Prince William County Government
Board of County Supervisors

Landfills as Renewable Energy Sources

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Solid Waste Division

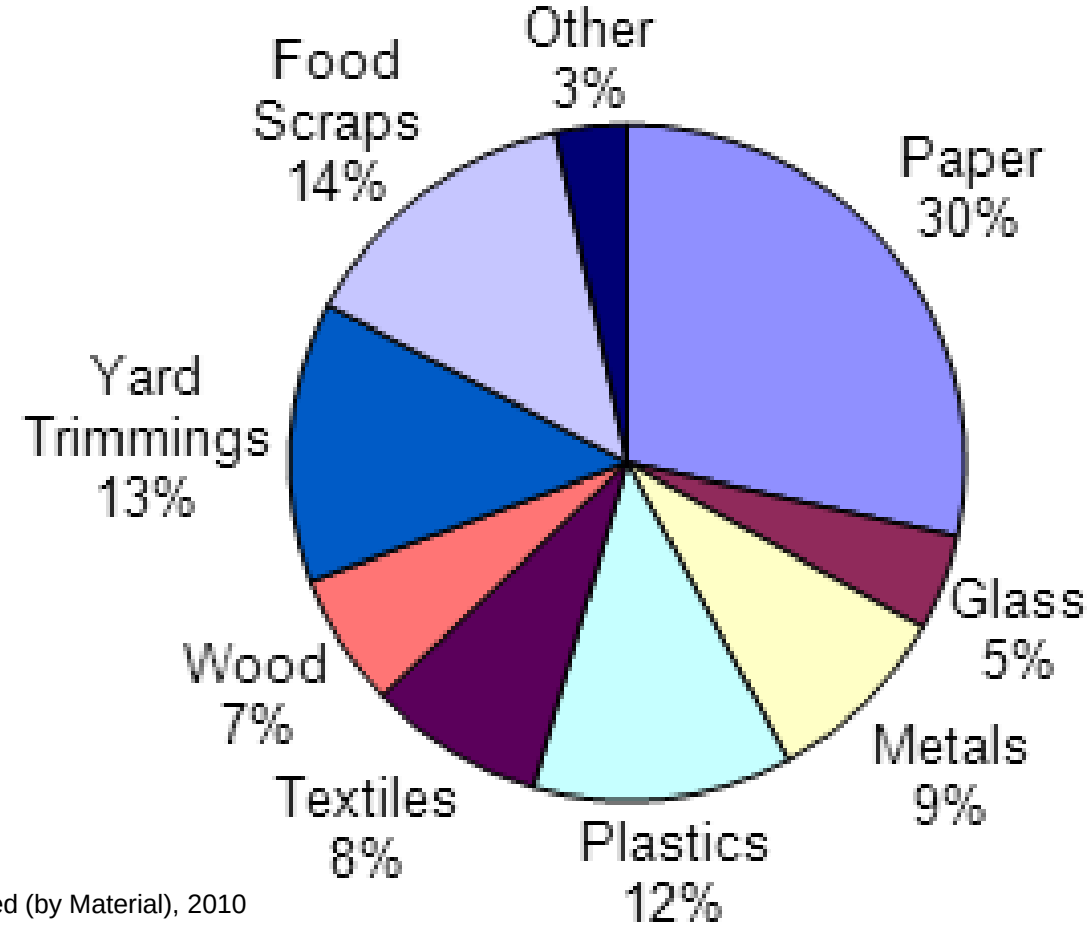
Solid Waste Management Hierarchy

Problem: People are Creating Too Much Waste!

- Prince William County residents generate about 6 pounds of trash per day (2,040 lbs/year)
- While about 36% of the County's trash is recycled nearly twice as much (58%) goes to our County Landfill to be buried

- Much of the trash going to the landfill could have been reused or recycled saving natural resources, energy, and landfill space

Breakdown of Waste Generation



Total MSW Generated (by Material), 2010
(before recycling)
Source: EPA December 2011

Landfill Gas to Energy Program – Background

- **Formation of landfill gas**
  - The County landfill has operated for 40 years.
  - Over 8 million tons of trash is buried at the landfill.
  - Anaerobic decomposition of the organic matter in waste produces landfill gas.
  - Methane and carbon dioxide are the two gases formed from the decomposition of waste.
  - Methane can be used as a fuel source.

Landfill Gas to Energy Program

- **Existing Energy Recovery Facility**
  - NEO Prince William (Fortistar) installed a landfill gas collection facility and a 1.9 MW energy recovery facility became operational in November 1998.
  - Energy recovery facility uses approximately 600 standard cubic feet per minute (scfm) of landfill gas.
- **Landfill Gas Generation**
  - The amount of landfill gas generated has increased from 1600 scfm in 1999, to the current amount of 2600 scfm.
  - Only 25% of the landfill gas is used for energy recovery.
  - Fortistar and the County has agreed to increase production of energy.

Landfill Gas to Energy Program

The landfill gas is converted to electricity to produce 1.9 megawatts of power and has potential for expansion.

Landfill Gas to Energy Program

Landfill Gas-to-Energy Program

- **Expansion of Energy Recovery Facility**
  - Fortistar recently obtained a permit from VDEQ to install 4 additional engines increasing the existing capacity from 1.9 to 8.3 MW.
  - Negotiations with the local power company (NOVEC) for sale of power and interconnect have been completed (Difficult Process).
  - Three (3) additional engines are scheduled to be installed by August 2013 to produce additional 4.8 MW.

Other Beneficial Uses of LFG

- Approximately 200 scfm of excess landfill gas will be available even after the additional engines are operational.
- Direct use of landfill gas is viable.
- A new gas pipeline has been installed to provide landfill gas to heat the Fleet Maintenance Building and provide fuel to the Animal Shelter incinerator to replace propane.

Landfill Gas Pipeline Route

LFG Treatment System

GAS TRANSMISSION PIPELINE

CD-1

CD-2

CD-3

CD-4

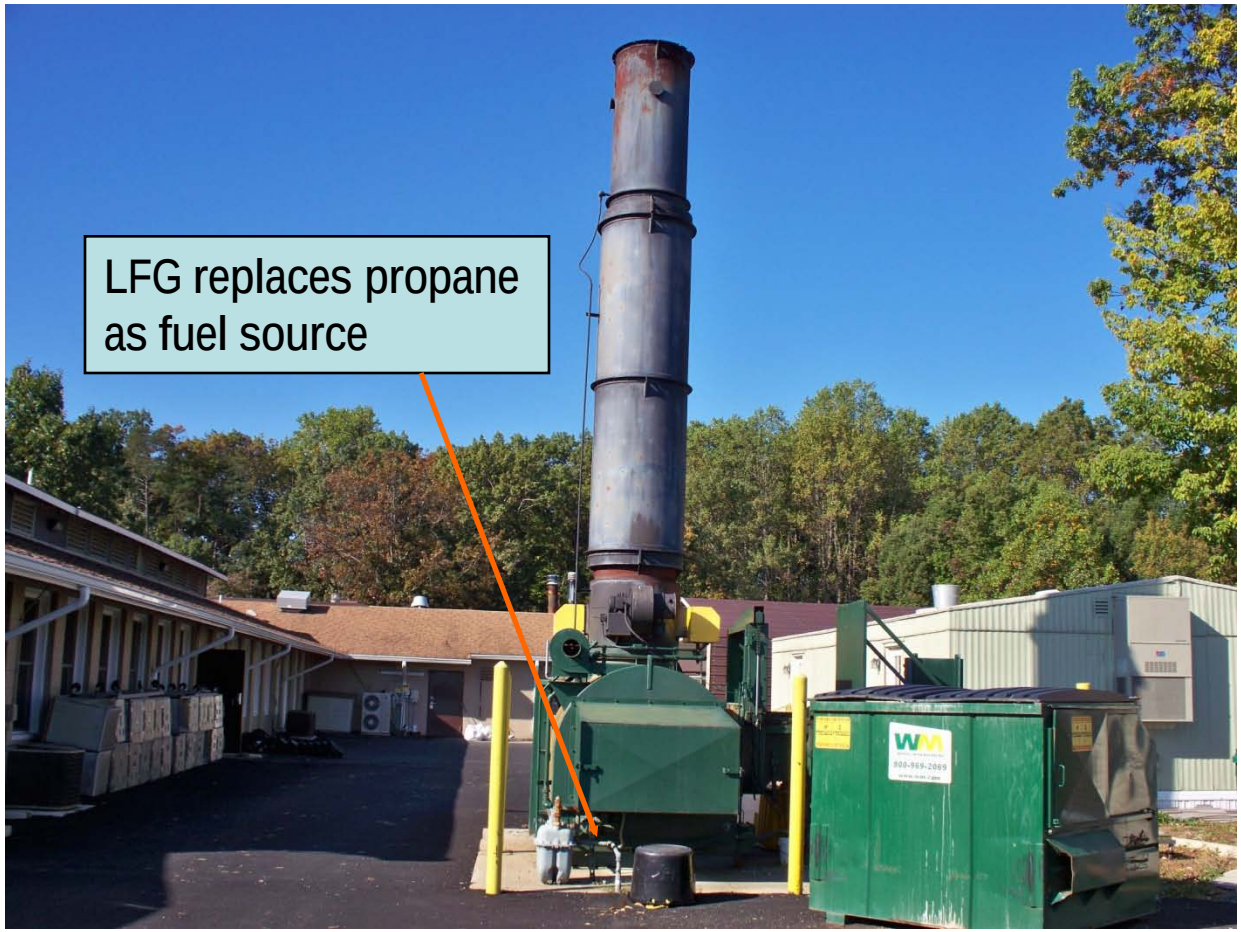
Fleet Building

Animal Shelter

Public Works is Replacing Propane with Landfill Gas, a Renewable Fuel Resource

Fleet Building Heater Retrofitting

Animal Shelter Incinerator



Landfill Aerial Photo

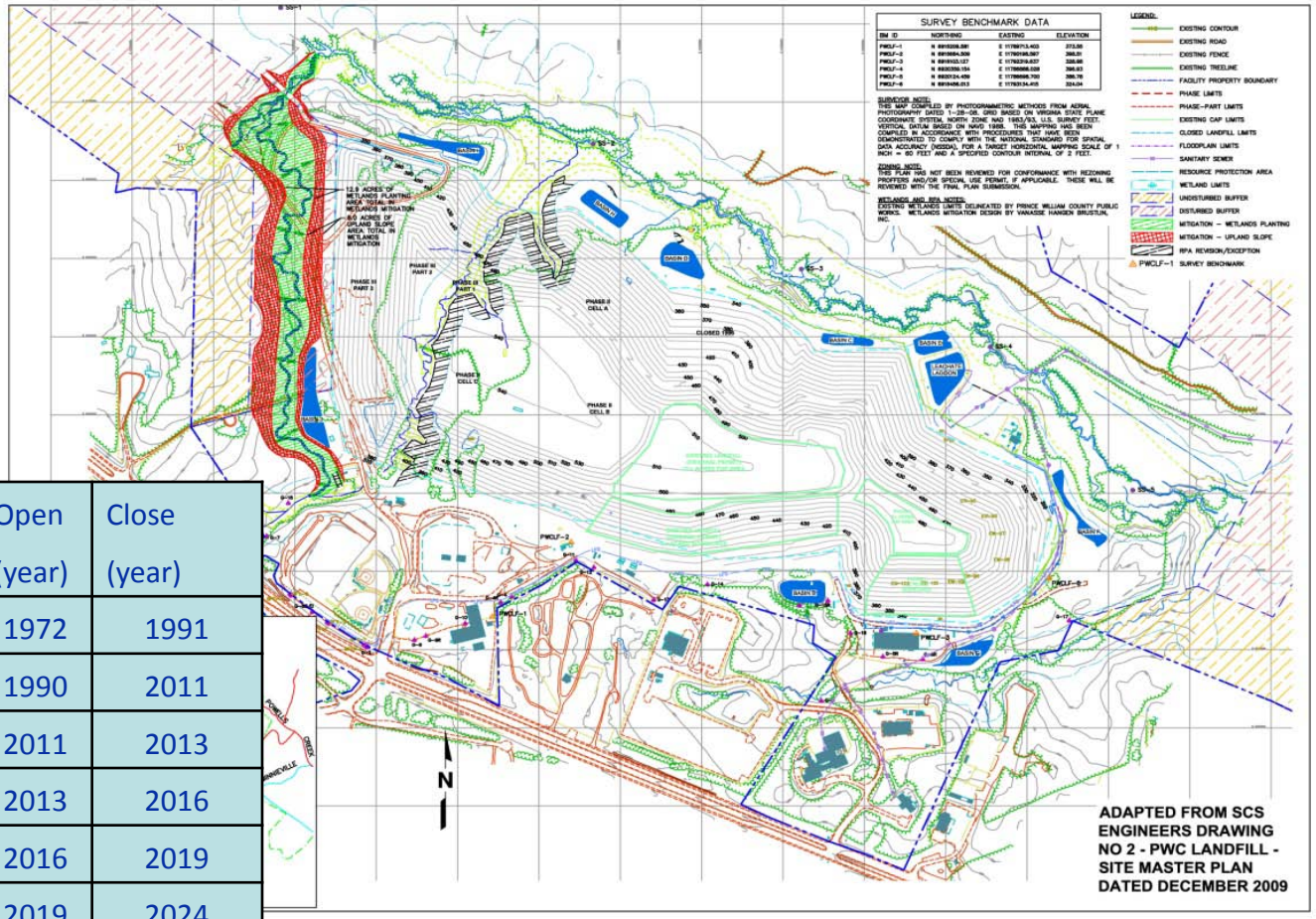
Prince William County Renewable Energy Park

Project Background & Objectives

- Prince William County landfill as an underused resource.
- Potential for creating a Prince William Renewable Energy Park (PWREP).
  - Decrease fossil fuel dependence.
  - Decrease greenhouse gases.
  - Generate revenues.
- Identify applicable technologies, e.g. solar, wind, landfill gas (LFG).
- Identify potential projects.
- Determine technical and economic feasibility of potential projects.

Landfill Site Opportunities

Phase	Part	Base Area (acres)	Open (year)	Close (year)
Existing	--	57	1972	1991
Phase I	1,2,3	39.5	1990	2011
Phase II	1	16.03	2011	2013
	2	15.33	2013	2016
	3	12.64	2016	2019
Phase III	1	13.65	2019	2024
	2	15.09	2024	2028
	3	13.08	2028	2032



Opportunities Summary

Resources	Conversion Technologies	Markets

• Solar Radiation
• Wind
• Landfill Gas
	• Photovoltaic
	  • Monocrystalline
	  • Polycrystalline
	  • Thin Film (Rigid or Flexible)
	• Wind Turbines
	• Gas Engines, Turbines, Micro Turbines, Boilers
		• Electricity Sales
		  • NOVEC
		  • Dominion
		  • On-site Users
		• Heating/Cooling
		  • High School
		  • County School Board Facility
		  • Greenhouses
		  • Detention Center
		  • Future Church

Future Landfill Energy Opportunities

- **Potential Energy Use for High School**
  - **Heating and Cooling**
    - **Boiler Running on Landfill Gas**
  - **Electrical Power (Micro turbines)**
  - **Educational Opportunities**
    - **Conservation and Renewable Energy**
    - **Environmental Studies**

Technology: Waste Conversion

- Companies Offering Technology and/or Development Services
  - 13 Aerobic Composting
  - 88 Anaerobic Digestion
  - 26 Ethanol Fermentation
  - 163 Gasification
  - 46 Plasma Gasification
  - 41 Pyrolysis
  - 70 Others (agglomeration, autoclave, de-polymerization, thermal cracking, steam reforming, hydrolysis)

Current Status

- Completed Feasibility Study.
  - Wind and solar is feasible, particularly to provide power for on-site or adjacent County facilities.
  - Landfill gas utilization (power plant expansion, heating, on-site power, vehicle fuel).
- Briefed Solid Waste Citizen Advisory Group on energy park concept and study. Working on overall vision/master plan of landfill site.
- Met with George Mason University staff to discuss possible partnership in developing Eco-Center and educational component of the energy park.

Current Status

- Private interest expressed in developing solar power at landfill site.
- Private interest expressed for alternative waste conversion technology demonstration project at County landfill.

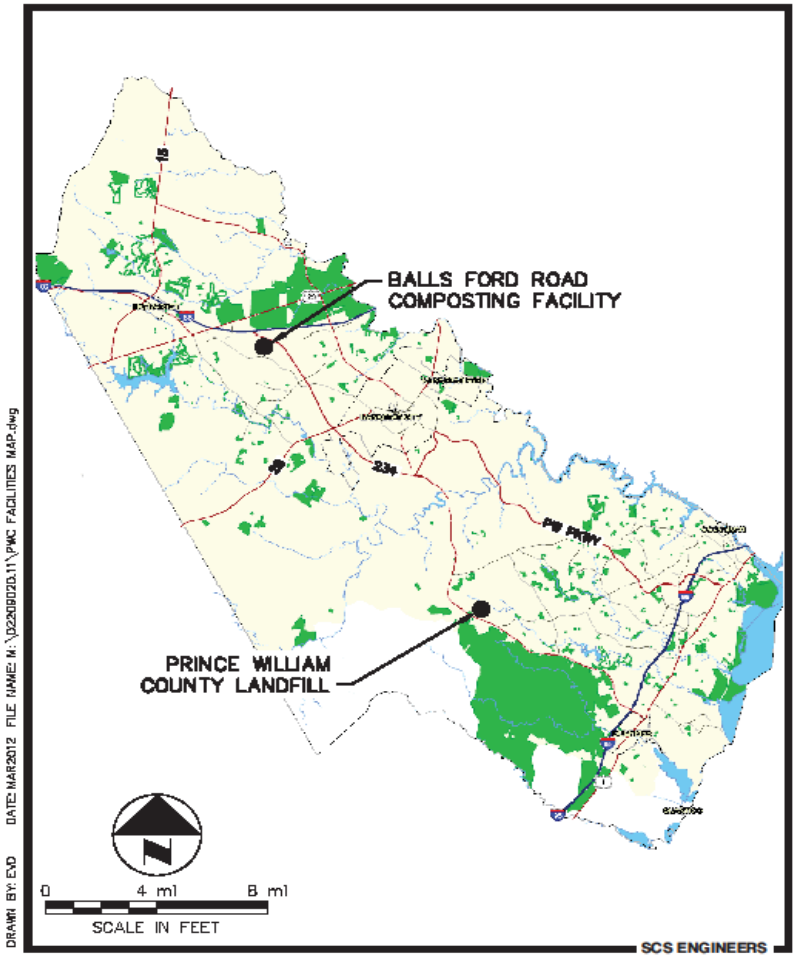
Current Status

- Develop RFPs to solicit and evaluate private interest in developing alternative energy facilities at the landfill site.
  - RFP for alternative disposal technologies has been issued and responses are under review.
  - RFP for solar and wind power under development.
  - Utilize consultant and project team to develop RFP and evaluate responses.
- Continue to work with NOVEC and Fortistar on expanding the landfill gas to energy plant.
- Continue to explore end users of power – County facilities, schools and adjacent properties at the landfill site.

Waste Conversion RFP Purpose

- Host a demonstration project of an innovative municipal solid waste (MSW) conversion technology.
  - On the landfill site or, as an alternative,
  - At the County's existing Balls Ford Road yard waste composting facility.
- Identify qualified technology companies to design, build, finance, own and operate the demonstration plant.
- Select the one with the best proposal to provide and operate such a facility.

Demonstration Sites



PRINCE WILLIAM COUNTY SOLID WASTE FACILITY LOCATIONS

Eligible Technologies

- Technologies on the verge of commercialization and that need to be proven at throughputs of 50 to 200 tons per day (TPD) on a continuous basis.
- Pyrolysis, gasification, anaerobic digestion, plasma torch or other conversion method producing a fuel or energy product, such as electricity, syngas, synfuel, steam, useable heat and/or other commercial energy outputs.
- Preference given to technologies whose primary output is not electricity.

Ineligible Technologies

- Traditional incineration with waste heat recovery technologies, of either MSW or refuse-derived fuel, such as stoker-fired, waterwall, fluidized bed or modular incineration (even two-stage starved-air incineration).
- Mixed-waste composting technologies that use open-air curing processes.

Scope: Offeror Undertakings

- Design, financing, construction, ownership, operation and maintenance of the facility.
- Applying for and securing all required permits, approvals and permissions.
- The construction and operation of the demonstration facility must not in any way interfere with the operations of the landfill.
- The demonstration site must be secured and kept clean.
- A site restoration bond is required.
- The Offeror is solely responsible for the financial arrangements of the demonstration, including the sale of all of the offtake products.

County Undertakings

- Site at nominal rent and site access/easements.
- 50-200 TPD of “as-received MSW” as requested by the Offeror (note: the County’s marginal disposal cost is $15-$20 per ton).
- Easements for the export of the energy products at no cost to the Offeror.
- Disposal of process residue, non-hazardous bypass waste and unacceptable waste at no cost to the Offeror (not including transportation cost to be borne by Offeror).
- Use of the County’s scale facilities at no cost to the Offeror.
- Cooperation in obtaining permits, approvals and permissions.
- Assistance with grant applications or financial incentive programs.
- Potential purchase of project outputs, as negotiated.

Pricing Proposal

Pricing Proposal to include:

- Tipping Fee, if any
  - Note: County's marginal cost to landfill waste is $15-20 per ton.
- Pricing of energy product(s); potential arrangements for County purchase of output(s).
- Disposition of recycling revenues.
- Allocation of energy/carbon credits.
- Other

Minimum Requirements

- Proposals not meeting the minimum requirements will not be evaluated further.
- Technical Requirement
  - At least one facility that has processed MSW at a throughput rate of at least five (5) TPD for at least 6 consecutive months at an availability of 75% or greater.
- Financial Requirements
  - Net worth of at least four million dollars ($4 million) or qualifying guarantor.
  - Ability to obtain financing for the project, with potential equity of the lesser of (a) ten million dollars ($10 million) or (b) 50% of the projected capital cost of the facility.

Basis for Selection

- The award will be made to the responsible Offeror whose offer conforms to the solicitation and is most advantageous to the County, cost or price and other factors considered.
- Technical Proposals will be scored 0-100.
- Financial Proposals will be scored 0-100.
- Final score weighted as follows:
  - Technical score = 65%
  - Financial score = 35%
- Highest ranked firms may be interviewed.

Proposal Review

- Three (3) Proposal have been received.
  - All using anaerobic digestion of organic material as primary disposal method.
  - Development of gas and/or fuel pellets for power production and/or conversion to vehicle fuel.
  - Various methods of pre-sorting. One (1) proposer only offered to process source separated organic waste.
  - Pricing proposals are being reviewed. One is requesting higher tip fees than County is willing to offer. Another is requesting financing support from the County.

Reasons for No Response

- Major Reasons Why Other Companies Did Not Respond.
  - Not looking for demonstration project. Desire larger full scale facility (1000-3000 tons/day).
  - Not economically viable – County landfill tipping fee too low and/or energy prices not high enough.
  - Did not meet technical/experience requirements.

Contact Information

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Solid Waste Division Web Site Link:
www.pwcgov.org/recyclerefuse