Swedish-American Entrepreneurial Days

November 8-10, 2010

"Energy Production from Waste and Biofuel"

EVER-GREEN ENERGY™

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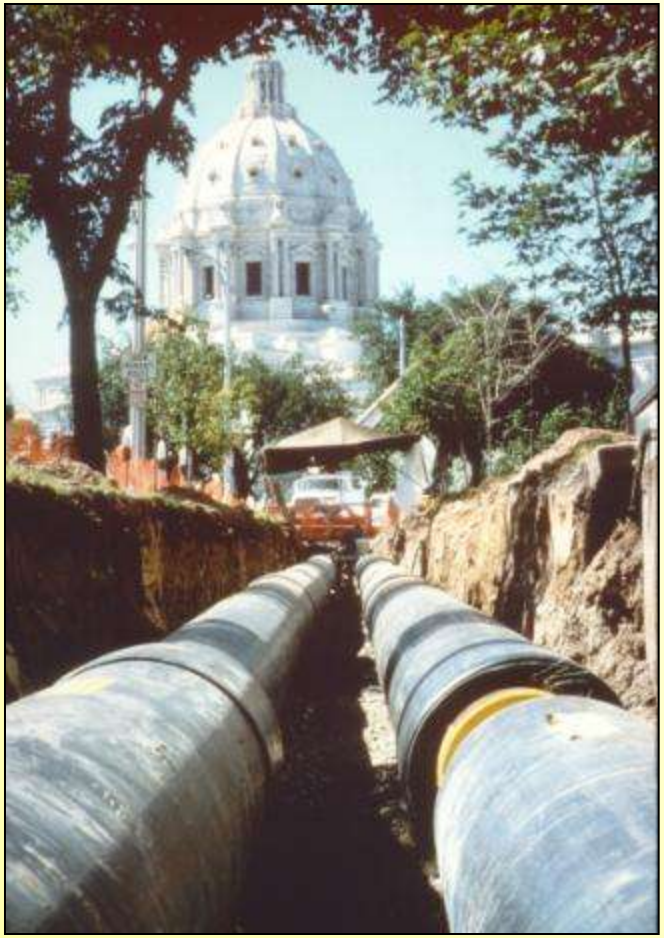
Outline

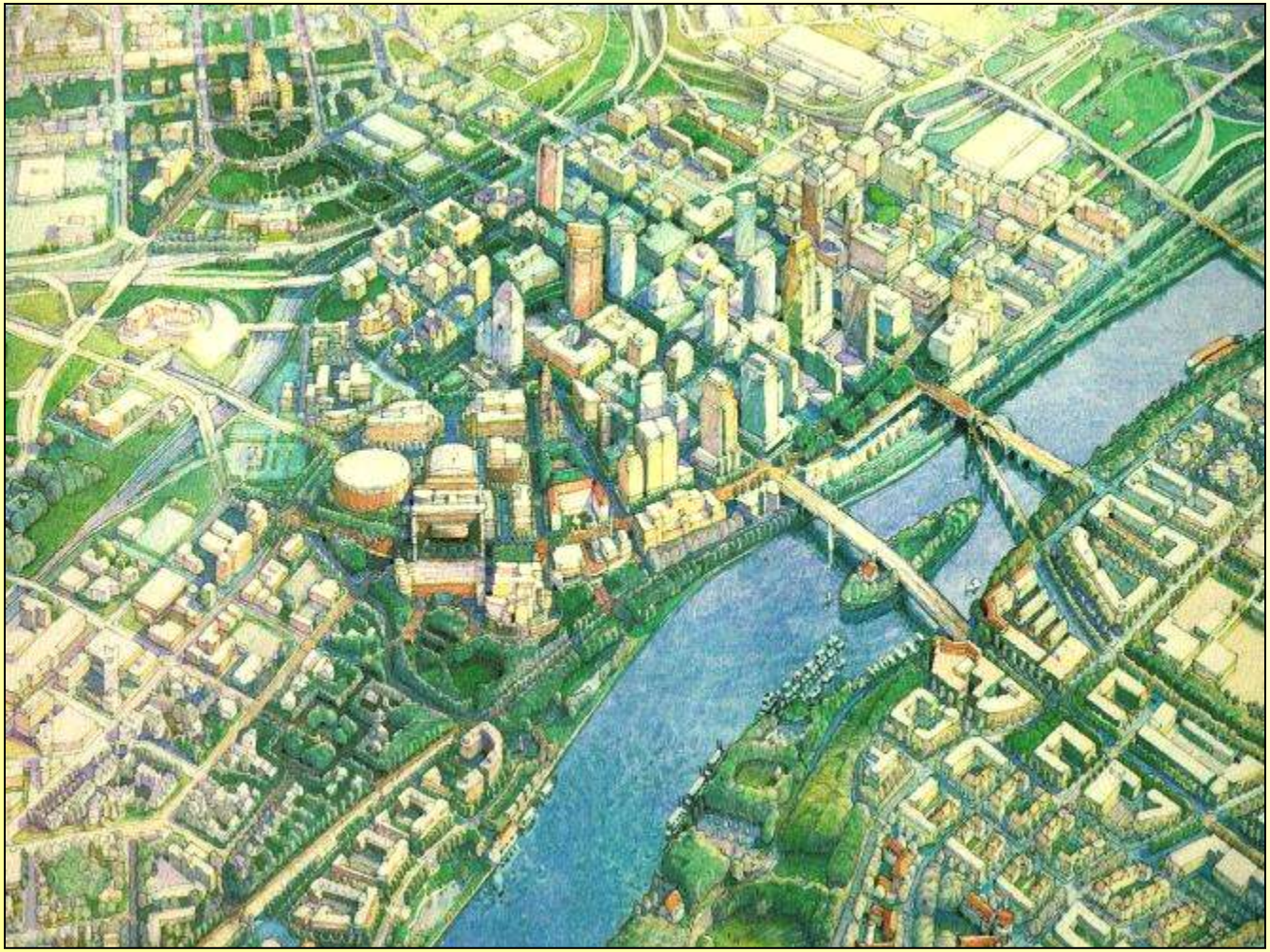
- District Energy St. Paul
- Biomass Fuels
- Waste-to-Energy

District Energy St. Paul Mission

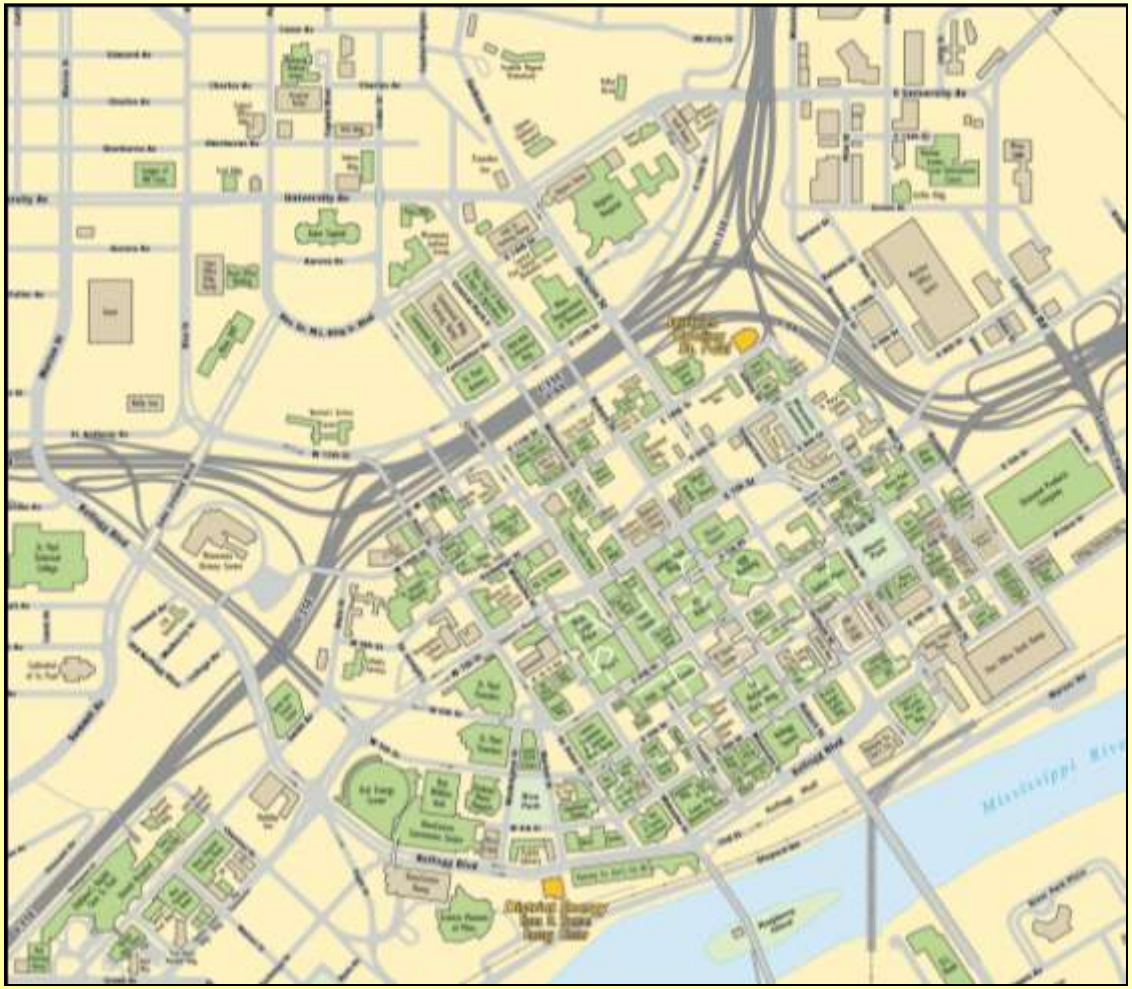
"Be the preferred provider of community energy services that benefit our customers, the community and the environment."



City of Saint Paul



Heating & Cooling Saint Paul



Broad Customer Base

DISTRICT ENERGY
ST. PAUL™

31.7 Million Sq Ft

187 Customers

+ 300 Residential*

DISTRICT COOLING
ST. PAUL™

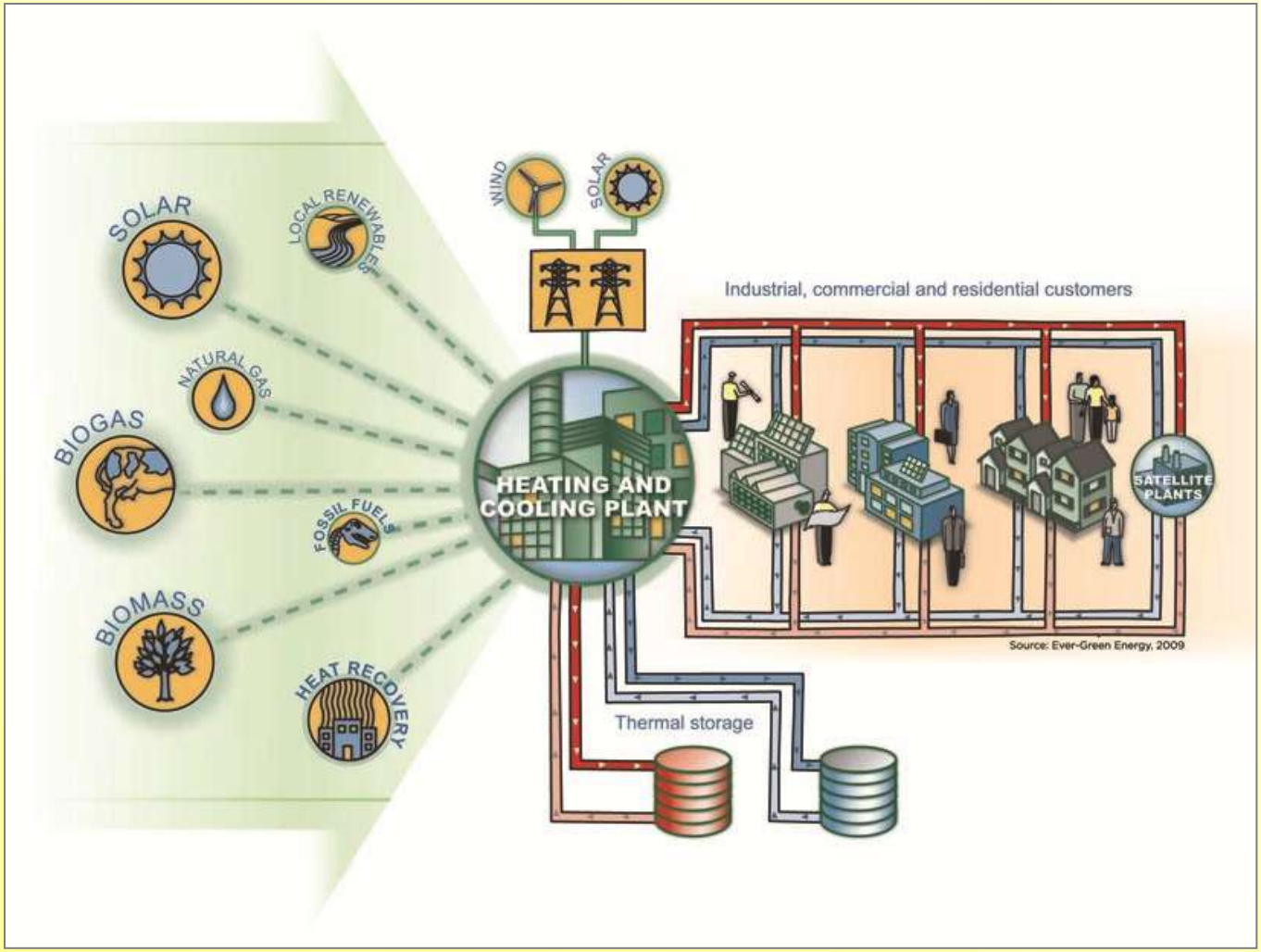
19.3 Million Sq Ft

98 Customers





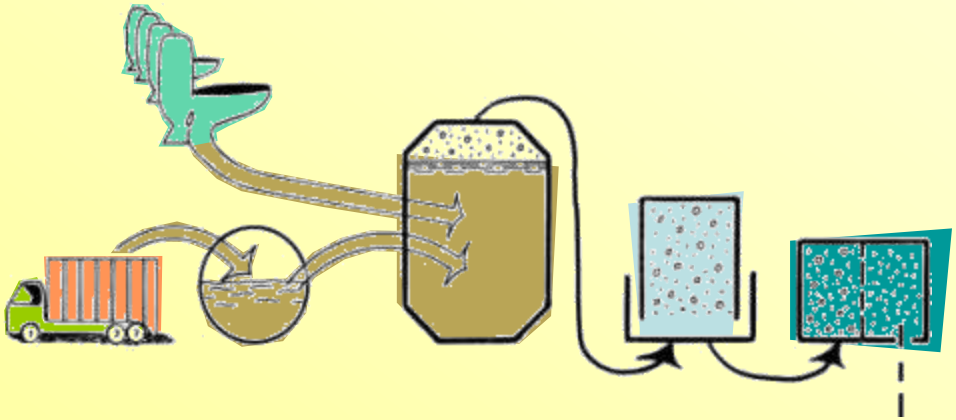

Integrated Community Energy System

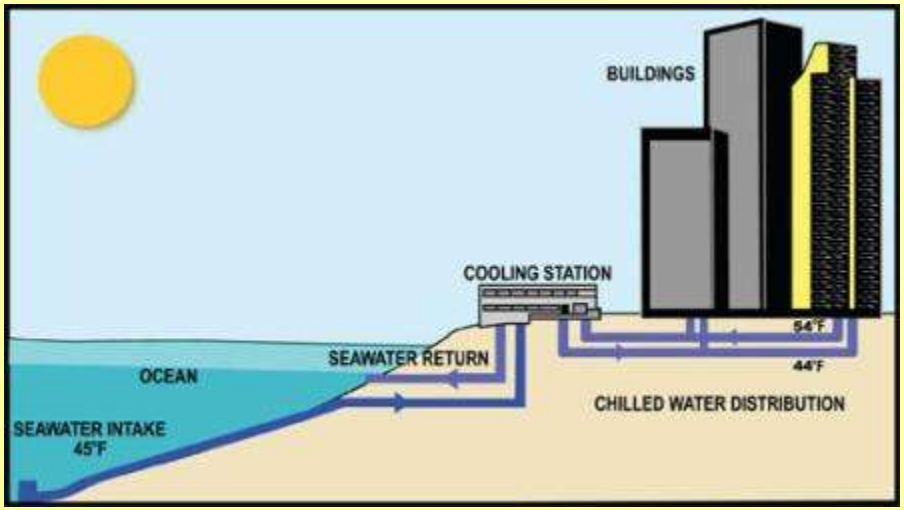


Benefits of Integrated Energy Systems

- Increase energy efficiency, reduce primary energy consumption and associated GHG emissions
- Enable beneficial use of surplus thermal energy from dispersed sources
- Ease transition to use of renewable energy
- Enables energy storage and smoothing of energy peaks
- Achieve significant energy conservation and GHG emissions reductions using currently available technology

Integrate a Diversity of Renewable Sources





Biomass

Wood is an age old-energy resource…

…with a renewed interest today.

Biomass-Fired CHP

Saint Paul uses up to 300,000 tons per year of clean, renewable, urban wood residue.

Where does the wood come from?

Tree Waste:

- Municipal parks and forestry operations
- DNR projects
- Land clearers (large developments)
- Tree removal contractors
- Storm damage
- Diseased trees
- Forest residuals

Keys to a successful biomass fuel project

Fuel

- Availability/location/sustainability
- Quality
- Variability/seasonality of supply
- Competition & potential partners
- Flexibility
- Logistics - transportation and storage
- Fuel handling system design
- Cost

Where are we in the United States?

- Biomass is currently the largest US source of renewable energy providing 3.4% of total U.S. energy consumption
- Most common in the pulp and paper industry as CHP

What is possible in Minnesota?

- Significant biomass resources
  - Forest residues
  - Agriculture residues
    - Corn Stover
    - Oat hulls and other milling residues
- Policies that promote bioenergy

Biogas

- Relatively new development in the US market
- Public acceptance as “clean energy”

Large Potential Market

- Existing infrastructure in place for transportation
- Potential feedstocks
  - Sewage
  - Organic household waste
  - Farm waste
  - Waste from food processing, ethanol production, etc.
  - Forest residuals

Waste-to-Energy

- Public perception about Municipal Waste Combustion (MWC) is that it is a polluting energy source
- Any form of gasification of garbage is more acceptable

Large Players in the MWC Business

- Covanta Energy Co.
- Wheelabrator Technologies
- Veolia Waste-to-Energy Inc.

Photo courtesy of Covanta Energy

Statistics

- Total of 87 MWC plants in operation
- 57 of these were built before 1990
- Only one was built after the year 2000
- One large 750,000 ton/hr plant under development in Vancouver, Canada, 100 MW electric production

Business opportunities for biomass and waste-to-energy technologies varies widely from state to state.

Thank You!

EVER-GREEN ENERGY™

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