GEOS 24705 / ENST 24705
Problem Set #13
Due: Thurs. May 10th

Problem 1: Electricity markets

Read through the posted slide deck on electricity markets to really understand. Pay particular attention to slides 36-38, which show three examples of a "supply stack" for 2010-2012. (Note - these graphs aren't the stack for a particular RTO but combine generation from multiple RTOs and utilities for explanatory purposes. The x-axis is energy used in some unspecified time period, likely one hour so the x-axis can be read as simply MW.)

You should also browse through realtime information from electricity markets here: https://ircweb.worldsecuresystems.com/Grid/default.

A. For the supply stack in slides 36-38, what is the wholesale price in 2010 if demand is 200,000 MW? What is the price in 2011? What is the price in 2012?

B. Same question but now for demand of 325,000 MW.

C. How much coal generation (in MW of capacity) has retired in the 2 years between 2010 and 2012?

D. Look at real-time grid conditions for PJM. (Click on current grid conditions.) What is average electricity price (the mean "locational marginal price" or LMP) across the RTO's service area? The price will be given in $/MWh; divide by 10 to get the price in cents/kWh. How does this compare to a normal wholesale price? State the time you viewed the website.

E. What is the LMP for Chicago in particular? You need to scroll down to view a map. Local LMPs will be different if there is congestion on transmission lines. The prices are used to encourage or discourage generation in different locations.

F. One of the graphs shows PJMs forecast of demand (their prediction of how much power would be needed) overlaid with the actual power that was generated. (The graph starts from midnight so don't look at this at midnight.) Estimate: how accurate was the forecast?

G. Look at the California ISO for contrast. How different is the CAISO price compared to that in PJM? Comment if you see any interesting variations in price with location within CAISO.

H. ***(Optional).*** At the time you are looking, what fraction of CAISO's utility-provided electricity is renewables? Compare to the fraction in PJM.

I. ***(Optional).*** Click around on the PJM or CAISO sites, take a screenshot of something interesting, and discuss. Extra points for more items.