

**CPET 581 Smart Grid & Energy Management
Homework 3**

Assigned Date: September 13, 2013, Due Thursday, Sept. 27, 2013, before 5 PM.

Hand-in requirement and Due Date:

- Pre-homework 3 study:
 - Lecture note 6 (9/13)
 - Submit your **hw3.docs** file as email attachment to Prof. Lin lin@ipfw.edu
1. Define the following terms: electric power grid, installed capacity, capacity factor, summer reliability, peak demand
 2. Briefly describe U.S. Independent System Operators (ISO) & Regional System Operators.
 3. Briefly describe the U.S. three power grid “interconnection.”
 4. Answer the following questions for the ISO related questions, and showed all the links to the web references:
 - a. Which ISO covers states of Indiana, Michigan, and Ohio?
 - b. Who are the members of MISO?
 - c. What are the “scope of operations” of MISO?
 - d. Based on the NY ISO’s statement on the Cost of Wholesale Electricity as cited the Lecture note 6 “5. Cost of Wholesale and Retail Electricity.” Find the similar statement or information about the cost of electricity for the MISO.
 - e. Explain what is the MISO’s “Security-constrained economic dispatch of generation”? and its “market.”
 5. View the Webinar and answer the posted questions NREL webinar on the Renewable Energy Integration Challenges: How States are Managing Rapid Growth of Renewable Energy, 2013/4/28 (<http://www.nrel.gov/electricity/transmission/webinars.html>): “Mitigation Options,” 1st speaker Lori Bird, and “Lessons Learned in Wind Integration in ERCOT,” 2nd speaker, Dan Woodfin; and
 - (A) Answer the following questions posted by Lori Bird:
 - a. What challenges do higher penetrations of wind and solar pose for grids?
 - b. How much wind/solar can be integrated?
 - c. What solutions are available to address variable nature of wind, solar?
 - d. What are the costs of integration?
 - e. What can policymakers do?
 - (B) Answer the following questions/terms found in Dan Woodfin’s presentation:
 - a. Give an overview ECORT’s Competitive Renewable Energy Zones (CREZ)? (Ref: Public Utility Commission of Texas, CREZ Transmission Program Information Center, <http://www.texascrezprojects.com/overview.aspx>)
 - b. What are the operation challenges to wind integration of ECORT?
 - c. What are the “Ancillary Services requirements ” cited in Dan’s presentation? (also see the Glossary, **Ancillary services**: Services that ensure reliability and support the transmission of electricity from generation sites to customer loads. Such services may include load regulation, spinning reserve, non-spinning reserve, replacement reserve, and voltage support. <http://www.eia.gov/tools/glossary/?id=electricity>)
 6. Find the answer for the following questions about Wind forecast and Wind power energy in Indiana.
 - a. Find wind power farms (turbines) in the state of Indiana and its electricity generation statistics such as “Installed name plate capacity in MW,” “Averaged Indiana Wind Generation (GWh = 1000 x MWh) in 2012,” (Ref. Wind power in In Indiana: http://en.wikipedia.org/wiki/Wind_power_in_Indiana

b. Find wind and wind forecast information for those large wind farms in the state of Indiana.