

## **BIOREFINERY AT THE LANDFILL**

**The concept is local energy independence for communities whereby communities become self sufficient in renewable electricity and fuel by using the wastes and residues in their backyard. It would also reduce greenhouse gas emissions and the carbon footprint for the community. This is a new concept. Warrenton and Fauquier would be the first to do this.**

**A feasibility study done by Antares Group and Pacific Northwest National Labs (PNL) concluded that a small scale integrated biorefinery sited at the landfill to take the incoming trash, both MSW and non-recyclable C&D, and convert it via gasification to either electricity or liquid fuel was economically and technically feasible. To convert it to both electricity and fuel simultaneously was possible.**

**Antares Group is a leading consulting firm on analyzing different types of biomass for conversion to energy or fuel. PNL is the leading research firm on gasification technologies and receives its funding from the US Department of Energy (DOE).**

**The Office of Biomass Programs of DOE and RDAP of USDA provided financial assistance for the study. The Town of Warrenton contributed a 10% cost share.**

**The study looked at the different types of biomass in the area which included agriculture residues at the local farms such as corn stover and soybean stubble; the planting of new energy crops such as switchgrass on idled farmland and CRP land; forest residues such as wood chips and tree clippings; municipal solid waste (MSW) at the landfill; construction and demolition waste (C&D) brought to the landfill; and other types of high BTU waste within a 50 mile radius that could be delivered such as used tires, auto shredded material and food processing wastes.**

**A brief examination was made of high moisture or wet feedstocks such as horse manure, poultry litter and sewer sludge. These feedstocks are normally converted through anaerobic digesters to produce a biogas but could, after being dried out in a drying shed, be gasified with the low moisture feedstocks**

**The study suggested that the biomass plant start initially with just the MSW and non-recyclable C&D coming into the landfill. This would provide for a 250 ton per day plant size. It would consist of approximately 55,000 tons of the 70,000 tons of**

**MSW annually, 24,000 tons of wood chips and 8,000 tons of asphalt shingles from the C&D.**

**The conversion process would be a thermo-chemical, not a biochemical process. Of the various types of thermo-chemical processes, the plasma arc technology is recommended by PNL. This is a high heat process, up to 20,000 degrees F, that burns the feedstock in an oxygen deprived chamber to produce a synthetic gas (syngas). Because of the high heat, large quantities of steam are produced which is turned into electricity to provide the internal power requirements for the plant and should produce a surplus for export to the grid.**

**The syngas can then be used to produce electricity or it can be converted via a catalyst such as Fischer Trophe into a fuel; either ethanol, methanol, biodiesel or jet fuel. It is not known whether it can do both because it has never been tried.**

**A 250 ton per day plant could produce 8MW of surplus electricity or 12 million gallons of ethanol. 8MW of electricity would power every single home and building in Warrenton with 2MW to spare. 12 million gallons of ethanol would as an E-15 blend (15% ethanol, 85% gasoline, which is more ethanol than the most common blend today, E-10) provide enough fuel for every single vehicle in Fauquier county. If there is insufficient interest by local motorists to use ethanol, then the ethanol would be sold into the Virginia market where 165 million gallons are required under a federal mandate. No ethanol is produced in Virginia, it is all imported.**

**The plant is a closed loop plant that emits very few emissions. This is very different from the traditional waste to energy plants like the Covanta facility in Arlington. Several meetings with DEQ have resulted in a very favorable attitude towards the project. EPA supports the project as well. They see this as a much better alternative to land filling**

**Processing wastes rather than burying it in a hole at the landfill greatly reduces toxic emissions. Dioxins and furans would be reduced by 900%. Greenhouse gas emissions would be reduced by 50,000 tons.**

**The plant would use very little, if any, fossil fuels. Every other biofuel or bioenergy plant uses some amount, usually a large amount, of fossil fuels Unlike the other biofuel plants like corn to ethanol and soybean oil to biodiesel and unlike the traditional waste to electricity plants that are huge incinerators, this plant would not run on a fossil fuel like natural gas or coal. It produces its own**

**electricity. It could be started by the methane gas being captured at the landfill or biogas produced from an anaerobic digester being fed horse manure and sewer sludge sited next to the plant.**

**A company, Fauquier Landfill – a joint venture between Charles Foster and PEPCO – has a contract with the County allowing them exclusive use of the trash in order to capture the methane to convert into electricity for export to the grid. The county receives \$10,000. We asked Troutman and Sanders to review this contract and their opinion was that the county could ‘divert’ the incoming trash and not be in violation of the contract.**

**The capital investment for a gasification plant is substantial. It is more than traditional biofuel or waste to energy incineration plants. The cost for a 250 ton per day plant using a plasma torch technology is estimated at \$35 to \$45 million. Since the capital cost is higher, the operating costs must be lower than other bioenergy plants in order to be economically viable. This is possible if there is no feedstock cost or a negative feedstock cost.**

**The county receives a tipping fee of \$46 per ton. There are several landfill operating expenses that could be avoided if the trash was diverted to a plant. For example, it would avoid the \$1 million contract annually to bury the trash. These avoided costs represent somewhere between \$10 to \$20 per ton. The County would keep most of the tipping fee to pay for other operating expenses and make a contribution to the General Fund and the balance would be given to the plant so it could have a negative feedstock cost.**

**To date, two companies have said they would finance, build, own and operate a small scale (250 ton/day) biorefinery to produce either electricity or a liquid fuel and without federal assistance. They would require that the plant be sited at or near the landfill to take advantage of existing infrastructure and to have a long term (life of the plant) contract from the County to supply all the incoming MSW and non-recyclable C&D.**

**Since it is likely that either DOE or USDA will approve an application for a grant and/or loan guarantee under the \$2 billion program to commercially demonstrate new technologies or projects, we would try to insist with the companies interested in participating that they experiment with different processes, i.e., catalysts, so as to co produce electricity and fuel and the risk would be covered by a federal grant or guarantee for that portion of the project cost.**

**We would like to send out letters of solicitation as soon as possible to companies that we believe would be interested or, like Chevron, have already expressed an interest. In addition to the obvious companies – the oil companies, the energy companies, the utilities, the equipment manufacturers like GE and Siemens, it would also include companies that want to strategically partner in a project. Wal-Mart for example is looking for a project(s) because they are planning on having ethanol pumps at their stores. There are others who just want to “greenwash” themselves for PR purposes.**

**Although Warrenton/Fauquier County would be the first community to embark on such a project to achieve energy independence, there are other projects getting started which are gasifying trash into electricity or ethanol. A project is starting up in Toms River, NJ that will process 150 tons per day of used tires into 25 million gallons of ethanol using a plasma arc technology. GeoPlasma will be plasma torching 2,500 tons of garbage at StLucie, Fla into electricity. They will receive the entire tipping fee from the county to make the economics viable; since the project cost is \$450 million. A plant in Japan, also using Westinghouse’s plasma torch has been converting 250 tons/day of auto shredded material into electricity for the last three years. Several wood chips to ethanol plants like Range Fuels in Georgia are starting up and a turkey offal to electricity in Iowa and at least two plants in England are converting via anaerobic digesters manures and sewer sludge into biogas.**