

Building a CHP/Micro-Grid for Burlington, Vermont

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SVP System Development

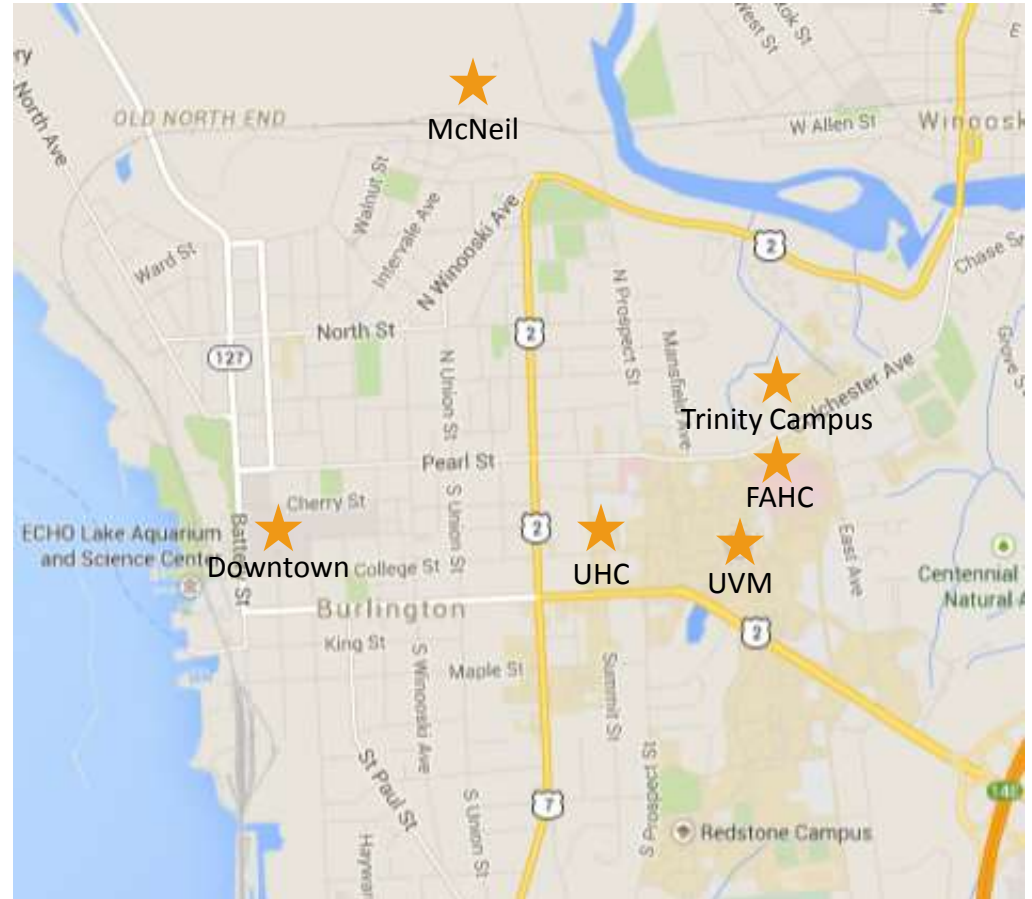


Overview

- Phase 1
 - Baseline concept
 - Initial feasibility
- Phase 2
 - Refining the concept
 - Partners
 - Burlington resilience
 - Financial analysis
 - Environmental benefits
 - Future opportunities
- Current status and next steps



Burlington, Vermont

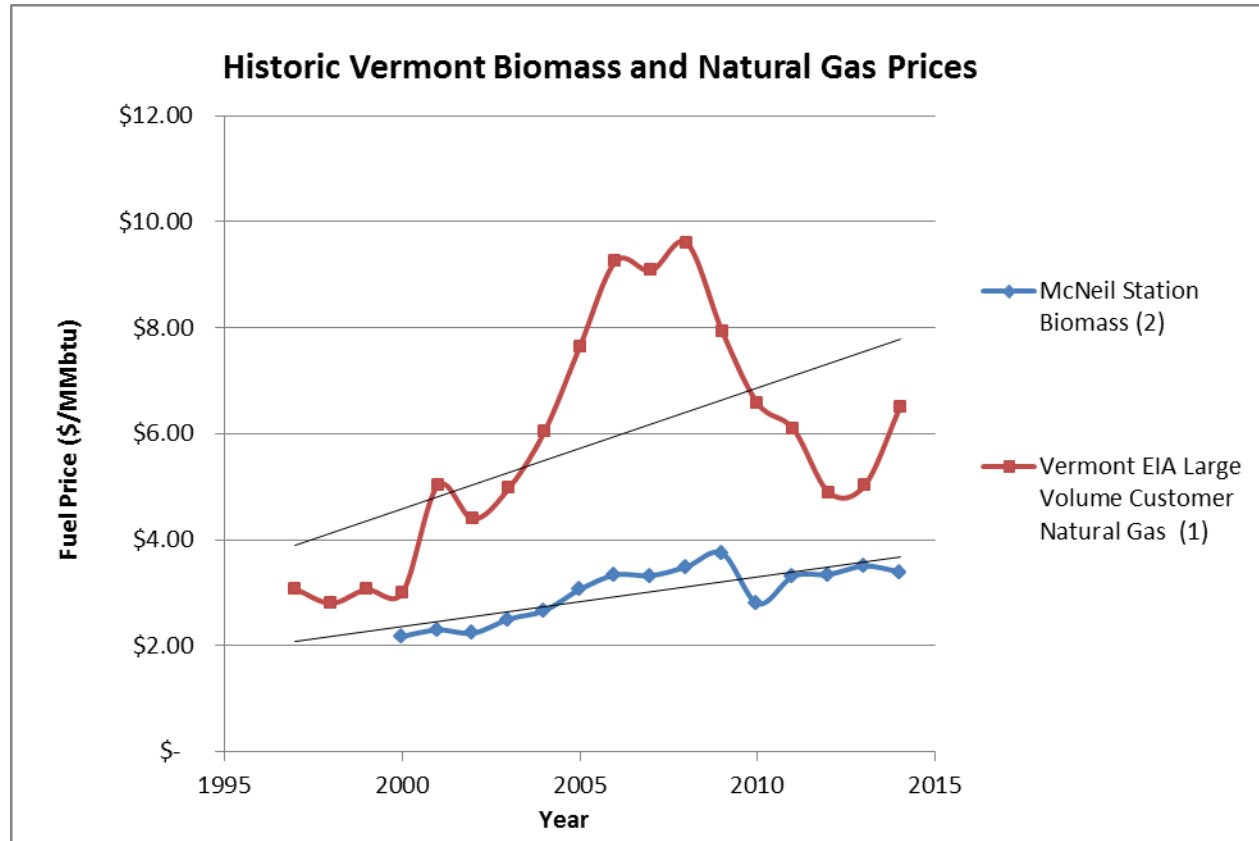


Baseline Concept

- Existing McNeil Station
- 50 MW biomass-fired power plant
- Improve efficiencies
- Reduce greenhouse gas emissions
- Stabilize energy costs



Managing Market Volatility



Initial Feasibility

- Combined heat and power opportunities
- Thermal Storage integration
- Service Areas
 - Alternative 1 – Focused area in downtown Burlington
 - Alternative 2 – Broad coverage of downtown area
 - Alternative 3 - Downtown plus Fletcher Allen and UVM Campus



Refining the Concept

- University of Vermont integration
- Fletcher Allen Health Care integration



Partners in Environmental Leadership

Burlington District Energy Service (BURDES): *“BURDES is a group of citizen-volunteers who are committed to taking advantage of the underutilized heat from the McNeil Electric Generating Station.”*

“Fletcher Allen named Top 25 ‘green’ hospitals”

— Vermont Business Magazine, July 2014

“Burlington, Vermont is Now 100% Powered by Renewable Energy”

— Care 2.com, September 2014

“UVM Reports STARS Gold from AASHE”

— The University of Vermont, University Communications, April 2014



Burlington Study Mission

- Develop a community energy plan that is implementable.
- Develop a plan that provides customers with stable, competitive energy rates
- Utilize local, renewable energy sources
- Reduce the carbon footprint for the Burlington community
- Improve the overall efficiency of the community
- Establish an initial customer base that is technically and economically feasible.



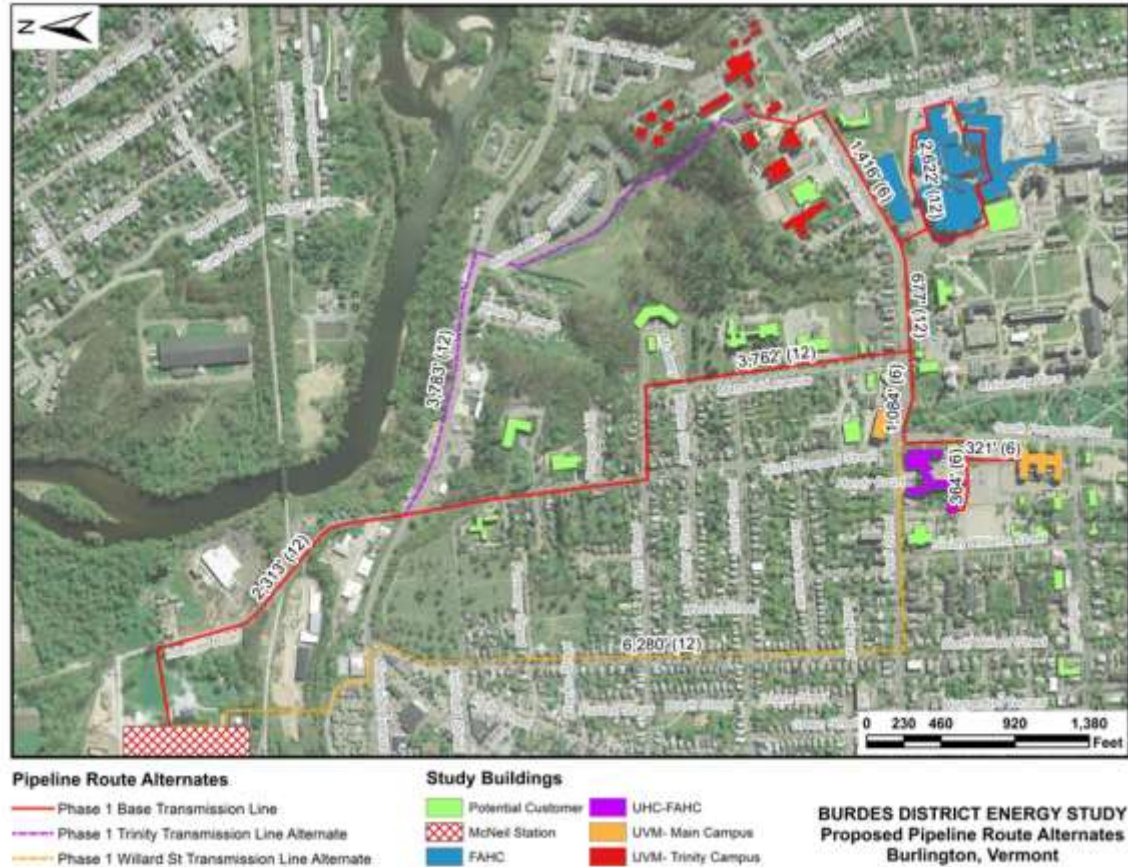
Burlington Resilience

- Burlington Electric generates enough electricity to meet the needs of the city
- Largest hospital in Vermont
- Integration with the local University
- Thermal grid can serve the hospital and portions of the University
- Establish a micro-grid in the event of an emergency event



System Integration

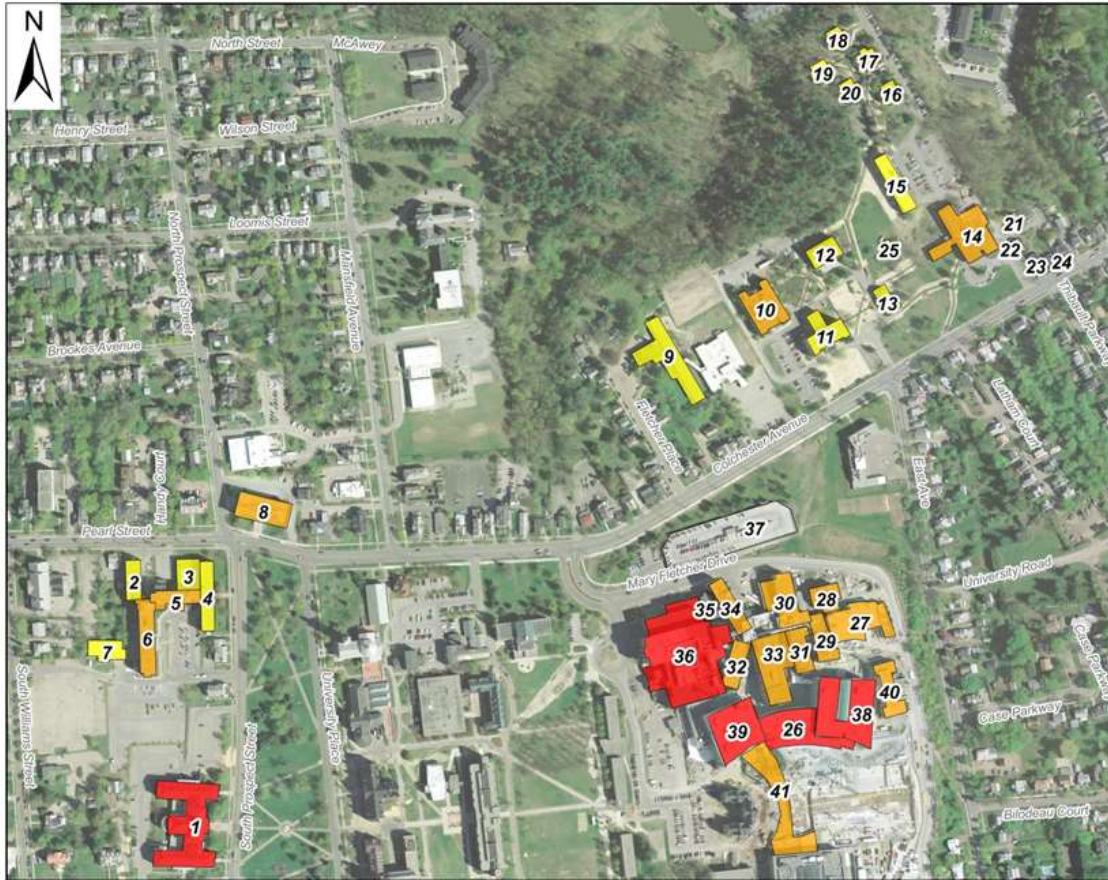
- FAHC Hospital as a customer and system backup
- UVM Primary and Trinity Campuses
- University Health Clinic
- Potential for connecting adjacent private buildings



Establish a platform to serve greater Burlington in the future



Potential Initial Customer Load



Existing Building Loads

- Peak Load – 70 MMBtu/hr
- Annual Energy - 160,000 MMBtu/yr
- Primarily steam-based
- Mostly hot-water compatible



Advanced Technology Integration

- Proven technologies
- Ease of installation
- Reduced costs



Photo courtesy of Alfa Laval Inc.



Economic Feasibility

- Business structured as a private, non-profit entity
- Cost based rate structure
- Total financing costs of ~\$31 million
- Aggregate energy rate of ~\$20/MMBtu
- Stable, predictable utility rates
- Life-Cycle costs found to be competitive with on-site generation

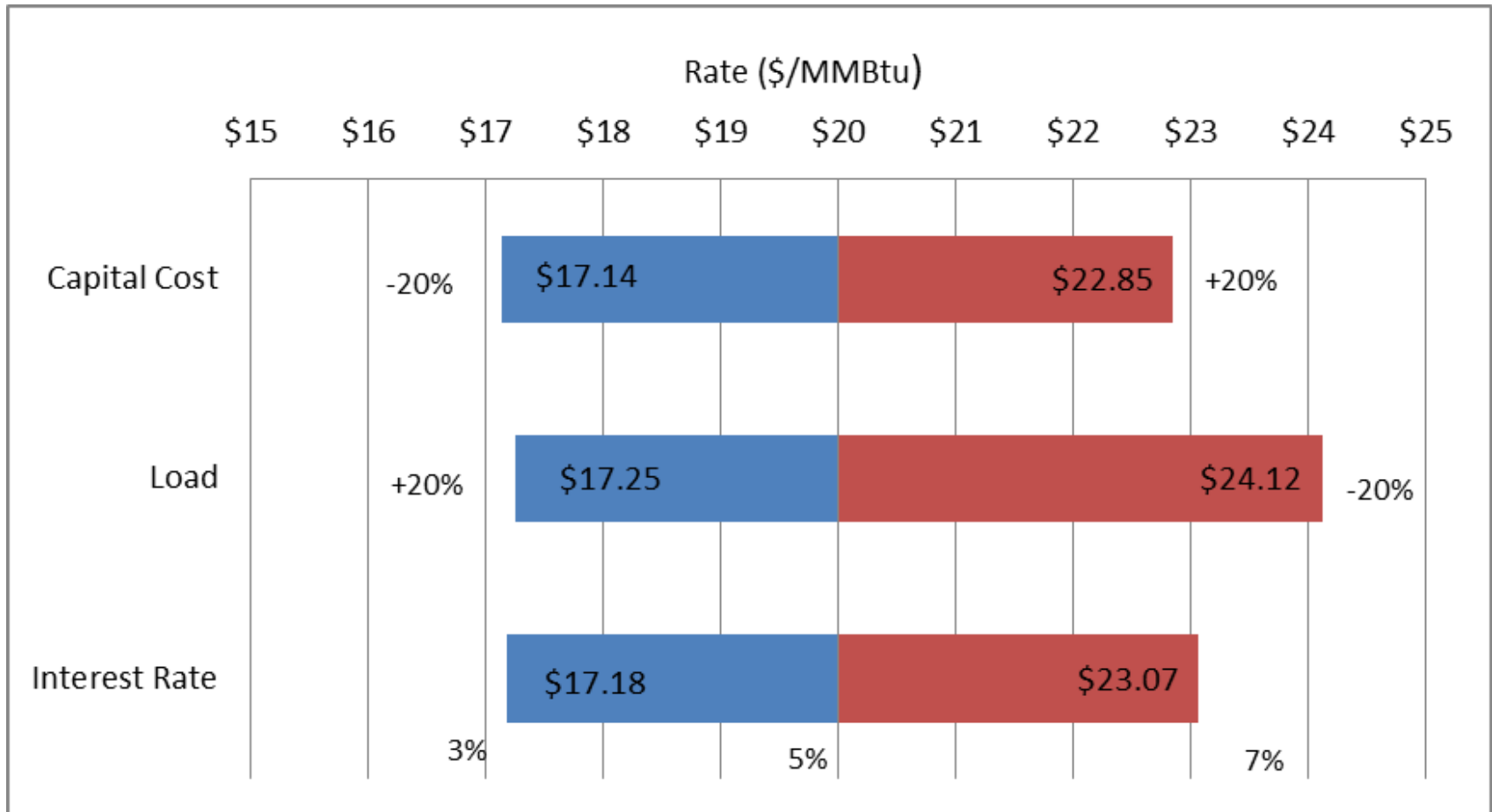


Break-Even Analysis

	Estimated Annual Cost		Natural Gas Rates	
	On-Site	CES	Present (2014)	Break-Even
	<i>(\$/Year)</i>	<i>(\$/Year)</i>	<i>(\$/MMBtu)</i>	<i>(\$/MMBtu)</i>
UVM Waterman Hall	\$208,800	\$284,995	\$4.92	\$8.90
UVM Dewey Hall	\$61,812	\$94,618	\$4.92	\$10.00
UVM Trinity Campus	\$332,353	\$310,841	\$7.88	\$6.90
UHC	\$185,861	\$191,769	\$4.92	\$5.30
FAHC	\$2,060,973	\$2,515,236	\$4.92	\$6.70



Sensitivity Analysis



Environmental Benefits

- Supporting Burlington's Climate Action Plan carbon reduction goals
- Phase I would reduce heating-related CO2 emissions by 78%
- Reducing CO2 emissions by 14,400 tons per year
- Equivalent of taking 2,700 automobiles off the road



Renewable Energy Credits (REC)

- McNeil sells Class 1 REC's on Connecticut Market
- Recently awarded contract by CT Department of Energy and Environmental Protection to sell RECs on CT Market
- One of only two biomass plants to receive contract
- 7.5 MW at a fixed rate
- 42.5 MW at market rates
- 10-year contract commencing in 2015
- CHP credits may become more valuable in the future



Future Opportunities

- Further integration with UVM
- FAHC expansion
- CHP REC's
- Adjacent private buildings
- Growth to downtown Burlington
- Establishing a micro-grid in Burlington



Next Steps - Business Plan Development

- Verify initial anchor customers
- Establish the preferred business structure
- Establish a structure for the energy services agreement
- Develop a system financing plan
- Verify distribution system routing
- Refine the conceptual design
- Identify needed permits
- Identify a franchise/easement strategy
- Update costs & schedule for System Development



Questions?

