MCNEIL AND DISTRICT ENERGY

- *What is District Energy?*

  District Energy is, in the Burlington context, a method of providing renewable thermal steam via efficient underground distribution systems. District Energy more broadly can refer to connecting multiple buildings with steam or hot water loops as done in multiple cities and campuses around the nation and around the world.

- *What is the history of District Energy in Burlington?*

  A Burlington District Energy system was contemplated in McNeil's original permit in the 1980s and has been studied extensively since then. Mayor Miro Weinberger tasked BED in 2014 with making one final effort to determine if District Energy could advance beyond studies. Through efforts first with Corix Utilities in 2016-2018, and now with Ever-Green Energy beginning in late 2018, BED has worked with partners such as VGS, UVM, UVMMC, and others to evaluate the opportunities. The effort with Ever-Green is unique in that it advanced beyond study to feasibility analysis, design and engineering, and full financial modeling. For the first time ever in the history of District Energy in Burlington, the project is shovel-ready and ready to advance fully into the Act 250 process.

- *Why is Burlington Electric pursuing District Energy now?*

  BED is pursuing District Energy because it is a key pillar of reaching our City's Net Zero Energy Roadmap goal of eliminating fossil fuel use by 2030 in the ground transportation and thermal sectors.[1] District Energy would reduce commercial sector natural gas use by approximately 16% in Burlington, making it the single-biggest step we can take to reach our Roadmap goal.[2] Unfortunately, without District Energy, our most recent Roadmap update shows that commercial sector natural gas emissions are on an upswing, with a post-pandemic rebound more pronounced than residential sector natural gas emissions or ground transportation emissions.[3] District Energy, by eliminating approximately 13,000 tons of CO2 annually, is a critical tool for Burlington in the fight against climate change.

- *Why invest in a 40-year-old plant?*

  Biomass plants, and some other types of plants such as hydro plants, are not like nuclear plants, which typically have a 40-year lifespan granted by the Nuclear Regulatory Commission. BED and the other McNeil joint owners have been investing in the plant since its first years of operation through continuing maintenance, capital improvements, and replacement, refurbishment, or overhaul of key plant components. There is nothing preventing McNeil from continuing to operate for many years provided we continue to invest in maintaining it. Similarly, many hydro plants have been operating for well over 40 years with maintenance and capital upgrades over time.

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[1] https://www.burlingtonelectric.com/sites/default/files/inline-files/NetZeroEnergy-Roadmap.pdf
[2] https://www.ever-greenenergy.com/project/city-of-burlington/
[3] https://www.burlingtonelectric.com/wp-content/uploads/NZE-Update-2022.pdf

More important, the investment required to build District Energy is largely an investment in an underground distribution system to transport the thermal energy from the plant to the District Energy system's customers. The investment at the plant to connect to the District Energy system will be a small part of the project. Finally, the not-for-profit entity Burlington District Energy will be financing the capital costs, not BED or the McNeil joint owners.

- *Won't investing in District Energy provide a justification to keep McNeil running when we should shut it down?*

  No. Burlington, Vermont, and New England need McNeil as a reliable, renewable generator of electricity for the foreseeable future, with or without District Energy. If we want to continue to be 100% renewable as a community, and support a regional switch to renewability, we need McNeil.

  Burlington and Vermont are part of a New England-wide electrical grid. Many are working to make the New England grid more renewable, as legacy coal and oil plants shut down and new wind and solar plants come online. This transition is a good thing, but it is nowhere near complete. The amount of new wind and solar generation—which, being intermittent resources, will need to be coupled with battery storage to provide the same reliability as the old fossil fuel plants—is far from the level needed to serve all of New England renewably. As a result, right now the marginal fuel providing electricity in New England during the hours McNeil runs is natural gas 92-98% of the time.[4] That means if we shut down McNeil, our region will rely more heavily on natural gas, a fossil fuel that already constitutes over 50% of New England's electricity generation and is not available in adequate supply in the winter as it is, driving energy price spikes during recent years.[5] If the marginal fuel when McNeil was running was wind or solar 92-98% of the time, phasing out biomass would be a very different question to consider than it is today. However, there is no current scenario where McNeil operation is displacing local solar or wind.

  As the largest in-state power producer in Vermont, McNeil also provides a critical reliability benefit at a time when Vermont is a net importer of electricity nearly every hour. McNeil provides the majority of its energy in the winter, when ISO-New England has known issues with natural gas fuel availability, and McNeil is also dispatchable, unlike other renewables, meaning that it can run when its energy is most needed. If we want reliable electricity (which BED customers consistently rank as their number one priority in our triennial surveys), we need McNeil.

  Lastly, investing in District Energy provides steam infrastructure to serve potential customers with renewable thermal energy; it does not require that we continue to operate McNeil exactly the same way for the next 20 years. If there are opportunities to improve McNeil further, increase its efficiency with new technologies, or make other positive changes, District Energy does not prevent that in any way. The decision to operate, or not operate, or re-power McNeil is largely unchanged, with or without District Energy.

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[4] https://www.burlingtonelectric.com/wp-content/uploads/VEIC-Final-Memo-to-BED-LCA-of-GHG-emissions-4.29.22-.pdf

[5] https://www.iso-ne.com/about/key-stats/resource-mix and https://www.iso-ne.com/about/what-we-do/in-depth/natural-gas-infrastructure-constraints#:~:text=Access%20to%20Fuel%20Has%20Become,when%20heating%20demand%20is%20high.

- *Ok, but why not spend the ~$40 million in capital for district energy on weatherization or a solar project?*

  Neither the City nor BED are planning to spend $40 million in capital investment in District Energy, so there are no opportunity costs or alternative choices to consider for the use of those funds. The $40 million of capital to build the District Energy system would be debt-financed by a 501 (c)(3) non-profit called Burlington District Energy (run by Ever-Green Energy, BED's district energy partner). (In addition, Senator Leahy secured over $5 million in federal funds specifically to help buy down capital costs for district energy.[6]) Burlington District Energy would repay the debt through the sale of renewable thermal steam to District Energy customers. Neither the City nor BED would be taking on the financing or debt obligations for this project, and while energy efficiency and solar are both important climate imperatives, neither weatherization nor solar can address the thermal steam need for commercial sector customers.

  So it is not a question of how we, the Burlington community, could best spend $40 million. Instead, it is a question of how we decarbonize larger, industrial-scale energy uses (which cannot be electrified with today's technology) in the City of Burlington to help meet our climate and energy goals. District Energy powered by McNeil represents a huge opportunity to reduce commercial natural gas use by 16% while also increasing the efficiency of an existing critical asset in our local wood energy plant. The potential customers of the District Energy system will consider their own economics and carbon reduction goals in deciding whether to purchase energy from the system and how that option compares to any alternatives.

- *So this won't impact the City's debt financing?*

  No, because neither the City nor BED are financing this project. The financing would come from a non-profit 501(c)(3) organization called Burlington District Energy, with some capital funding support from Senator Leahy's appropriation of $5.16 million. Burlington District Energy would pay off the financing over a 20-year period through the sale of renewable thermal steam to District Energy customers. BED and other partners may provide appropriate incentives to the project, but the financing will not be provided by the City or BED.

- *Why do I hear that District Energy will increase emissions?*

  Lifecycle analysis of the District Energy project finds the exact opposite, that it will reduce greenhouse gas emissions compared to fossil-based natural gas by over 95%. Specifically, a carbon intensity score of McNeil-based District Energy was conducted by a third party, First Environment, using the GREET model specified in the recently enacted Affordable Heat Act (Clean Heat Standard) for Vermont. This analysis compares lifecycle greenhouse gas emissions on an apples-to-apples basis using grams of CO2 equivalent per megajoule of energy. The First Environment analysis showed McNeil-based District Energy would produce a carbon intensity score of 3.6 grams of CO2 equivalent per megajoule of energy.

[6] Mayor Miro Weinberger and Partners Announce District Energy System Ready for Act 250 State Permitting | City of Burlington, Vermont (burlingtonvt.gov)

This compares to natural gas at a score of 79 grams, meaning McNeil-based District Energy would reduce greenhouse gas emissions by over 95% compared to fossil-based natural gas.[7]

Some who do not support District Energy are forgoing consideration of lifecycle analysis and assuming emissions only at the stack, with no benefit given to biomass for regrowth and sustainable management of forest lands. Using that methodology, which is inconsistent with Intergovernmental Panel on Climate Change (IPCC) protocols[8], they may assert District Energy could require more wood chips, and therefore more emissions.

It is inconsistent and inaccurate to count biomass-related greenhouse gas emissions solely at the stack, however, and doing so may result in double-counting emissions that are already included in "land use flux" when a tree is harvested, which is why science and policy[9] (including in Vermont[10]) indicates that

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[7] https://www.burlingtonelectric.com/wp-content/uploads/CI-Model-Letter-Report-draft-ver-3.pdf and https://www.burlingtonelectric.com/wp-content/uploads/2023-06-13-TEUCpresentation.pdf (slides 24-25)

[8] Per IPCC guidelines Vermont's ANR does not include biogenic CO2 in Vermont's emission inventories. "An important distinction when considering accounting practices for biogenic CO2 is that carbon dioxide emissions from the combustion of fossil fuels are coming from a geologic source, which is on a significantly longer time scale than carbon in the much faster carbon cycle which moves between pools on the order of months to centuries, which means that combusting fossil fuels adds more carbon that was in long term storage and effectively out of circulation into the atmosphere and into the more immediate carbon cycle. Carbon dioxide emitted from the combustion or decomposition of biogenic materials which are a part of the faster carbon cycle are assumed to be sequestered by the regrowth of the biogenic material that produced them, and are captured in the flux from the land use change as described above." "Carbon dioxide from electricity generated through biomass combustion is not included because the CO2 is of biogenic origin, but CH4 and N2O emissions are included in totals. States in the region differ on this accounting practice, however, it is consistent with IPCC inventory guidelines for the treatment of biogenic CO2." Resource: Vermont Agency of Natural Resources, Greenhouse Gas Emissions Inventory and Forecast, Methodologies, April 2023 https://outside.vermont.gov/agency/anr/climatecouncil/Shared%20Documents/_Methodology_Vermont_Greenhouse_Gas_Emissions_Inventory_1990-2020_Final.pdf

[9] EPA - https://www.epa.gov/sites/default/files/2016-08/documents/biogenic-co2-accounting-framework-report-sept-2011.pdf -"As discussed in Section 2, fossil and biogenic carbon interact with the overall carbon cycle on very different time scales, and this difference has implications for understanding estimates of biogenic CO2 emissions from stationary sources. CO2 emissions from the consumption of fossil fuels will inevitably increase the amount of carbon in the atmosphere on policy-relevant time scales, but such an outcome is not inevitable with the consumption of biologically based feedstocks. The amount of biologically based feedstocks consumed at stationary sources during a year may be partially or completely balanced by the amount of feedstock that grows during the year. On that basis, as discussed in Section 2, EPA concludes that in order to develop an accounting framework to adjust total onsite biogenic emissions at a stationary source, it is essential to assess the carbon stored by growth of biologically based feedstocks." See also White House Council on Environmental Quality (CEQ) 2016 Obama Administration – "This Guidance establishes guidelines for Federal agencies in calculating and reporting GHG emissions fluxes from different sectors and sources associated with agency operations, and seeks to avoid double counting. Though its goals differ from those of the IPCC inventory (i.e., to develop a common system for countries to inventory all anthropogenic GHG emissions, including fossil and biogenic CO2 emissions, across all sectors), both this effort and the IPCC inventory guidelines seek to avoid double counting. To that end, in IPCC inventories, carbon sequestration and CO2 emissions within biological systems, including the growth and harvest of terrestrial biomass, are assigned to Land Use, Land Use Change and Forestry (LULUCF) sector. Therefore, when biomass is burned for energy, the related biogenic CO2 emissions are accounted for in the LULUCF sector where the carbon was stored and initially emitted via harvest, not the Energy sector. (IPCC, 2006)" https://www.sustainability.gov/pdfs/federal_ghg%20accounting_reporting-guidance.pdf

[10] See. E.g. pathways report for Vermont Climate Council, page 33 "The use of biofuels, including renewable natural gas, biodiesel, and advanced wood heating systems, provides another means for reducing emissions. The lifecycle emissions from biofuels need to be considered, and not all sources result in reduced emissions; however, in many situations, biofuels

bioenergy emissions should be considered on a lifecycle basis and include a focus on carbon storage changes in the harvested lands.

District Energy will not change the way McNeil is dispatched; the plant will continue to run when electric market prices are beneficial for ratepayers or otherwise required. In a given year, McNeil's electricity production already varies; the plant might use 50,000 tons more or less of wood chips on an annual basis. Estimates suggest District Energy could in some operational scenarios require up to a week and a half of additional wood supply (18,000 tons) for the steam portion of the energy, and in some scenarios may not require any additional incremental wood supply at all over the amount used in past years. Either way, the incremental supply for District Energy is well within the range of annual variability in woodchip use now and will not require changes to harvesting practices already underway in our region.

- *Why do I keep hearing about the "steam pipe" project, is this the same as District Energy?*

District Energy is the name by which this project has been known in Burlington for four decades. District Energy is also a recognized climate solution and a viable, operating technology in place in cities and campuses around the nation and around the world.[11]

As the United Nations Environment Programme (UNEP) puts it: "A district energy system is a network of pipes that heat and cool buildings across a neighbourhood or entire city. Modern district energy systems connect renewables, waste heat, thermal storage, power grids, thermal grids and heat pumps—delivering up to 50 per cent less primary energy consumption for heating and cooling. Visionary cities and countries have been able to decarbonize heating and cooling and achieve high efficiency, renewable energy, and CO_2 targets with modern district energy."[12] UNEP calls district energy "a secret weapon for climate action and human health" and stated "Forward-looking cities are connecting district energy with efficient buildings, waste and renewables to create integrated urban systems and achieve resilience and circularity."[13] UNEP cites positive case studies where biomass district heat replaced fossil-based natural gas with greenhouse gas emissions reduction benefits.[14]

We are not sure why some refer to the project as a "steam pipe" instead of District Energy. The label is not as important as the project's goals: to improve efficiency at McNeil, cut fossil fuel use and fossil fuel–related greenhouse gas emissions in Burlington, and deploy the UN Environment Programme's "secret weapon for climate action" to advance our Net Zero Energy Roadmap goals.

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provide significant reductions in comparison to fossil fuels." https://climatechange.vermont.gov/sites/climatecouncilsandbox/files/2022-03/Pathways%20Analysis%20Report_Version%202.0.pdf

[11] See e.g. St. Paul MN district energy - About | District Energy; Truro campus University's biomass plant generates international accolades for energy-efficiency gains - Energy Manager (energy-manager.ca); Charlottetown PEI - Enwave Energy Corporation;

[12] https://www.unep.org/news-and-stories/story/district-energy-secret-weapon-climate-action-and-human-health

[13] https://www.unep.org/news-and-stories/story/district-energy-secret-weapon-climate-action-and-human-health

[14] http://www.districtenergyinitiative.org/%E2%80%98A%20complete%20circle%E2%80%99%3A%20Prince%20George%20proves%20district%20energy%20can%20work%20in%20Canada