

**DEVELOPMENT OF AN AREA-WIDE
DISTRICT HEATING SYSTEM
BURLINGTON, VERMONT**

By

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ABSTRACT

The University of Vermont, the City of Burlington, and the Fletcher Allen Healthcare group have teamed together to develop an area-wide district heating system using steam from a 50 MW local wood-fired cogeneration plant. This paper discusses technical issues, and the institutional and community issues associated with project development.

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proximity to the City of Burlington and the neighboring Winooski community has also brought challenges. One concern of neighbors adjacent to McNeil has been fugitive dust emissions from the handling and storage of wood, as well as emissions from the wood-fired boilers. In the year 2000, the McNeil Partners addressed these issues by installing a new enclosure over the wood loading area and through aggressive management of the wood handling systems.

PROPOSED SYSTEM

Numerous technical options have been explored for interconnection of the UVM campus with McNeil Station. A steam line connection was chosen to provide the initial community energy leg which will take advantage of wood fuel and require the fewest modifications of the University of Vermont. (Figure 1) The system will consist of a high pressure steam main, condensate return piping, necessary thermal expansion devices and connections at the McNeil power station and University of Vermont central boiler plant. Steam will be delivered at a pressure of approximately 220 psig with condensate returned to McNeil Station. The majority of steam used by the University will be supplied from McNeil Station, however, stand-by and peaking steam will continue to be provided by the University of Vermont central energy plant.

In practical terms, steam will be purchased from McNeil Station and transferred to the University of Vermont through the system which will be developed and operated by the Burlington Electric Department. All required system upgrades, metering, and maintenance activities will be provided through the BED managed interconnection and amortized in the project financing. The initial cost of the project, interconnection of McNeil Station and UVM, is anticipated to be in the range of \$7.5 million to \$10 million. A large portion of this project will be financed with public funds since many of the environmental and economic benefits accrue to the greater Burlington community and society as a whole.

UVM supports the project given the following benefits are realized: that annual operating cost savings are achieved, future capital costs can be avoided and that the system is considered reliable.

**Table I
Phased Environmental Impact**

Burlington Community Energy System - Avoided Emissions (Tons/yr)	Phase I UVM District Htg (1)	Phase II FAHC, MCHV Campus (2)	Phase III Downtown CBD (3)	Phase IV Winooski (4)	BCES, Total of all Phases
Annual Community Energy (MMBtu)	357,604	170,658	116,019	50,000	694,281
Emission Type					
Nox	33.1	16.6	10.7	4.6	65.0
SO ₂	24.3	12.1	7.9	3.4	47.7
Particulates	3.3	1.7	1.1	0.5	6.5
CO	8.3	4.2	2.7	1.2	16.3
CO ₂	29,349	14,519	9,521.8	4,104	57,493
VOC	1.3	0.7	0.4	0.2	2.6
Total (Tons/yr)	29,419	14,554	9,545	4,113	57,631

- (1) Includes Health Science Research, UHC, Waterman, Dewey
- (2) MCHV campus with build out
- (3) From Kattner/FVB Study, Case 4 - Emissions derived using 1998 JTC study.
- (4) Winoosky Redevelopment Project, complete scope - Emissions derived using 1998 JTC study

The reductions in emissions have a desirable effect on the environment which extends beyond greater Burlington and benefits all of society. One widely accepted method to assign a value to environmental benefits is to apply externality costs to each emission type. Externalities are benefits or costs resulting as an unintended byproduct of an economic activity that accrue to someone other than the parties involved in the activity. Median externality costs were researched for each pollutant and applied over a twenty year time period. When all phases are complete the total economic benefit of these avoided externality costs is \$1.7 million per year. The twenty year net present value of the emissions reduction is almost \$21 million.

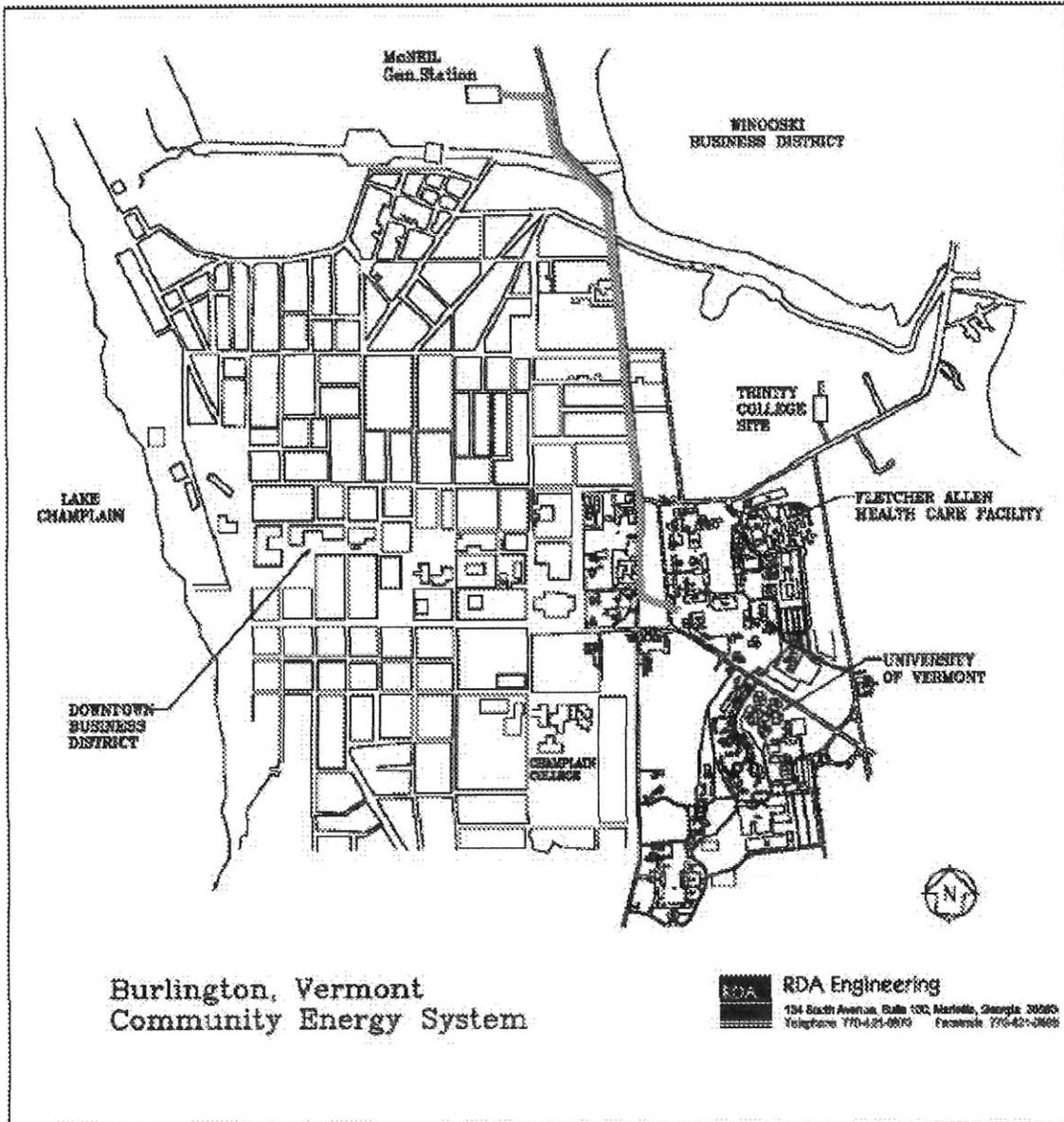


Figure 1