemed complete to pre-hearing or hearing (statutory standard) | 40 days | 42 days | 50 days | 40 days | 59 days | 78 days |
| Minor-to-major applications: Days from the end of the comment period to pre-hearing or hearing (statutory standard) | 20 days | 22 days | 37 days | 19 days | 78 days | 104 days |

| Application type | CY 2018 | CY 2019 | CY 2020 | CY 2021 | CY 2022 |
|---|---|---|---|---|---|
| Major (hearing required) - Average Days from Deemed Complete to Decision Issued per Year | 256 | 245 | 205 | 296 | 362 |

- The application processing times reported above include time spent by applicants obtaining certain permits from other state agencies that are used to document compliance with several Act 250 criteria. This time can vary from several weeks to several months and, occasionally, a year or more.
- The term "deemed complete" refers to the date a district coordinator and technician determine an application to be technically and administratively complete. If an application is incomplete, it is returned with missing or unclear information. This critical determination allows the application to be reviewed by the citizen-based district commission.
- These figures do not include processing times for altered, remanded, corrected, or withdrawn permits.
- Of the 379 decisions issued in CY 2022, 21 (6%) as major applications.

[71] legislature.vermont.gov/assets/Legislative-Reports/Annual-Report-2022_FINAL.pdf

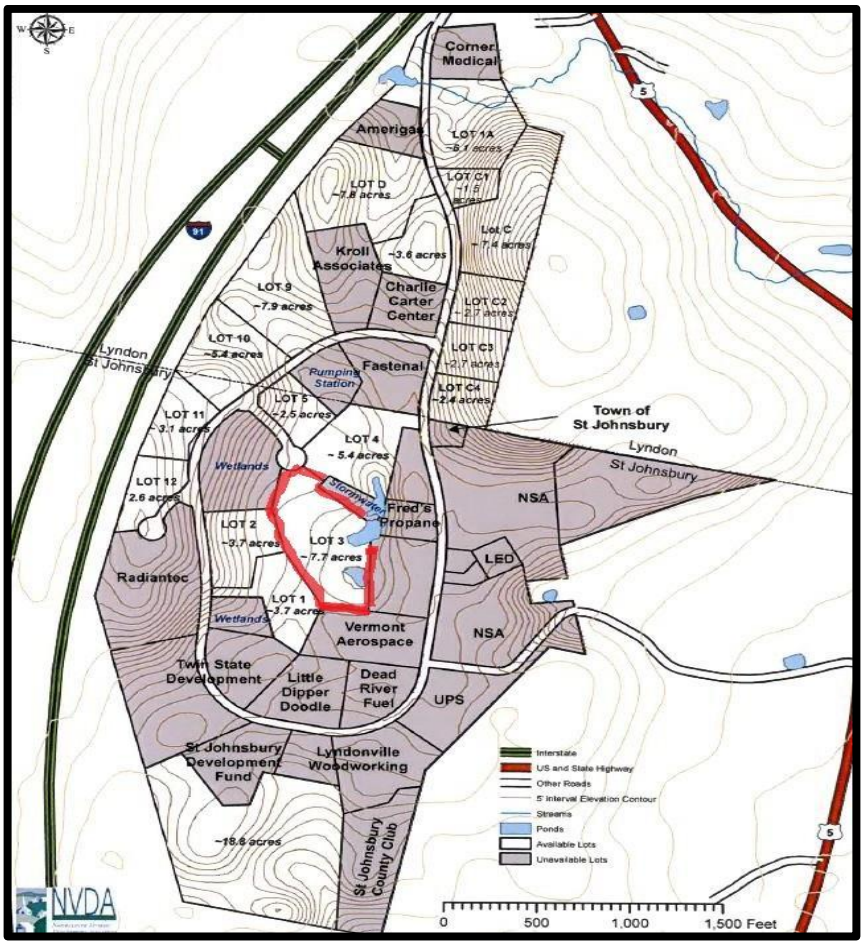
**Table D-6. Plant Closures within the BDO Zone 2011 – 2024**

| Type[72] | Plant | Year | Location | Consumption (BDT) |
|---|---|---|---|---|
| **PULP & PAPER** | | | | |
| 3 Plants and 737,000 bdt in consumption | 1# | 2014 | East Angus, Qc | 143,135 |
| | 2# | 2019 | Sherbrooke, Qc | 314,897 |
| | 3# | 2015 | Madison, ME | 279,114 |
| **COMBINED HEAT & POWER** | | | | |
| 1 plant and 35,000 bdt in consumption | 1# | 2016 | Concord, NH | 35,000 |
| **BIOMASS POWER PLANTS** | | | | |
| 7 plants and 902,600 bdt in consumption | 1# | 2019 | Whitefield, NH | 106,521 |
| | 2# | 2017 | Alexandria, NH | 84,095 |
| | 3# | 2019 | Tamworth, NH | 123,340 |
| | 4# | 2019 | Bethlehem, NH | 100,914 |
| | 5# | 2012 | Chateauguay, NY | 117,733 |
| | 6# | 2020 | Portsmouth, NH | 280,318 |
| | 7# | 2019 | Springfield, NH | 89,700 |
| **WOOD PELLETS** | | | | |
| 1 plant and 37,000 bdt in consumption | 1# | 2019 | West Windsor, VT | 37,400 |
| | | | **TOTAL[73]** | **1,712,500** |

[72] Figures rounded to nearest 1,000

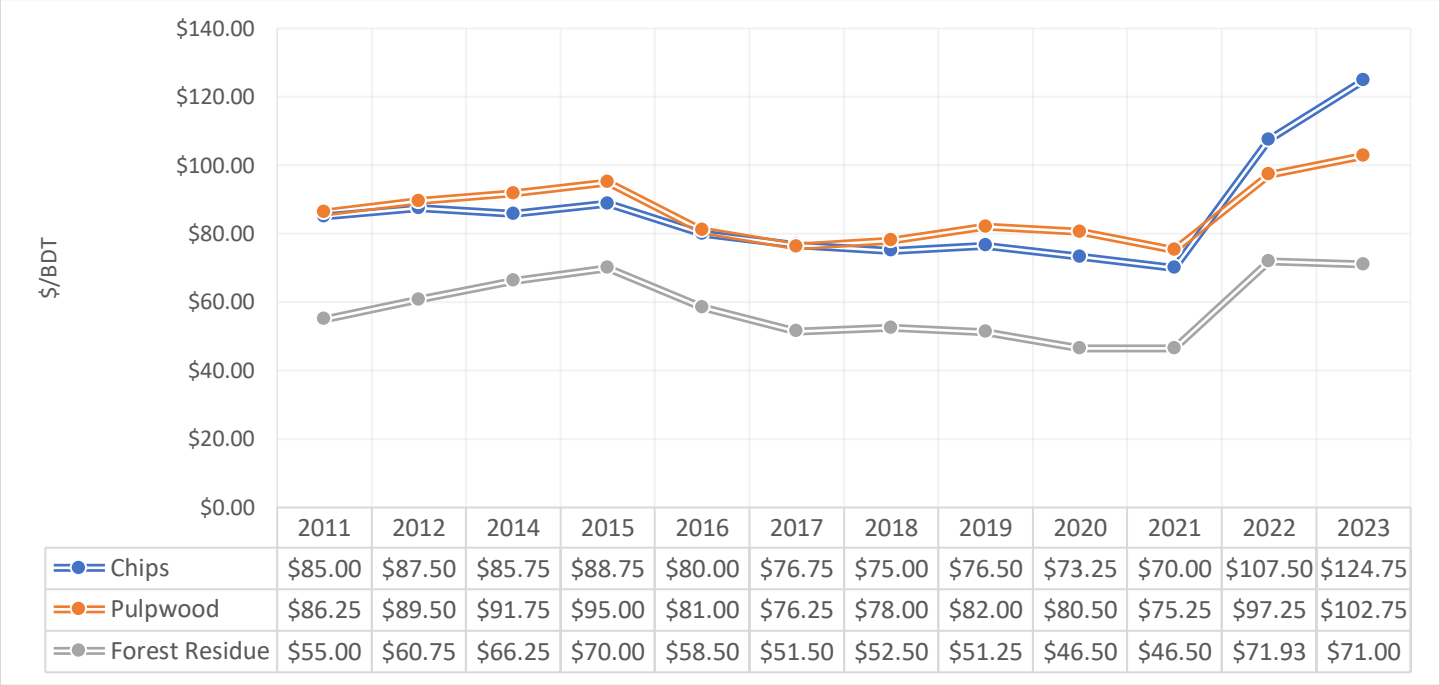
[73] Rounded to nearest 1,000

**Figure D-5. St. Johnsbury/Lyndon Industrial Park**




- Lot 3 (outlined in **red**) is the proposed Project Site location covering 7.7 acres in the center of the industrial park.
- Access to Interstate 91, which runs along the west side of the industrial park going south, and US Route 5, which runs east of the industrial park and is an important north-south connecter. Interstate 91 is the primary north-south thoroughfare in the region's western part. US Route 2 runs east-west routes across Vermont, just over 5 miles from the project site.
- The line crossing east/west on the above figure in the northern portion of the property shows a divide between Lydon and St. Johnsbury, whereas the project site falls within the Town of St. Johnsbury.
- Onsite infrastructure, including access to 3-phase power, potable water, fire hydrants, sewer, stormwater system, and paved roadway.
- Lyndonville Electric has a substation onsite. High-side voltage is 34.5kv (high voltage) and is lowered to 12470 volts via a 3.7mVa grounded wye step-down transformer. 167kV GE regulators govern voltage regulation via the bus. There is no SCADA communication with this substation.
- The industrial park has an Act 250 master permit, which allows tenants to apply for amendment under the existing master permit, which can cut down timelines for permitting.

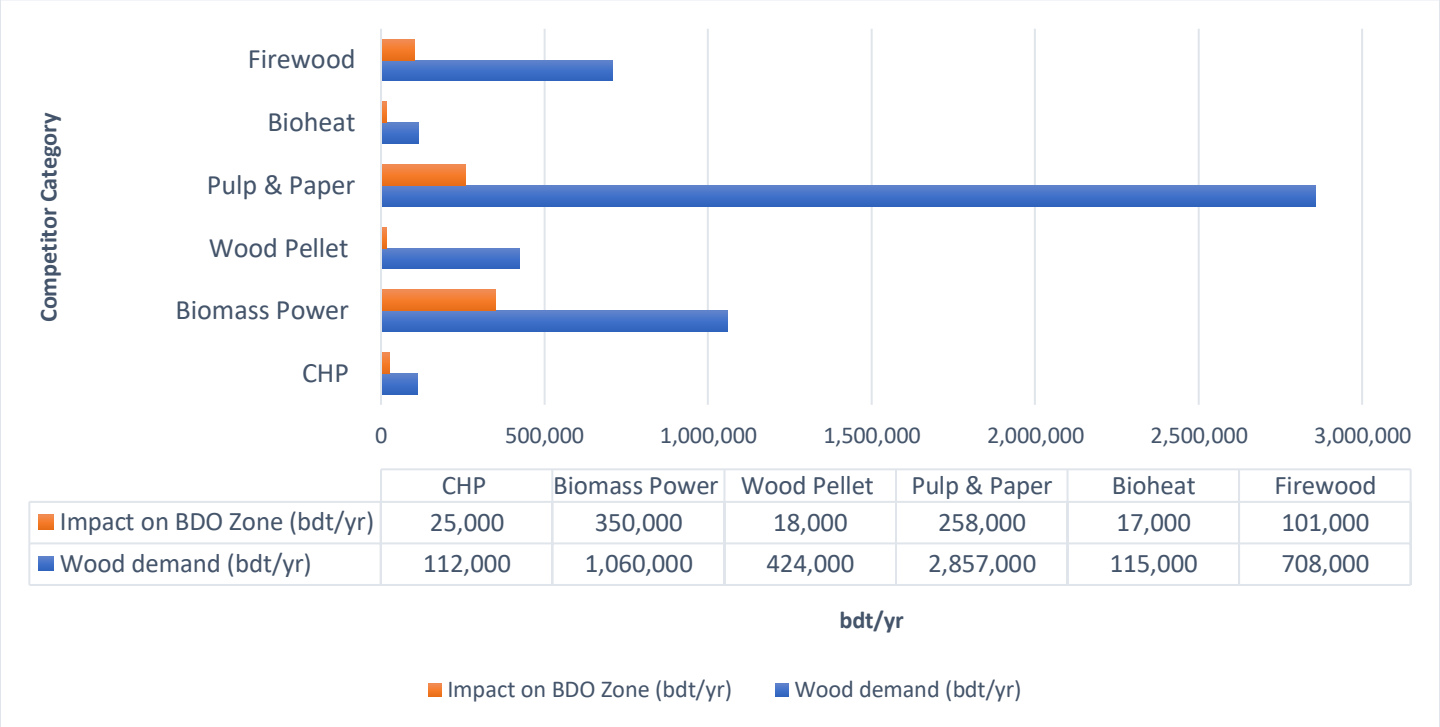
**Figure D-6. Historical Woody Biomass Pricing for U.S Northeast - Forisk**




| | 2011 | 2012 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chips | $85.00 | $87.50 | $85.75 | $88.75 | $80.00 | $76.75 | $75.00 | $76.50 | $73.25 | $70.00 | $107.50 | $124.75 |
| Pulpwood | $86.25 | $89.50 | $91.75 | $95.00 | $81.00 | $76.25 | $78.00 | $82.00 | $80.50 | $75.25 | $97.25 | $102.75 |
| Forest Residue | $55.00 | $60.75 | $66.25 | $70.00 | $58.50 | $51.50 | $52.50 | $51.25 | $46.50 | $46.50 | $71.93 | $71.00 |

- All pricing is on a delivered basis in USD
- Chip prices are weighted averages of sawmill and pulp chips prices
- Pulpwood prices include both hardwood and softwood combined, and pricing was determined on an annual basis using an average of quarterly prices for each year.
- From 2015 to 2021, the lower price of pulpwood can be attributed to several market dynamics. The strength of the sawlog market during this period often subsidized the cost of pulpwood harvesting, as higher sawlog prices made it economically viable to offset pulpwood costs. Additionally, plant closures and production curtailments led to a surplus of chip volumes, further contributing to the decline in pulpwood prices.
- From 2021 to 2023, the average annual delivered pulpwood, forest residue, and chip prices increased sharply with residual wood chip prices increasing by close to 80%, pulpwood prices increased by 37%, and forest residues by 53%.

**Figure D-7. Woody Biomass Demand vs. Impact on the BDO Zone**




| | CHP | Biomass Power | Wood Pellet | Pulp & Paper | Bioheat | Firewood |
|---|---|---|---|---|---|---|
| Impact on BDO Zone (bdt/yr) | 25,000 | 350,000 | 18,000 | 258,000 | 17,000 | 101,000 |
| Wood demand (bdt/yr) | 112,000 | 1,060,000 | 424,000 | 2,857,000 | 115,000 | 708,000 |

- Comprehensive feedstock demand and the specific requirements originating from the BDO Zone across six distinct competitor categories identified within the Competition Zone represents close to 15% of their total demand or 769,000 bdt/yr of 5,272,199 bdt/yr.
- The most significant impact from competitors comes from biomass power plants, representing 46% of the demand or 350,000 bdt/yr, and pulp and paper facilities, representing 34% of the total demand or 258,000 bdt/yr.
- The average drive distance for all competitors from Lyndonville is 108 miles, and the average drive time is 2 hrs and 33 minutes.

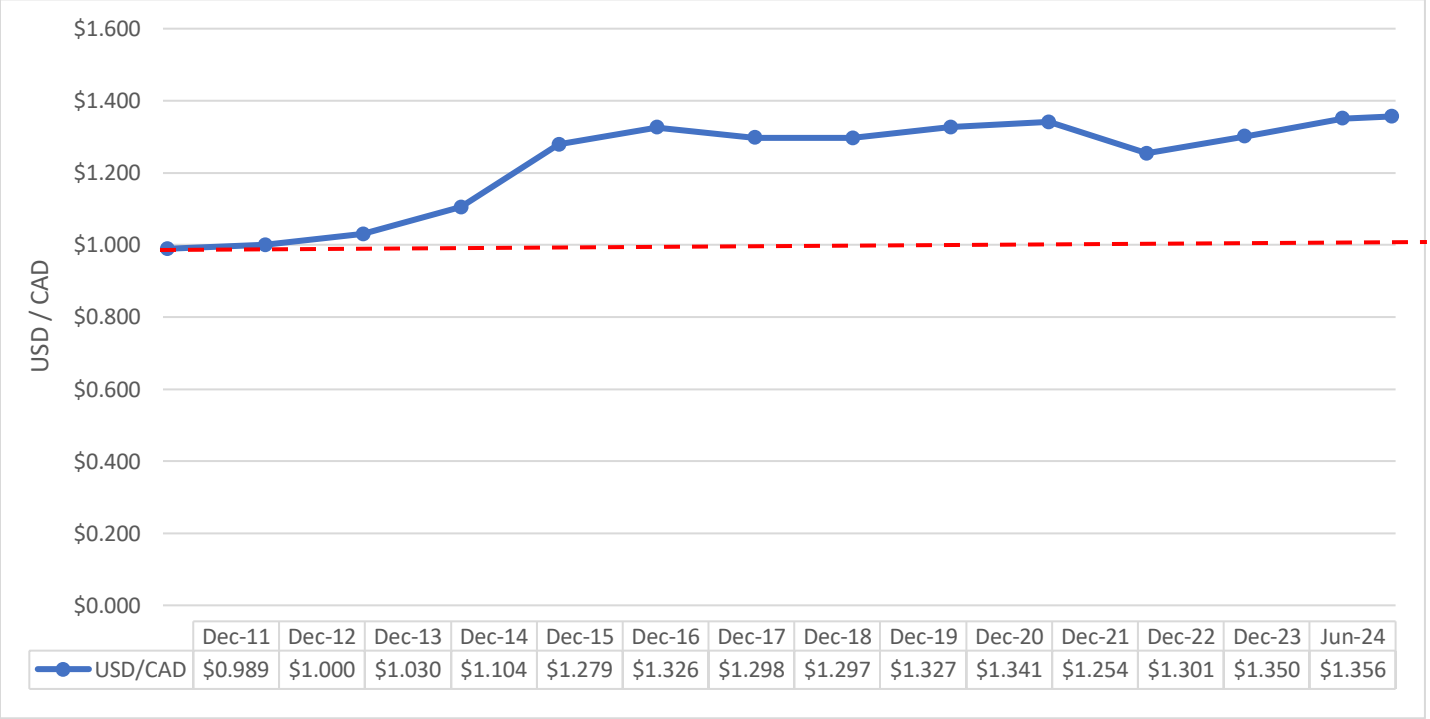
**Table D-7. Central Railways within the BDO Zone and Distance from the Industrial Site**

| Railroad | Distance from Industrial Site |
|---|---|
| Washington County Railroad (WACR) | 1.3 miles |
| St. Lawrence and Atlantic Railway (SLR) | 26.5 miles |
| Central Maine and Québec Railway US Incorporated (CMQ) | 37 miles |
| The St. Lawrence and Atlantic Railway (SL&A) | 43 miles |

**Table D-8. Largest Employers in Caledonia County**

| Name | Location | Employee Count |
|---|---|---|
| Northeastern Vermont Regional Hospital | St. Johnsbury | 692 |
| Northern Counties Health Care | St. Johnsbury | 375 |
| NSA Industries | St. Johnsbury | 200 |
| VT Aerospace | Lyndonville | 200 |
| Northern Vermont University | Lyndonville | 200 |

**Figure D-8. USD to CAD Historical Exchange Rates [74]**




[74] www.ofx.com/en-ca/

## SECTION E: LEGAL DISCLAIMER

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