

## Smart Power Grids

**Project: due 10pm November 30, 2017**

Project Assignment: You are a regulated electric utility in the state of North Carolina.

### 1. Project Outline

You will participate on a project team of 2-4 students. Your team must prepare a filing to the Utilities Commission requesting approval of:

a. Integrated Resource Plan (1/3 of your grade)

Include a listing of your generation plants and T&D system, as well as any DSM programs your utility chooses to deploy to meet your customer's energy and peak demand needs. Show with calculations that your resources are adequate to supply and transmit the needed power to your customers, and list the acquisition costs of your assets and the expenses of your DSM programs. This section will be graded on the accuracy and reasonableness of your IRP (Did you have enough resources? Too many? Did you satisfy reserve margin requirement and peak load needs? Etc.)

b. Financial Report for 2012 (1/3 of your grade)

This must include: a

- capital needs, types (debt, equity) and costs
- balance sheet for end of 2012
- income statement for 12 months (2012)
- calculation of your revenue requirement for 2013

This section will be graded on the clarity and accuracy of your financial documents.

Add notes if required to explain your reports (interest and depreciation calculations, for example).

c. Regulatory Memo (1/3 of your grade)

A 1-2 page request to the utility commission explaining your revenue requirement, rate of return and your request for rates for your residential, commercial and industrial customers. This section will be graded on your demonstration of good ratemaking principles. (E.g., did you use a least cost resource plan? If not, why? Did you raise capital with reasonable costs and risks? Etc.)

### 2. Data and Assumptions

#### A. Generation

Your utility must begin operations on day 1 with enough capacity to serve all customer energy and demand needs, allowing for a 15% reserve margin. Your choices for generation include:

- i. Nuclear  
Nameplate capacity: 1,000 MW  
Capacity factor: 95%  
Operational life: 60 years
  
- ii. Coal  
Nameplate capacity: 630 MW  
Capacity factor: 92%  
Operational life: 40 years

- iii. Solar PV  
Nameplate capacity: 14-20 MW  
Capacity factor: 20%  
Operational life: 25 years
- iv. Natural Gas Combined Cycle  
Nameplate capacity: 680 MW  
Capacity factor: 90%  
Operational life: 30 years
- v. Hydroelectric  
Nameplate Capacity: 100 MW  
Capacity factor: 98%  
Operational life: 80 years

Capital costs and O&M costs (operating costs) for your generation should be obtained from:  
<http://nuclearfissionary.com/2010/04/02/comparing-energy-costs-of-nuclear-coal-gas-wind-and-solar/>

**B. Transmission and Distribution**

Your utility needs 5 transmission substations, 5 distribution substations, 2000 miles of distribution lines and 800 miles of transmission lines.

Costs

Substation: \$10M, useful life: 30 years  
 T&D lines: \$3.384M/mi

O&M costs: \$564,000/mile/year in all regions

**C. Revenue**

To calculate energy use and revenue for your customers, use information from the US Energy Information Agency (<http://205.254.135.24/>) or other web sources (with citations).

	Count
Residential	2,400,000
Commercial	300,000
Industrial	30,000

**D. Other Expenses**

Your utility expenses include IT costs, HR and legal expenses, accounting, finance, customer service, purchasing and supply chain, etc. The costs for these functions and other operational costs are shown below:

- i. General O&M: 15.4% of revenues
- ii. Combined state and federal tax rate is 32.1%
- iii. You may purchase power to meet customer needs at \$.08/kWh
- iv. All assets generation use straight-line depreciation