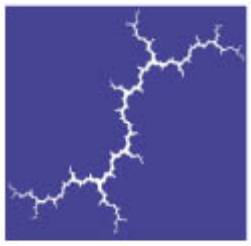


To: William Fraser, City Manager, Montpelier VT

From: William Steinhurst, David White

Date: August 9, 2012

Re: Review of District Heating Project

This memorandum is to summarize our review of the above matter. In general, we found the City's analysis to be reasonable as to method and assumptions and the substance of the agreements to be reasonable in light of normal energy purchase and sale agreements. We note a number of issues for the City's consideration.

Scope of Work

Synapse was engaged to provide an expedited review of the materials listed below and a memorandum giving our opinion as to the general reasonableness of the input assumptions and methods used to assess the finances of the District Heating Project. We did not include in our review any legal matters, engineering of the Project, cost estimates for construction or maintenance of the project, sources or amounts of funds other than project revenues, or the number or type customers that would participate.

Results of Review

The economic viability of the plan lies in the economic savings of replacing imported fuel oil with local wood to provide district heating (DH) services in the city of Montpelier Vermont.

There are several key questions here:

1. Are the fuel cost savings sufficient to cover the fixed and variable costs of the DH system?
2. Do the proposed agreements ensure that those fixed and variable costs will be fully recovered from the participants?
3. Will sufficient participants sign agreements to adequately fund the project?

Items 1 and 2 are addressed below. Item 3 is not within the scope of our assignment.

Economics

Fuel Cost Savings

The first step in evaluating the economics of the Montpelier District Heating proposal is to look at the benefits of the fuel replacement. This calculation depends on assumptions about fuel costs as well as conversion and delivery efficiency.

Fuel costs are the most important element of this determination. Fuel oil costs are much more expensive than wood costs for this area. There is a huge difference in the delivered costs of these fuels on an energy basis. In 2011 the cost of fuel oil (at $2.69/gal) was $19.46/MMBtu whereas for wood (at $46.98/ton) it was $4.66/MMBtu.[1]

Burning fuel oil on site is a little more efficient than burning wood in a central plant and distributing the heat, but that is a small effect compared to the basic price differences. Using 2011 prices and taking into account the various efficiencies of delivering heat to the loads, the cost for fuel oil produced energy was $25.28/MMBtu whereas for wood it was $6.77/MMBtu. This gives a significant cost advantage for wood of $18.50/MMBtu delivered. Going forward the comparable economics improve, with a wood advantage of about $21/MMBtu in 2013 increasing to $28/MMBtu (nominal) in 2030.

Behind these calculations are various assumptions about combustion efficiency, wood moisture content and district heating system losses. In general those appear reasonable and would only have marginal effects on the comparable costs.

Some Key Technical Assumptions

Fuel Oil Seasonal Efficiency	77%
Wood Moisture Content	42%
Wood Boiler Efficiency	71%
District Heat System Loss	3%

More important are the assumptions about fuel prices. The materials we reviewed had five alternative forecasts for fuel oil price, but only one for wood fuel. The following table summarizes these forecasts on a levelized cost basis and calculates the wood fuel advantage. We have looked at the U.S. Energy Information Agency's *Annual Energy Outlook 2012* (AEO) forecast for residual fuel oil for the commercial sector in New England which comes in a little below the Moody's forecast which is reasonable since delivery costs are likely a little higher in Vermont. Only for the AEO Low case is the wood fuel cost advantage less than $20/MMBtu. Such a situation is very unlikely and for our analysis we will be using the relatively conservative Moody's forecast, which appears reasonable.

[1] The delivered cost for wood in Montpelier is close to the New England price for natural gas, but natural gas is not available in this area.

Levelized Energy Cost Comparisons

Residual Fuel Oil - $/MMBtu delivered (2013-2030)

	Wood	$8.35	Advantage
Fuel Oil Forecasts			
Moody's		$31.50	$23.15
AEO Ref		$35.16	$26.81
AEO HI		$60.49	$52.14
AEO LO		$18.58	$10.23
Calibrated to City Hall		$40.26	$31.92
AEO 2012 New Eng Commercial		$27.87	$19.52

There is also, of course, uncertainty in the wood fuel cost, but that is substantially less since it is a local resource. Also a change in the wood cost would have only a modest effect on the relative premium. For example a 50% wood price increase would decrease the benefit relative to the Moody oil forecast from $23.15 to $18.95 (an 18% reduction).

We have reviewed the wood price forecast used in the "Work in Progress" workbook and have traced them back to values that appear in the "VT BGS Municipal Utility Case" workbook which ultimately goes back to a starting price of $45.00/ton for soft wood in 2010. We have spoken with the people who developed this value and consider it to be a conservative (high) estimate. This price then escalates at about 2.4% per year into the future based on Moody's CPI inflation rate. These wood pricing assumptions appear reasonable.

However those source materials also used higher moisture content for wood than the "Work in Progress" calculations, a value of 48% instead of 42%. If that higher moisture level is used, the wood energy cost increases by about $1/MMBtu tightening the economics of the switch.

Not mentioned explicitly are CO_2 costs, however any future implementation of these is likely to improve the economics of the DH system. The direct effect would be to increase the cost of burning fuel oil, which increases the savings margin associated with wood. There may also be an increase in wood prices because of market effects, but that is unlikely to be as much as the effects on oil costs.

The following table shows the expected fuel cost savings at two load levels. The initial load level represents almost entirely city buildings, and the second design load level includes other customers. The fuel cost saving available to offset fixed costs is substantially greater in the second case.

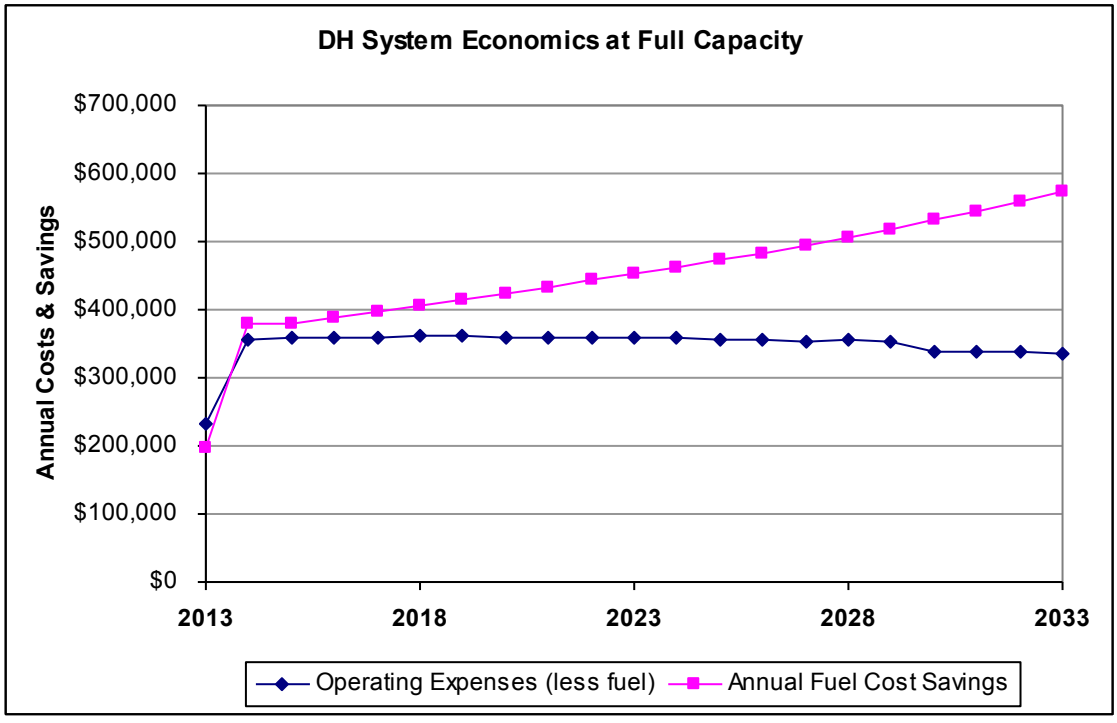
DH Load and Fuel Cost Savings [2]			Fuel Cost Savings ($/yr)			
System Load	Design Load (MMBtu/hr)	Annual Heat Load (MMBtu/Yr)	Levelized (2013-2033)	2013	2014	2015
Initial Load	9.71	11,169	$265,835	$235,424	$226,736	$226,730
Design Load	16.30	18,749	$446,253	$395,202	$380,617	$380,608

Although the fuel costs are a pass through under the proposed agreements, it is the fuel cost saving that determines the net benefits for the city and the other participants. Is this fuel cost advantage enough to pay for the fixed and other variable costs of the proposed district heating system? That is the next thing we will look at.

Overall System Costs and Benefits

Using the total expense calculations from the most recent analysis (document C6 in the list below), we observe that the fuel savings will cover the fixed costs in a typical year only if the system operates at its design load of 16.30 MMBtu/hr. The savings resulting at the initial load level of 9.71 MMBtu/hr are insufficient to cover the non-fuel costs of paying for and running the system.

Overall at full capacity the ratio of the system non-fuel costs to the expected savings are a little over 90% in the initial years, but the savings and benefits grow substantially in later years as oil prices increase but the system fixed costs remain relatively stable. So although the basic economics are tight in the initial years they start out positive and improve thereafter.



[2] Using Moody's fuel oil price forecast.

And, of course, the challenge for the system planners is selecting the right fee levels to cover the costs with an appropriate margin while providing enough of an incentive for customers to sign up, especially since the economics worsen if the system is used at less than full design capacity.

Agreements

While we do not express any opinion about legal matters, we reviewed the various agreements listed below for concerns and reasonableness.

The agreements between the City and the State clearly reflect special features of the proposed upgrade to the State's system, the sources of funding and so on. The remaining terms appear to be within reasonable range for an energy and capacity purchase agreement. We would bring the following items to the City's attention for possible resolution.

1. The original MOU states, "The point of delivery will be at the City equipment room attached to the Heat Plant. Both Parties shall have access to read the meter(s). The City shall be responsible for maintenance and proper operation of the thermal conversion unit." There does not appear to be any further provision in the agreements about a City equipment room or for access by the City for purposes other than reading the meters.

2. The original MOU and Thermal Purchase and Sale Agreement (TPSA) refer to various insurance requirements on the City. It is not clear from the documents we have reviewed whether to cost of such insurance or additional risks covered by existing insurance were taken into account in estimating the City's operating costs.

3. The TPSA defines Variable Cost to include, among other items, regulatory charges. It is not clear whether there will be any such charges or whether they were taken into account in estimating the City's operating costs.

4. Section 3.1 of the TPSA covers purchase of Additional Capacity under certain situations. Section 3.2 covers rental of Reserve Capacity under certain other situations. The analyses we reviewed did not reflect such requirements or their costs except that document C6 contained a row for the cost of purchasing Additional Capacity as part of cash flow analysis. Tests using that row of document C6 showed this assumption to make a material difference to the Cash on Hand with Capacity Payment results. For example, if the units of Additional Capacity purchased is changed from 2 (as shown in document C6 as provided to us) to 5 units, the Cash on Hand goes somewhat negative in a few years. It is not clear whether document C6 or the Customer Service Agreement would compensate for that with additional revenue from customers or with additional fuel cost savings at City buildings.

5. Section 4.3 of the TPSA provides for reconciliation of operating costs, fixed cost payments and energy payments after the fact. The City should examine how that provision squares with its Customer Service Agreement (CSA).
6. Section 4.4 of the TPSA requires the City to operate the City Boilers under certain circumstances. This provision does not appear to have been reflected in the analyses we reviewed.
7. Section 2.1 of the CSA establishes a term of 20 years, possibly from the date service commences. If that date is less than 20 years from TPSA's Commencement Date, this may need to be adjusted to be coterminous with the TPSA.
8. Section 6.6.9 of the CSA refers to "Capacity Rate Discounts offered pursuant to Article I of this Agreement." Article I does not appear to mention such discounts.
9. It is not clear whether the analyses provided address the issue of thermal losses on the City's sides of the delivery point up through the meters of customers being served. Section 7.3.4 for the CSA does appear to address the need for billing customers for such losses on a pass through basis, but not losses incurred in serving City buildings.
10. Concerning late fees and disconnection as we discussed at our initial meeting, Sections 10.4 and 10.5 of the CSA provide for late fees and disconnection. The City should still consider an adjustment for the lead/lag of its payments to the State and payments to it from customers.
11. Section 14.1 of the CSA provides for downward adjustment of capacity charges to customers in certain circumstances. It is not clear whether there is a similar downward adjustment in the City's obligations to pay capacity charges to the State. The City may wish to adjust for that possibility.

Reviewed Documents

Key	Document	Comments
A1	MOU - District Heat FINAL Version 6-9-11.pdf	
A2	PROCUREMENT AGREEMENT 1 6 12 FINAL EXECUTION CLEAN.pdf	
A3	Sub-recipient Agreement 1 6 12 FINAL.pdf	
A4	Thermal Purchase and Sale Agreement FINAL CLEAN 1 6 12.pdf	
A5	Customer Service Agreement	
C1	Montpelier District Heat DRAFT Business Plan.pdf	Initial business plan concept for DH system but now outdated. Created by Gwendolyn Hallsmith.
C2	VT BGS Municipal Utility Case 1-24-2011.xlsx	Initial workbook with preliminary cost calculations created by Larry Copp.
C2a	Basis for Operating Calculations.pdf	Some assumptions about operating costs.
C3	district_heat_basis_of_design_-_revison_2.pdf	Engineering design document.
C4	Summary of Buildings.xlsx	Building characteristics.
C4a	CustomerAnalysisTemplate_120413 with PrePay.xlsx	Template used for characterizing buildings.
C5	Work_In_Progress_120410.xlsx	Base worksheet showing many key assumptions and calculations created by Harold Garabedian.
C6	District Heat Budget and Project costs.xlsx	Latest economic calculations focusing on non-fuel related costs. Created by William Fraser.