

Old Deerfield District Energy Proposed System Description

Old Deerfield, Massachusetts appears to be a very attractive community to install a new biomass district energy system that will increase the reduce heating and cooling costs by increasing the efficiency of energy production, distribution, and consumption as well as displacing expensive imported fossil fuels with clean, local renewable energy resources, that will keep Old Deerfield's energy dollars in the local area rather than paying for fuel imports.

The system includes three basic components:

- Clean, low cost heat source
- Hot water distribution network
- Building connections, including thermal cooling where appropriate

The best option for the clean, low cost heat source appears to be a biomass combined heat and power plant. This plant could be sited anywhere on the hot water distribution network with access to suitable electric lines, but after some initial evaluation the most appropriate site appears to be on Greenfield Road near the intersection of Old Main Street, either just north of the Sunoco Station or south along the highway. The plant would require about four truckloads of wood chips daily on the coldest day of the year or when generating at its maximum electric output. The plant could be designed to look like an eighteenth century mill, complete with a water wheel on the side. The plant should include a parking lot and visitors' center that would attract a substantial number of visitors to see how Old Deerfield is fulfilling its role as a responsible steward of the environment.

The major components of the plant itself would include a biomass gasifier, a 900 HP high pressure steam boiler that can produce 30,000 pounds per hour of 600psig/750°F steam, and a 2 MW condensing steam turbine that would exhaust at 10 psia to make 190°F hot water. Additional components would include one or more natural gas/oil package boilers to provide peaking and backup capacity, a diesel generator to provide blackstart capability, and an air cooled heat exchanger to reject additional heat into the atmosphere when economically warranted and to maximize installed capacity payments from the ISO-NE Forward Capacity Markets. A hot water thermal storage tank would be installed to allow the plant to run at maximum output when electric prices are highest and to be shut down at other times during which the system heating demand would be met by the thermal storage tank. Massachusetts law requires a stationary engineer to be in attendance to operate a steam turbine, so turning the turbine off will minimize labor costs while also maximizing the plant's efficiency and environmental profile (which will be most favorable when operating at full output). Ideally, a solar thermal array would also be included, although this would probably have to be sited in a location that does not impair the historical architecture of Old Deerfield. Fuel for the plant would be provided by existing biomass providers in Burlington, Vermont, where a similar system is being developed. George Miller of the Magic Wings Butterfly Conservatory has also identified some potential wood chip suppliers in Massachusetts for a proposed new biomass heating plant at that facility. Mr. Miller has some substantial power plant experience and could be very helpful in moving any local energy project forward.

Hot water produced by the plant would be distributed through a new underground piping network designed around state of the art European prefabricated piping systems. Each building would have its own energy meter, which would be connected to a real-time metering system that allows each customer to access their own energy information. Other building services such as water and electric can also be connected to this metering system if desired.

Each building would have an energy transfer station that would deliver heat for space and domestic water heating, plus snow melting and other application. Hot water absorption chillers would also be installed to generate cooling using the hot water in the summer, thereby increasing the thermal demand when electric prices are highest and simultaneously reducing electric consumption.

The plant and thermal distribution network would be owned by a not-for-profit corporation with 501(c)(3) recognition from the IRS. This ownership model has been used by District Energy St. Paul for over twenty years quite successfully. The corporation could be set up to own just the Old Deerfield system or alternatively could encompass other potential systems either in the Town of Deerfield or throughout the Pioneer Valley. The potential financing advantages of the single larger system could be significant. In any event, the board of the corporation would be selected by the participating consumers in a manner of their choosing. Financing for the project could be done with 501(c)(3) bonds issued through the Massachusetts Development Finance Agency (MassDevelopment), which also has a Predevelopment Assistance Funding Program which seeds community development by funding pre-construction analyses associated with early-stage projects. MassDevelopment also provides direct loans and loan guarantees for projects with clear community development or job creation/retention potential. Other potential financing options include the USDA Community Development program (which offers loans, loan guarantees, and grants to qualifying rural communities, and new energy financing programs included in the in the 2007 Energy Bill (which is currently in conference committee).

The project can basically be viewed as an energy conservation project, with a capital investment resulting in lower energy costs. The proposed biomass plant will be efficient enough so that revenue from electric energy and capacity sales should pay for all of the fuel, resulting in a hot water variable cost that is close to zero or even negative. The low cost financing will minimize the fixed expenses, which will include debt service and ongoing operating and maintenance costs.

Development Process

Deerfield Academy appears to be the largest single energy consumer in Old Deerfield. If they are interested in this project, Historic Deerfield, Bement School, Eaglebrook School and the Pocumtuck Valley Memorial Association could also be invited to participate. The system could also serve the local fire station as well as the remaining single family residences in the community.

A presentation to these institutions could then introduce the system and the development process necessary to move towards construction and commercial operation. Several similar systems are being developed in Vermont and eastern New York, and the Carrier Corporation has agreed to develop and build these projects for interested local communities. Old Deerfield's very high visibility and large number of visitors will greatly enhance the value of this projects, which can also be utilized as an educational tool for local students.

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