

## Reducing The Environmental Footprint of the Energy Delawareans Use

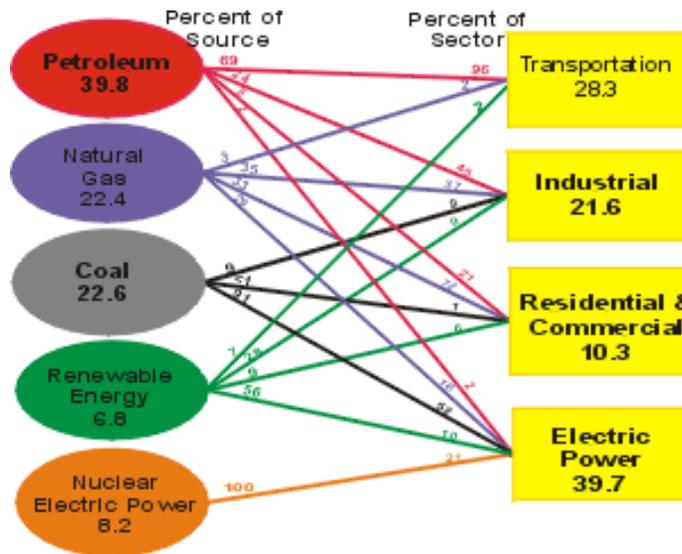
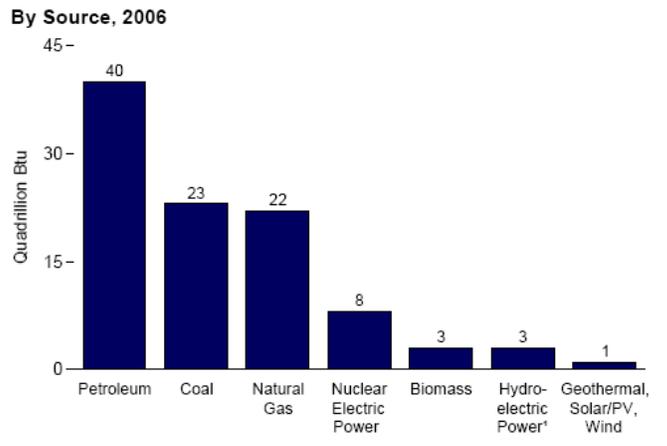
By Andrea Kreiner  
A. Kreiner Company

### Background Information

Total Delaware energy use across all sectors in 2005 was 312.6 trillion BTUs. 1999 total Delaware energy use was 280 trillion BTUs.<sup>1</sup> Total energy use grew 11.6% over the 6 year period. Per capita use was ~357 million BTUs in 1999, and 372 million BTUs in 2005, a growth of 4.2% over the 6 year period.

#### Energy use by Fuel Type:

US total energy use by fuel type is shown in the bar graph below.<sup>2</sup>



The chart on the left shows US primary energy consumption by source and sector in 2006 (quadrillion BTUs).<sup>3</sup> The lines represent the percentages of fuel sent to the sector and percentage of the sector's fuel that comes from that source. With the exception of nuclear power, which is only used for electricity generation, all fuels are used in multiple sectors.

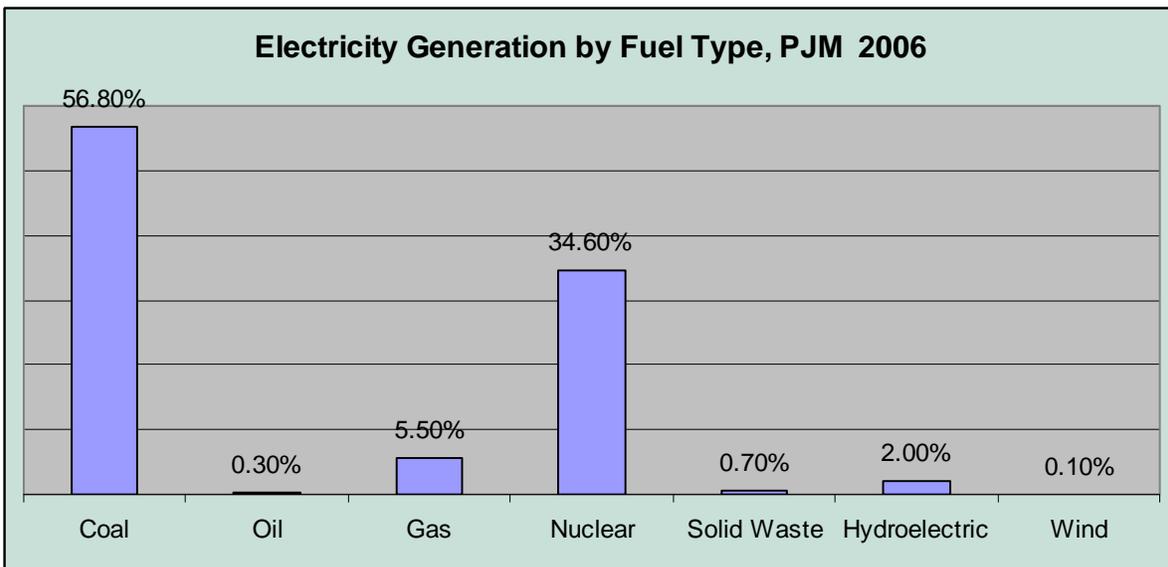
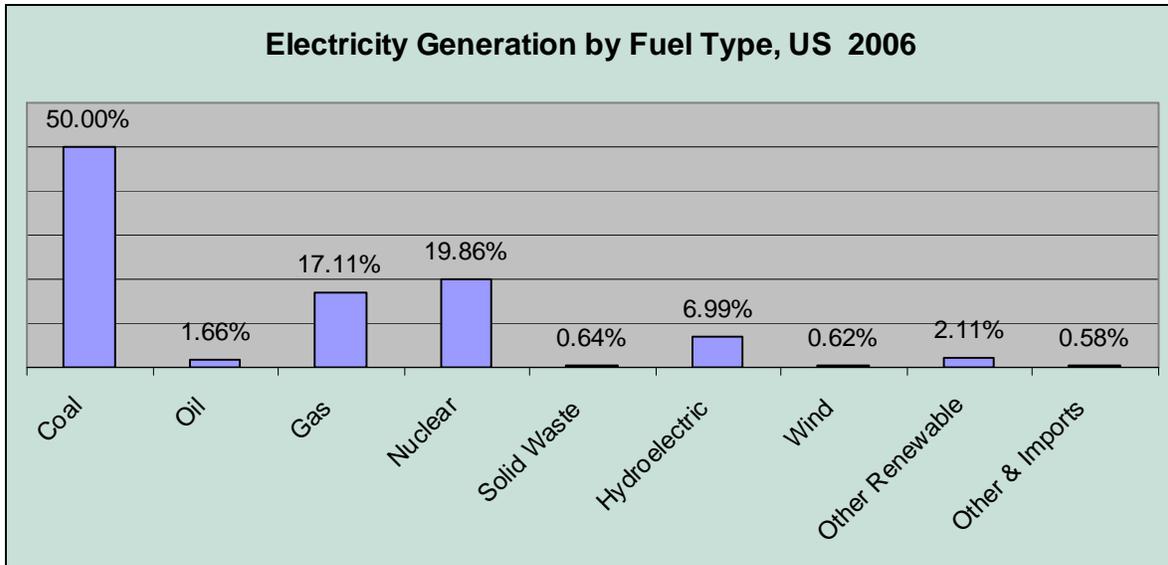
at current at the time.

:1\_8.pdf

Source: <http://www.eia.doe.gov/total/energy/basics/energy.html>

### Electricity Generation

The two graphs below focus on fuels used for electricity generation. They show the percentage of each fuel used nationally and in the PJM region, which supplies the electricity for Delaware.



Both charts show heavy reliance on coal for electricity generation, followed by nuclear and natural gas. In PJM, there is a much heavier use of nuclear generated electricity and less on natural gas than nationally. The PJM region also uses relatively less oil, hydroelectric and renewables in the mix of fuels.

Electricity is generated in Delaware at the following facilities:<sup>4</sup>

Plant Name	Main Fuel	Other Fuels	Nameplate Capacity (MW)
City of Dover			
McKee Run	Residual Oil	Natural Gas	151.2
Van Sant	Natural Gas	Distillate Oil	45.1
Conectiv			
Christiana	Distillate Oil		45
Delaware City	Distillate Oil		14
Edge Moor	Coal	LFG, WWTP Gas, Natural Gas, Distillate Oil	251.8
Edge Moor	Residual Oil	Natural Gas, Distillate Oil	446
Edge Moor	Distillate Oil		12.5
Hay Road	Natural Gas	Distillate Oil	705
Hay Road	Waste Heat		237
West Substation	Distillate Oil		14
Invista	Coal	Residual Oil, Natural Gas	30
NRG			
Energy Center Dover	Coal	Natural Gas	18
Energy Center Dover	Natural Gas	Distillate Oil	100
Indian River	Coal	Distillate Oil	782.4
Indian River	Distillate Oil		17
Premcor			
Refinery	Refinery Gas		119
Refinery	Refinery Gas	Syngas	63
Refinery	Syngas	Distillate Oil, Natural Gas	180
Warren F. Sam Beasley Station	Natural Gas	Distillate Oil	45

The 2006 air emissions from each location are shown below. The emissions are combined for all units at each site. Mercury data is not included in this chart; data is available on mercury emissions for each generation unit at each location.

Plant Name	CO2 (TPY)	SO2 (TPY)	NOx (TPY)	PM2.5 (TPY)	VOC (TPY)
City of Dover McKee Run	19,959	55	47	3	1
City of Dover Van Sant	2,538	0	2	0	0
Conectiv Christiana	1,257	2	5	0	0
Conectiv Delaware City	724	1	2	0	0
Conectiv Edge Moor	1,657,418	7,982	1,665	416	24
Conectiv Hay Road	564,024	3	269	30	9
Conectiv West Substation	474	0	1	0	0
Invista	270,946	4,143	1053	249	3
NRG Energy Center Dover	127,498	1,531	382	95	2
NRG Indian River	3,573,125	20,706	6,373	2,346	33
Premcor Refinery	1,665,563	496	779	21	4

<sup>4</sup> Source: Delaware Department of Natural Resources & Environmental Control, Air Quality Management Section. Analysis of 2002 Emissions from Delaware Electricity Generating Units (EGUs). Email from David Fees, 2/15/2008

Warren F. Sam Beasley Station	9,360	0	2	1	0
-------------------------------	-------	---	---	---	---

Air pollution emissions from electricity generating units as a percentage of all sources of emissions was evaluated for 2002. The results are shown below<sup>5</sup>

% Contribution of Electricity Generating Units to:	NOx	SO2	PM2.5-PRI	Hg
All point sources	73%	87%	65%	27%
All point and mobile sources	22%	78%	45%	27%
All sources	21%	76%	29%	24%

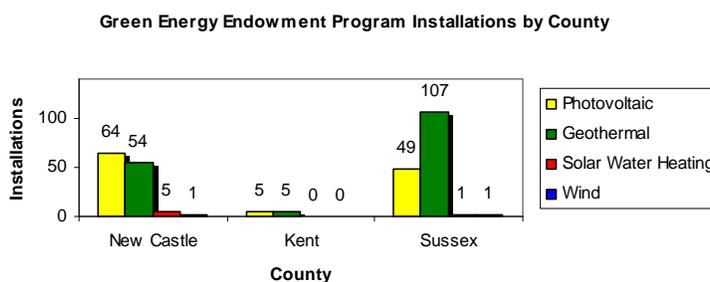
Two landfill gas to energy operations in Kent and Sussex counties became operational in 2007, with combined generation of 7 MW (Kent: 4 MW, Sussex: 3 MW).

**Electricity generated from renewable energy:**

The Green Energy Program has provided grants for the installment of 118 photovoltaic systems, 162 geothermal systems, 6 solar water heating systems, and 2 wind systems throughout the state. The total capacities of the installed systems are shown in the table below:<sup>6</sup>

Green Energy Program - Nonresidential Installed Capacity		
Technology	Installed Capacity	Units
Photovoltaic	879.89	Kilo-watts
Geothermal	94.50	Tons
Solar Water Heating	0	Square Feet
Wind Turbines	1.8	Kilo-watts
Green Energy Program - Residential Installed Capacity		
Technology	Installed Capacity	Units
Photovoltaic	413.82	Kilo-watts
Geothermal	779.50	Tons
Solar Water Heating	490.0	Square Feet
Wind Turbines	2.4	Kilo-watts

Installations by county are shown in the chart to the right:



<sup>5</sup> Source: Delaware Department of Natural, Air Quality Management Section. Analysis of 2002 Emissions from Delaware Electricity Generating Units (EGUs). Email from David Fees, 2/19/2008. Data reflects reduced SO2 emissions from Premcor's non-EGU units.

<sup>6</sup> Source: Delaware Department of Natural Resources & Environmental Control, Energy Office. Green Energy Program: Fiscal Year 2008 Status Report.

DEC's Renewable Resource Fund has provided grants to member-owners for renewable generation projects such as solar and wind. To date 16 solar and 3 wind projects have been completed or are under construction representing over 80 kW of member-owned renewable capacity.

DEMEC customers have installed a total capacity of 48 tons of geothermal and 30kW solar photovoltaic.

### **Regional Greenhouse Gas Initiative**

The Regional Greenhouse Gas Initiative (RGGI) is a collaborative program encompassing 10 states in the Northeast and Mid-Atlantic region designed to reduce carbon dioxide emissions from power plants. The 10 states (MD, DE, NJ, NY, CT, RI, MA, VT, NH, ME) will institute a cap and trade emissions trading program for CO<sub>2</sub>, the first such program in the country. The program is designed to hold CO<sub>2</sub> emissions constant through 2015 (based on 2000-2002 average annual emissions), and then reduce emissions 10% by 2019. The program applies to any fossil fueled electric generating unit of greater than 25MW.

The RGGI program will begin in January 2009 and is composed of four, three year "compliance" periods. At the end of each compliance period, affected facilities will be required to surrender CO<sub>2</sub> allowances equal to their CO<sub>2</sub> emissions over the preceding 3 years. Allowances will be made available by each state's regulatory agency through auctions, sales or allocation conducted on a periodic basis throughout the compliance period. Allowances will also be "created" through development of specific offset projects conducted by or for affected facilities. Each participating state is required to adopt regulations within their state to implement the program. All states will have required regulations in place by the close of 2008.

### **Legislative & Programmatic Changes**

Several pieces of legislation have been enacted between 2003 and 2007 that can impact the sources of electricity generation in Delaware:

- Net Metering  
Delaware's net energy metering standards were amended to increase the net-metering capacity limit for non-residential facilities to 2 megawatts per DP&L meter, 500 kilowatts per DEC meter, and 500 kilowatts per municipal electric meter. Also allows all net-metering customers to carry over excess energy credits from month to month during a 12 month period to account for seasonal variance in generation and energy consumption.
- Renewable Portfolio Standards  
A renewable portfolio standard was enacted in 2005 and amended in 2007 to increase the required minimum percentage of electrical energy sales to Delaware end-use customers from renewable energy resources through the year 2019. The law requires that, between 2009 and 2019, the minimum percentage of sales from solar photovoltaics increase from 0.03% to 2%. The law also set a solar annual compliance payment that can be adjusted by the Delaware Energy Office at an amount higher than, but not more

than 20% higher than, the estimated competitive market cost for purchasing renewable energy credits (RECs)

- Delaware Sustainable Energy Utility (SEU)  
In addition to energy efficiency projects, the SEU will provide funding for customer-sited renewable energy, including assuming management of the Green Energy Fund, which was doubled in a separate piece of legislation.
- Delaware Electric Cooperative's Renewable Energy Rider: DEC sells to its member-owners renewable energy through REC's derived from a landfill gas-to-energy plant. Over 2 million kWh have been sold since the plans inception in 2006.

## **Key Questions to be Addressed by the Work Group:**

1. What policies and programs can be put into place that will reduce the environmental footprint of Delaware's energy use?
2. How should Delaware meet its current and future electricity requirements?
3. What will the impact be on Delaware's electricity generation system as the price of coal rises? The price of natural gas? The price of carbon?
4. What can be done to moderate price shocks or create price stability over time? What is the likelihood of price stability or instability?
5. What is the likelihood of future regulations impacting the energy type used to generate electricity in Delaware?
6. What should be the appropriate balance between regionally generated electricity and transmission from distant generation facilities?