

Introduction

IRP Objectives

The primary objective of this Integrated Resource Plan (“IRP”) is to outline City of Burlington Electric Department (“BED”)’s approach to decision-making to ensure BED can reliably serve the needs of its customers in accordance with 30 V.S.A. §218c. In addition, this IRP describes BED’s methods and plans for:

- Environmental stewardship by transitioning to a Net Zero Energy (“NZE”) community by reducing and eventually eliminating fossil fuel use in the electric, thermal, and ground transportation sectors by strategically electrifying, managing demand, realizing efficiency gains, and expanding local renewable generation while increasing system resilience
- Reliably and safely serving customers and the community
- Maintaining financial strength
- Modeling and understanding the potential impacts (costs, benefits, risks) to BED of actions taken to advance NZE goals
- Ensuring that BED’s operations and capabilities can adapt to significant technological disruptions and customer behavioral changes.

This IRP satisfies the requirements of Vermont’s 2016 Comprehensive Energy Plan for the following reasons:

- It identifies key input variables and risks that could impact operations;
- It describes how BED will manage those identified risks;
- It documents how BED can reliably meet the energy needs of its customers, after safety concerns are addressed, at the lowest present value lifecycle costs; and
- It highlights a series of priority action steps to be taken in the future.

Because the electric utility industry is rapidly evolving, BED has used the IRP process as an opportunity to develop, test, and demonstrate how its decision-making framework, methodologies, and tools will provide greater flexibility so that the organization can act on opportunities as economic and technological conditions evolve. BED has relied on this IRP process to demonstrate how its decision-making methodology and tools can be used to evaluate future investment options for balancing supply and demand while also ensuring low-cost, reliable, and safe electric service. We explain our decision-making processes in the chapters that follow and offer a sample decision analysis of utility-scale storage in Burlington.

In the absence of new policy tools or funding injections, BED assumes for the purpose of this IRP that the current pace of future customer adoption of beneficial electrification,

weatherization, and other clean energy initiatives will continue until those changes occur. Consequently, the findings and recommendations of this IRP primarily reflect a base case scenario (sometime referred to as Business-as-usual) for load growth, resource adequacy requirements, and infrastructure upgrades to provide a basis for evaluating the impacts of these changes when they are advanced. This baseline scenario is important for planning and relative comparison of NZE scenarios.

Net Zero Energy Context

This IRP frequently references the City of Burlington's NZE goals and the implications that near-term progress toward those goals could have for BED's delivering energy services in accordance with 30 V.S.A. §218c.

In September 2019, BED issued a comprehensive Net Zero Energy Roadmap ("the Roadmap") illustrating how the community could transition to net zero energy by reducing and eventually eliminating fossil fuel consumption across the building and ground transportation sectors. The electric sector has already been converted to NZE with BED's achievement of 100% renewable energy in 2014; importantly, however, to convert transportation and heating to NZE, both the amount of renewable energy and the ability of BED's system to support load will need to increase.

Successfully reaching NZE will require a significant shift in how Burlington thinks about, invests in, and consumes energy in the thermal and transportation sectors. Making the transition will require policy changes, incentives, and significant investment in new technology. However, several key factors are beyond BED's control, including the pace of change for electric transportation and heating technologies, federal policies such as fuel economy standards and tax incentives, state policy initiatives including whether Vermont or the region prices carbon, and the potential for non-linear adoption rates for technology as prices come down. In terms of BED's contributions to advancing policy initiatives, BED is working on two potential City policies related to weatherization in rental buildings and electrification of new buildings. Investment in new technologies is expected to be balanced by the financial and societal returns on such investments over their lives.

BED recognizes that NZE requires a shift in our own internal thinking. While BED is a regulated franchise provider for electric service, the electric technologies that move us toward NZE (such as electric vehicles and heat pumps) are not widely adopted and are competing in some instances against unregulated fuels such as gasoline. We see renewably sourced electricity for example, as a less expensive and cleaner transportation fuel than gasoline. Analysis indicates that electric transportation fuel in Vermont keeps more dollars within the state economy than fossil fuels (<https://www.eanvt.org/wp-content/uploads/2020/02/pg21-staysleaves.png>). Therefore, when pursuing program and technology adoption in new spaces,

BED must employ strategies first used in our energy efficiency programs to support outreach, customer education, vendor engagement, and partnerships to fully realize the potential for the electric transition.

Policy discussions are often focused on the upfront capital cost of protecting and sustaining our environment. In chapter 8 of this IRP, BED focuses instead on the net benefits. As further discussed in the NZE Roadmap, the net benefits of a transition to net zero energy are significant.¹ As Table 1 illustrates, net operational savings from pursuing the identified NZE pathway amounts to \$474 million, resulting in \$157 million in net benefits over the next 10 to 20 years. This is in a scenario where the state or region prices carbon at a value similar to the price that the Department of Public Service (“DPS”) and the Public Utility Commission (“the Commission”) already use to evaluate avoided costs in certain instances.

Table 1: Cost-effectiveness of NZE transition with a \$100/ton CO2e price

Pathway (at \$100/ton of CO2 e)	Present Value of Costs and Savings (in millions, 2019\$)			Total Net Energy Reduction 2020 - 2040 (trillion BTUs)	Cost per Unit of Energy Avoided (2019\$/mmBTU)
	Capital costs	Operational costs	Net benefit/cost		
Efficient electric buildings	\$ 141	\$ (202)	\$ (61)	27	\$ (2)
Electric vehicles	\$ 113	\$ (242)	\$ (129)	7	\$ (18)
District energy	\$ 63	\$ (30)	\$ 33	9	\$ 4
Total	\$ 317	\$ (474)	\$ (157)	43	\$ (17)

For additional information on the net benefits of a NZE future, BED encourages readers to review the Roadmap (www.burlingtonelectric.com/NZE), as it demonstrates how communities can help their residents, businesses, and institutions transition away from fossil fuels. Furthermore, a recent national study of significant decarbonization through electrification over a similar timeframe (2035) found significant jobs and economic benefits of such a transition.²

¹ A comprehensive discussion of the benefits of a NZE transition is provided in our Net Zero Energy Roadmap, included in the appendix of this document and at <https://burlingtonelectric.com/sites/default/files/inline-files/NetZeroEnergy-Roadmap.pdf>

² Please this report for more information: <https://tinyurl.com/y3bd43jr>

Impacts of COVID-19

Although this IRP is submitted during the COVID-19 pandemic, it does not contain an extensive discussion of COVID-19's impacts on BED, since BED assumes that COVID-19 will be a short-term disruption, with impacts hopefully restricted to the last few months of BED's FY20 budget and some part of BED's FY21 budget. It is possible, however, that there will be longer term impacts that may be reflected eventually in BED's long-term planning. (One such example could be the potential impact of a permanent shift to dramatically increased telecommuting.)

BED did use its IRP modeling capabilities to estimate the short-term impact of the pandemic on BED's FY20 and FY21 budgets, recognizing that COVID-19 affects key variables identified by the Financial Assessment chapter of this IRP, specifically:

1. Customer sales and revenue (decreased commercial but increased residential values)
2. Charges associated with load, such as capacity and transmission
3. Wholesale energy prices (decreasing due to falling regional load)
4. BED's risk profile (the loss of retail sales, which increases BED's exposure to low market prices – see discussion of “long” vs “short” positions in the Financial Assessment chapter)

Furthermore, the duration of all the above impacts was uncertain. Accordingly, BED created several scenarios that consider the interaction of the above impacts on the remaining FY20 and FY21 periods over various lengths of COVID-19 disruption, from a steady decline in impact over time, to possible future “resurgences” of the virus in the fall. All of this helped BED to better prepare for potential future outcomes under significant uncertainty.

BED also took immediate action to help support our customers' progress toward NZE while also supporting local economic recovery: in June of this year BED launched its Green Stimulus programs, which will also help reduce the impacts of COVID-19 on BED's efficiency and electrification efforts. The Green Stimulus programs are planned to run for a limited period but may prove instructive in improving BED's efficiency and electrification programs in the longer term as well (in which case any long-term changes in program design would be incorporated into BED's long-term planning). Already BED is seeing indications of an increased pace of program uptake based on the Green Stimulus activities, including HVAC contractors fully scheduled for heat pump installations into the fall.

As a City department and community member, BED acknowledges the hardships our customers have been experiencing due to COVID-19. Working toward NZE while also addressing and overcoming pandemic-related challenges will require support and engagement from the community over an extended period. In addition, BED recognizes the present moment of intense focus on social and racial justice issues in our community and nation as an

opportunity to ensure that our programs and services are available, accessible, and affordable to all of our customers. We are undertaking new efforts, in coordination with City partners, to enhance outreach strategies, and our 2020-2021 Strategic Direction includes the following objective:

Ensure all programs are equitable and accessible, with a priority given to low-to-moderate income, rental, black, indigenous, and people of color (BIPOC), immigrant, and refugee populations.

If we continue to focus on ensuring that all customers have equitable opportunities to participate in our energy services, it will support Burlington's NZE efforts, as attaining the NZE goal City-wide will only be achievable if all community members can engage in the effort.

IRP Organization & Chapter Summary

The following chapters, summarized below, comprise BED's 2020 IRP:

Chapter 1 – Introduction: Provides context, overarching thought processes, and a summary of the contents of the 2020 IRP.

Chapter 2 – Burlington's Demand for Electricity: Establishes Burlington's "business as usual" ("BAU") long-term energy requirement and peak demand forecasts. The output from these analyses informs the range of total energy and capacity that may be needed to provide reliable electric service absent specific actions taken to accelerate the transition to NZE. For this IRP, energy and capacity forecasts are based on statistically adjusted end-use models that rely on historical data related to regional economic growth, weather patterns, seasonality, net metering generation, housing starts, and business formation, as well as customer usage and behaviors. This IRP forecast is BED's first to also include sales of electric vehicles and heat pumps as customers adopt these technologies over time (but not at the pace of adoption that would be required to reach NZE by 2030 or 2040 per the Roadmap).

Chapter 3 – Generation & Supply Alternatives: Provides information on BED's existing resources (for energy, capacity), either owned or contracted, and compares them to the BAU load forecast from Chapter 2. Chapter 3 also includes a general review of the economics of various resource types under low, base, and high case values of key variables. The general review of resource economics is intended to guide the type of resource for which BED seeks more detailed proposals for potential action. If an actual resource decision is contemplated, actual pricing at a much higher level of rigor would be applied to the potential decision as illustrated in Chapter 7 – Decision Processes.

Chapter 3 also includes information on the ability of BED's existing resources and expected electrification program activities to meet the requirements for the three tiers of the Vermont Renewable Energy Standard ("RES") over the 20-year planning horizon.

It should be noted that it is perfectly normal for existing resources to not be sufficient to meet the projected 20-year requirements. BED does have sufficient resources to meet its energy and RES requirements over the three-year period prior to the preparation of the next IRP. The expiration or retirement of resources and a search for their replacements is a normal course of business for an electric utility. The tools created for this IRP would be used if a long-term (20-year+) resource procurement was to be contemplated during the next three years, but none is anticipated at this time.

Chapter 4 – Transmission & Distribution: BED is committed to providing the highest system reliability, power quality, and system efficiency to its customers, and has excellent performance in this respect. This commitment is backed up by continuing investments in distribution upgrades and process improvements to ensure maintenance of BED’s high quality of service.

Chapter 4 discusses BED’s transmission and distribution system and its capability of providing high-quality service for the projected BAU loads. Discussion of the needed upgrades and additions required for the system to serve increasing loads under the early stages of transition to NZE are discussed in more detail in Chapter 8.

Chapter 5 – Comprehensive Energy Services: To effectively address the energy needs of its customers, BED combines traditional electric energy efficiency with beneficial electrification services in a comprehensive, customer-centric manner. BED is unique in this respect as the only electric utility in Vermont that is also an efficiency utility. (The efficiency needs of the customers of the other Vermont utilities are served by Efficiency Vermont.) Chapter 5 contains information on BED’s plans for continuing to provide energy efficiency and strategic electrification programs over the next three years, including the historical performance and future projections of both our traditional electric efficiency and Tier 3 beneficial electrification programs that are designed to ensure that BED is prepared to meet increasing customer demand for electricity, while simultaneously meeting the State required reductions in greenhouse gas emissions.

Chapter 6 – Financial Assessment and Potential Rate Pressure: Includes the results of a 20-year forecast of BED’s BAU cost of serving its customers. This projection is stated in terms of pressure to increase rates over time, but it does not represent a projection of actual rate increase that may be needed. Rather, a projection of rate pressure under BAU permits BED to evaluate whether intended actions (either by BED or external to BED such as changes in laws/regulations) will tend to increase or decrease the need to raise rates over time. The establishment of a base case cost of service allows BED to evaluate which outside factors could impact those costs, and hence effect rate pressure, over short (5-year) and longer (20-year) horizons.

BED’s base case scenario does reflect an ongoing pressure to increase rates over time. This is not surprising, as all organizations and individuals are exposed to cost increases from inflation.

Although BED's cost-controlling measures and energy portfolio (which is not seriously exposed to fuel price changes) have allowed BED to avoid raising electric rates since 2009, at some point unavoidable pressures will cause the need to adjust rates.

The Financial Assessment chapter also discusses activities related to BED's rates for electric service, which are focused on rate modifications to support Burlington's NZE goals and to reduce or remove disincentives to efficiently use electricity for heating and transportation.

Chapter 7 – Decision Processes: Outlines how BED reviews decisions in an IRP context. It is important to understand that BED does not attempt to use IRP decision methodology for all organizational decisions. Use of the level of rigor discussed in the Decision Processes chapter is particularly warranted when:

1. The decision is of a large magnitude
2. The decision is subject to significant uncertainty
3. Alternate competing options (including doing nothing) are viable

Chapter 8 also includes a detailed review of the potential for a long-term contract for storage located in Burlington as a demonstration of BED's decision-making process with sufficient detail to permit that process to be reviewed, and ideally approved, by the PUC.

Chapter 8 – Net Zero Energy Roadmap Implications: As noted above, the NZE Roadmap was published in September 2019. At that time, BED's deadline to file this IRP was January of 2020. The DPS asked BED to include in this IRP an evaluation of the potential impacts of the City's NZE goals. Accordingly, chapter 8 provides a NZE impact evaluation and includes a high-level assessment of various factors that could affect BED's costs to serve the City. The chapter looks at the anticipated changes to the BAU case resulting from an increase in loads resulting from NZE activities to a peak load level of 102.8 MW in the winter. This is a material increase from BED's current peak load of 65 MW (which occurs in the summer) but does not reflect the full load projected in the Roadmap. It does, however, reflect a load that will stress, and hence require additions/upgrades to, BED's distribution system. BED evaluates the impacts of the costs associated with those upgrades, the wholesale market and transmission costs associated with those loads, and the incremental revenues from those loads to understand how they might affect rates over time.

Chapter 9 – Planning Priorities & Action Steps: Summarizes the priority actions that BED will be taking in the next several years, organized by the functional area of BED that will be engaged in those activities. The activities contained in this chapter support BED's approved Strategic Plan and pave the way for NZE.

Appendices: Appendices to this IRP include:

- Itron Long-Term Electric Energy and Demand Forecast Report

- Net Zero Energy Roadmap
- BED Strategic Plan
- McNeil Generating Station Economic Impact Report & BED Staff Response
- Controllable Loads Research Report
- Pilot Program Report