What is District Energy and How Does it Work?

District Energy (DE) systems use hot water or steam to heat and cool homes and businesses within a town or community. The basic components of a DE system are a heating plant (low-pressure boiler) and a closed underground pipeline system for water distribution. The generating plant produces the hot and cold water and pumps it into the grid.

Benefits of District Energy include:

- Possible conversion to renewable energy sources, such as woody biomass.
- Energy and system efficiency.
- Energy conservation.
- High reliability, low maintenance.
- Flexibility and adaptability.

The heating plant can be configured to use woody biomass as a feedstock (chips, shreiddings, pellets, etc.). Various configurations can utilize different combinations of renewable feedstocks, as well as traditional fossil fuels.

Buildings on the grid do not need their own furnaces or air conditioners so new buildings have reduced construction costs. District energy has been very reliable and cost-competitive.

If electricity generation capacity is added, then you have a Combined Heat and Power (CHP) plant. A CHP plant uses hotter steam and higher pressure boilers. It, too, can be configured to use a variety of feedstocks, including woody biomass.

District Energy plants can serve both small and large communities. The idea is not new. Thomas Edison built a system in Philadelphia. Many systems currently exist across North America. Historically, many were abandoned over time because of inexpensive fossil fuels. With growing price increases for fossil fuels and concerns about global climate change, District Energy systems that run on renewable fuels have drawn increasing interest.

For communities interested in District Energy, clusters of large buildings might first be evaluated. Schools, colleges, municipal buildings, and industrial parks might be logical choices. Once cost savings are demonstrated, a large number of homes may wish to be tied into the pipeline grid.
In 2008, Traxys Corporation converted a conventional power plant in L’Anse, Michigan, to use woody biomass and sells the heat to a nearby forest products company.

The technology for District Energy—primarily boilers and pumps—is readily available. Chillers remove heat from the water for air conditioning. Air quality equipment would need to be considered, and a pipeline grid engineered and constructed. An area for feedstock handling is necessary, such as room for trucks, feedstock storage, and movement of feedstock into a boiler. An assessment of feedstock costs and availability is essential, especially for woody or agricultural biomass.

In the past, District Energy was used to help maintain snow-free and ice-free conditions on sidewalks and public areas, as well as for building heat. In the near future, District Energy may be an economical option to provide renewable, sustainable, and clean heat (and cooling) for business, government, and residential buildings. In some countries, a large and increasing portion of heating energy already comes from woody biomass.

In Sweden, about 26 percent\(^1\) of the nation’s total energy consumption comes from renewable woody and agricultural feedstocks, much of that through District Energy. In the United States, biomass supplies about 3 to 4 percent of our energy consumption.\(^2\)

Across North America, a number of landmark buildings are heated and cooled by District Energy grids, such as the IDS Center in Minneapolis, several prominent facilities in Toronto, Boys Town National Hospital in Omaha, downtown St. Paul, Minnesota, the Empire State Building, and the United Nations Headquarters. Most of the North American District Energy supplies heating and cooling to commercial and government buildings. Residential use runs less than 10 percent.\(^3\)

In Michigan, District Energy is employed at several universities, including Michigan State University. Detroit, Ann Arbor, and Grand Rapids each have District Energy systems as part of their infrastructure.

In addition to providing renewable and economical heat, district energy plants can encourage establishment of local energy plantations and so promote economic activity near the heating plants. Retired farmlands can be brought back into production to help supply a heating plant with feedstocks. Plantations might include species such as willow, hybrid poplar, switchgrass, Miscanthus, or other agricultural products.

More information can be accessed through the International District Energy Association (IDEA) www.districtenergy.org

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