EES 306 **Assignment 9** **Wind Power**

1. The table shown below is from the EIA site.

Table 5b. Historical Renewable Energy Consumption by Energy Use Sector and Energy Source, 2000-2004 (Quadrillion Btu)

Sector and Energy Source	2000	2001	2002	2003	2004[P]
Total	**6.158**	**5.328**	**5.835**	**6.082**	**6.117**
Biomass	2.907	2.640	2.648	2.740	2.845
Wood	2.257	1.980	1.899	1.929	1.989
Waste[a]	0.511	0.514	0.576	0.571	0.560
Alcohol Fuels[b]	0.139	0.147	0.174	0.239	0.296
Geothermal	0.317	0.311	0.328	0.339	0.340
Conventional Hydroelectric	2.811	2.242	2.689	2.825	2.725
Solar[c]	0.066	0.065	0.064	0.064	0.063
Wind	0.057	0.070	0.105	0.115	0.143

Based on the data in this table, estimate the energy produced by wind and alcohol fuels in 2030.

	Energy Consumption (Qbtu)								
	Total	Biomass	Wood	Waste	Alcohol	Geothermal	Hydro	Solar	Wind
2000	**6.158**	2.907	2.257	0.511	0.139	0.317	2.811	0.066	0.057
2001	**5.328**	2.641	1.98	0.514	0.147	0.311	2.242	0.065	0.07
2002	**5.835**	2.649	1.899	0.576	0.174	0.328	2.689	0.064	0.105
2003	**6.082**	2.739	1.929	0.571	0.239	0.339	2.825	0.064	0.115
2004	**6.117**	2.845	1.989	0.56	0.296	0.34	2.725	0.063	0.143
Growth rate			-3%	2%	21%	2%	-1%	-1%	26%
2030		42	0.87	1.02	40	0.54	2.23	0.05	56

fd2. Installed US wind capacity equals 11,600 MW. Approximately how much energy does wind produce annually? How does this compare to total US electric energy consumption.

*Energy = 0.30 * 11,600 MW *24*365 H = 30 billion kWh*

30 billion kWh / 4,000 billion kWh = 0.75%

So, about 1% of US electricity is generated from wind.

3. Use the annual energy yield curve for a 3.6 MW GE wind turbine to estimate the energy produced by this turbine in Class 3 and Class 6 sites. What fraction of capacity is produced in each case?

*Generation capacity: 24*365*3.6 MW = 32 million kWh*
Class 3: Windspeed = 6.7 m/s ➔ 7.5 million kWh ➔ 24%
Class 6: Windspeed = 8.4 m/s ➔ 11.5 million kWh ➔ 36%

4. Choose 1 of the New England wind sites and prepare a presentation about that site for next week.

Searsburg is my favorite project

5. Read “Making Wind Fit” and write a brief analysis of this pro-industry viewpoint.

Glossary

RPS – Renewable Portfolio Standards in CT: Enacted in 1998, Connecticut's renewables portfolio standard (RPS) requires each electricity supplier and electric-distribution company that provides standard service, transitional standard offer or supplier-of-last-resort service to generate 4% of its retail electricity sales using renewable energy by January 1, 2004, increasing to 10% by January 1, 2010.

PTC –The production tax credit (PTC) provides a 1.9-cent per kilowatt-hour (kWh) benefit for the first ten years of a renewable energy facility's operation. The PTC is set to expire on December 31, 2008.

Wind Forecasting – A wind power forecast is the expected production of one or more wind turbines in the near future. Usually power is forecasted for periods between 1 and 48 hours ahead, with the emphasis on the next day, but forecasts at a range as short as 15 minutes are made as well. Longer range forecasts (3 to 9 days), on the other hand, can be made but are not used. Wind power forecasts are comparable to weather forecasts, but then expressed in power (in kilowatts) or energy (kilowatthour) instead of temperature or precipitation. Another difference is that wind power forecasts are issued as a continuous series of 15 minutes values

Load Following – A utility's practice of adding additional generation to available energy supplies to meet moment-to-moment demand in the distribution system served by the utility, and/or keeping generating facilities informed of load requirements to insure that generators are producing neither too little nor too much energy to supply the utility's customers.

Comments

Reliability – Spatial distribution of wind turbines smooths power fluctuations. Forecasting leads to efficient management.

Capacity – Wind generally provides energy not capacity. It’s major strength is displace fossil fuels, especially natural gas or coal.

Assignment 11 Wind & Water

Next week instead of our regular time and place, we will meet in Webb 110 at 6:30 pm to watch “Thirst” and to participate in the discussion following this video. You task for that class is to investigate the role of wind in conserving the quantity and quality of water. Here are some examples of connections between wind and water:

- The Jacobs texts claims that “Wind conserves water. To generate the same amount of electricity as one 1-MW wind turbine, steam generation requires, on average, roughly 60 million gallons of water a year for cooling purposes.”
- Wind power avoids water polluting activities associated with extracting and transporting fossil fuels.
- Wind has traditionally been used in arid areas (think Texas) to pump underground water to the surface.
- Wind power could be used to desalinate water.
- Water storage could be used to store the wind energy.

Using your text, the 205 text, and other resources, find connections between wind and water and write a 2-3 page paper with proper citations. Bring that paper to the viewing of “Thirst”.