Three Essentials of the Electric Grid: The Economics of The Electricity Industry
Vermont Law School Summer Session, 2012

Homework #1: Due at the beginning of class on Tuesday, 5 June 2012.

1. Briefly explain two similarities and two differences between a Regional Transmission Organization and an electric utility.
2. In class, we mentioned that economists believe that the short-term price elasticity of demand for electricity is very low. Why is this? If we measure the price elasticity of demand for electricity over long time periods, we find that electricity demand is much more elastic (i.e., demand tends to decline when the price goes up and vice versa). Why would electricity demand be price-insensitive in the short term but price-sensitive in the long term?

The U.S. Energy Information Administration (EIA) web site contains a great deal of data that can be useful for understanding and analyzing the electricity sector. The following questions are aimed at helping you to use one section of the EIA web site, the State Electricity Profiles (http://www.eia.gov/electricity/state/). If you click on a given state, as we did in class, you will a page of summary statistics for electricity generation and consumption in each state. We will use this data for Questions 3-4.

3. Pennsylvania is one of the largest exporters of electricity to other states. What percentage of Pennsylvania’s electricity is exported? You can calculate exports by taking Net Generation – Total Retail Sales.
4. Pennsylvania is the second-largest producer of electricity in the U.S. Which state is the largest? What proportion of that state’s electricity is exported to other states? You will find that this percentage is much smaller than in question 3. Can you explain why?
5. You own a small electric utility on the island of Royalton. You own three generating plants, each of which has a different capacity (in MW) and cost, as shown in the table below. Note that the marginal costs for each plant are constant.

<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Capacity (MW)</th>
<th>Fixed Costs ($)</th>
<th>Marginal Cost ($/MWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colchester</td>
<td>120</td>
<td>50</td>
<td>15</td>
</tr>
<tr>
<td>Warren</td>
<td>60</td>
<td>25</td>
<td>40</td>
</tr>
<tr>
<td>Burke</td>
<td>50</td>
<td>10</td>
<td>75</td>
</tr>
</tbody>
</table>

(a) On a set of price-quantity axes, draw the “supply stack” for your utility. Don’t forget to label the axes, so I know which one is which!
(b) Suppose that electricity demand was 150 MWh. Calculate the total, marginal, and average cost for your utility.
(c) Repeat part (b) but now assume that electricity demand is 185 MWh.