

SWPCA Biomass Gasification Project

INFORMATION SHEET

What is the proposed SWPCA Biomass Project?

The City of Stamford has selected Nexterra Systems to develop a biomass gasification system that will convert locally sourced wood waste into clean burning synthetic gas or “syngas”. The syngas will be used to displace approximately 77,000 MMBtu/year of natural gas currently utilized by the Stamford Water Pollution Control Authority (SWPCA) to dry wet biosolids in an existing biosolids dryer. The proposed system would displace up to 85% of the natural gas currently consumed by the wastewater treatment plant.

Are there plans for future phases of development?

The initial phase of the project is focused on the conversion of wood waste into renewable thermal energy to provide heat to the SWPCA’s biosolids dryer. This phase of the project is scheduled to be operational by the end of 2010.

Future developments may include utilization of dried biosolids as a fuel source to provide thermal energy for drying.

The SWPCA also plans, in the future, to evaluate options for electricity generation. Nexterra is developing a unique biomass to combined heat and power solution (CHP) with General Electric. This CHP system will combine Nexterra’s gasification technology with high efficiency gas engines. This solution could enable the City of Stamford to self-generate renewable heat and power on-site.

Why is the SWPCA pursuing this particular form of renewable energy?

The SWPCA is one of the largest wastewater utilities in Connecticut and provides advanced wastewater treatment for 100,000 customers in Stamford and Darien. The facility’s heat and power is predominantly produced by burning fossil fuels such as oil and natural gas. The biomass gasification project will generate benefits for the SWPCA in several ways:

- Reduce current fuel costs
- Significantly reduce greenhouse gas emission levels
- Reduce consumption of fossil fuels and reliance on foreign fuel sources
- Demonstrate leadership in sustainability and water treatment innovation
- Stimulate local employment, leverage local energy fuel resources

What level of fuel costs savings will be generated by the project?

Fuel savings associated with the use of biomass fuel in place of natural gas will be approximately \$500,000 - \$1,000,000 annually.

How will the project be funded and how much will it cost?

The project will be funded by U.S. Department of Energy grants and matching funds from the SWPCA. Financing costs associated with matching funds to be invested by the SWPCA will be more than offset by energy savings that will be realized from the project. The project is anticipated to cost about \$8 million, half of which will be funded with grants.

What is biomass gasification?

Rather than burning wood waste through combustion, a gasification system creates a synthesis gas that is ignited to produce heat. The inputs for this process – wood and air – are heated in a low-oxygen environment (a refractory-lined chamber called a gasifier) until the wood breaks down into a gas. This resulting clean “syngas” is then used in place of fossil fuels to produce heat and/or power. Syngas is a clean burning fuel that can be used as a substitute for natural gas, fuel oil or propane to produce process heat, steam, hot water and/or electricity using conventional energy recovery equipment. Syngas is composed primarily of carbon monoxide, hydrogen and methane, as well as vapourized pyrolysis liquids and hydrocarbons.

Gasification differs from combustion because it uses just 20% to 30% of the air or oxygen needed for complete fuel combustion. During gasification, the amount of air supplied to the gasifier is carefully controlled so that only a small portion of the fuel burns completely. This “starved air” combustion process provides sufficient heat to pyrolyze and chemically break down the balance of the fuel into syngas.

What are the advantages of biomass gasification?

Nexterra biomass gasification systems are simple in design, offer operational flexibility, and produce inherently lower emissions than conventional combustion equipment. The system is modular and can be expanded to meet future heating needs. Nexterra’s gasification system offers significant fuel flexibility, including the ability in future to utilize biosolids as a fuel source. Moreover, the proposed system can also incorporate future developments such as gasification for electrical power generation using high efficiency internal combustion engines. This is not possible with conventional combustion technology.

What is biomass?

Biomass is a renewable, carbon neutral energy source derived from plants, vegetation, or agricultural crop waste.

What will the proposed gasification system use for biomass fuel?

Nexterra’s gasification system will use locally sourced waste wood that will be diverted from existing waste streams. This wood waste would be normally destined for landfills or incinerators in the area. One of the key advantages of Nexterra’s technology is its inherent fuel flexibility. Nexterra systems can operate on a wide range of wood fuels from wet bark and hog fuel to dry shavings and pellets.

How much fuel will the plant require and how will it be delivered?

The system that is currently being designed will consume between 6,000 – 8,000 bone dry tons (BDT) of wood fuel per year. At peak capacity, 2 trucks per day will deliver fuel to the plant. This is a relatively small volume of wood and is readily available in the Stamford area.

Where is the biomass coming from for the project?

Fuel sources for the project include debris cleared from land, clean construction debris, residue from municipal and commercial tree trimming as well as residues from other industrial sources such as value-added wood manufacturers.

Are there other sources of biomass apart from wood that the system could use in the future?

The proposed plant would be designed to run initially on woody biomass fuel. However, SWPCA is interested in utilizing biosolids as a fuel source in future.

Nexterra recently successfully tested biosolids as a fuel source at its Product Development Centre, in Kamloops, B.C. Tests were conducted using wet biosolids supplied by Metro Vancouver and dried biosolids supplied by the City of Stamford. Nexterra's gasification technology successfully produced significant high quality thermal energy from the biosolids.

How are biosolids disposed of today?

Biological sludge or "biosolids" is a residual product of the wastewater treatment process. Traditional biosolids management methods includes digestion, mechanical dewatering, land application or trucking to landfills. The SWPCA currently dries its biosolids and disposes of the dried materials as fertilizer. While this "beneficial use" as a fertilizer has many advantages over traditional land application or landfilling, it remains costly because of the low value of the fertilizer and the high transportation costs associated with moving it to agricultural areas.

What environmental impact will the project have on the municipality?

The project will reduce the plant's carbon footprint by up to 4,000 tons of CO₂ emissions annually, the equivalent of taking 1000 cars off the road. It will reduce natural gas consumption by 77,000 MMBtu/year – enough to heat 780 homes.

What emissions will the biomass gasification process generate?

The system will be designed to meet or outperform local air emissions standards. Recent testing at Nexterra's installations in Canada and the U.S. has verified that particulate emissions from those facilities are equivalent to those produced from natural gas combustion. In addition, emission results relating to carbon monoxide (CO) and volatile organic compounds (VOC) demonstrate significantly lower emissions levels than required by EPA guidelines.

How is the proposed system greenhouse gas neutral?

The CO₂ emissions from biomass are considered "carbon neutral" by key monitoring agencies including the World Resources Institute, Intergovernmental Panel on Climate Change, and the National Council for Air and Stream Improvement. These agencies distinguish renewable sources of energy (such as wood) as re-circulating CO₂ already in the biosphere's carbon cycle – from fossil fuels that add more CO₂ to that in active circulation.

Will the plant produce smoke?

The plant will produce no smoke. The synthesis gas or "syngas" produced from the gasifier burns cleanly much like natural gas. Any particulate matter produced from the gasification process would be captured by standard emissions control equipment.

What happens to the residual ash?

The volume of ash produced from woody biomass typically ranges from 4-6% of the original material used. The ash is safe and easily handled. The ash has a high mineral content and may be used in composting facilities.

How much noise will be heard near the facility?

Noise from the facility would be no more than current noise levels from surrounding building operations. Nexterra has sited comparable gasification systems in urban residential areas and achieved all noise related regulatory requirements.

Will the plant emit any odor?

No, the plant would not produce any noticeable odors in the surrounding neighborhood. Fuel will be stored in an enclosed building with a slight negative pressure to prevent any air from venting to the outside.

About Nexterra Systems Corp.

Nexterra Systems Corp is a leading developer and supplier of advanced gasification systems that convert biomass fuels into clean burning "syngas". Nexterra's industrial and institutional customers can reduce energy costs and become more energy self-efficient, while simultaneously significantly lowering greenhouse gas emissions. Nexterra has strategic alliances with Johnson Controls and General Electric and Andritz Separation.

Since Nexterra was established in 2003, the company has focused on commercializing its proprietary gasification technology for thermal and cogeneration applications. Projects include:

- US DOE, Oak Ridge National Laboratory (ORNL), TN – Nexterra's biomass gasification system is the cornerstone of an \$89 million contract for Johnson Controls to undertake a wide range of building management and energy conservation measures at ORNL.
- Dockside Green, Victoria, BC – Dockside is the world's highest ranked LEED Platinum commercial development. Nexterra's gasification system converts urban wood waste into heat and hot water for the entire development.
- University of South Carolina, Columbia, SC – The gasification plant converts wood fuel into 60,000 lbs/hr of steam to heat the campus as well as generate 1.5 MW of electricity.
- University of Northern BC, Prince George, BC – Nexterra's gasification system at UNBC will displace up to 95% of the natural gas currently used to heat the campus. It will also anchor a bioenergy innovation center.
- Tolko Industries Heffley Creek Plywood Mill, Kamloops, BC – The 38 MMBtu/hr gasification system converts wood residue into thermal energy to displace natural gas for a plywood mill.
- Kruger Products, New Westminster, BC – Nexterra's system at Kruger's paper mill will directly fire a boiler to displace natural gas used to generate 40,000 lbs of steam used in the paper making process.

Nexterra Systems Corp. is a private company majority-owned by ARC Financial Corporation.