

ECON 3313 - Test 2

Name: _____

ID#: _____

This take-home test is due *no later than 4:50 PM Tuesday December 11th*. You may also turn it in during my office hours or by appointment earlier than the deadline.

Please re-write the following phrase and sign your name in agreement before turning in this test.

I have neither given nor received help in answering the questions on this test. The work presented here is my own.

Signature: _____ Date: _____

1) Complete the attached multiple choice questions. Each question is worth 1 point.

1)

2)

3)

4)

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10)

- 2) Read “Paying for waste: Without carbon pricing, subsidies to renewables can be counterproductive” to answer the questions that follows **(20 points)**:

<http://www.economist.com/blogs/freeexchange/2015/11/paying-waste>

- a. In 2 paragraphs, summarize and critique the authors’ article.
- b. Use diagrams of supply and demand to show what the authors mean when they write that “[a]s long as our energy mix is not totally free of pollution, we must reduce electricity consumption, which requires higher electricity prices.”

3) Electricity Economics **(25 Points)**

- a. Describe the bidding process by which the electricity generation sector provides electricity to pooling and balancing authorities. Additionally, show this process by building an electricity supply curve.
- b. What antitrust and regulation concerns are present at the wholesale stage of the electricity market?
- c. Describe a market design that reduces market manipulation in wholesale electricity markets. Show that the Nash equilibrium under this market design will result in generators bidding their true marginal cost of production.
- d. Describe a vertically integrated industry as it pertains to the electricity sector.
- e. Describe non-linear (two part) pricing as it pertains to retail electricity sales. What is the purpose of this pricing system?

4) Energy Finance, Oil & Gas Economics **(25 points)**

- a. Compare and contrast the three energy derivatives discussed in class (Futures, Options, and Swaps). In your response be sure to make note of any connections between the three derivatives.
- b. Assume that an oil producer must guarantee a price of \$52/Bbl. to break even. Further, assume that a future contract is executed to provide 11,000 Bbl. at \$53/Bbl.
 - i. If the settlement (spot) price is \$60/Bbl. at the future date how much did the producer hedge/lose?
 - ii. If the settlement (spot) price is \$40/Bbl. at the future date how much did the producer hedge/lose?
- c. Suppose that OPEC countries have previously limited their oil outputs to match the amount that would be seen in a monopoly market, and that these countries can be adequately modeled as an Oligopoly market in which firms compete by choosing production levels (Cournot competition).
 - i. Describe why an OPEC cartel may not be able to sustain the collusive (monopoly) output amount.
 - ii. Evaluate how the current oil price has been effected by these strategic interactions, and assess how the advent of hydraulic fracturing in the United States has impacted the oil price and the strategic response by OPEC.
 - iii. Discuss your view on the feasibility that OPEC can sustain the recently announced 1.2 million barrel per day output cut.

5) Wind Energy, Excel (20 points)

You are deciding on the financial viability of a potential wind project that will provide a stream of revenues for the next 20 years. The upfront cost per megawatt is \$975,000, the total capacity of the wind farm is 180 MW, and the net capacity factor is 46.5%. You may assume that the rate of return on the next best investment alternative is 8%, that all energy sales are taxed at 10%, and that there are no marginal costs for wind energy.

- a. What is the minimum power purchase agreement (PPA) you should agree on? Print out your Excel workbook in addition to your answer.
- b. What is the Net Present Value of the project if a PPA price of \$37/MWh is established? What is the internal rate of return at \$37/MWh? Print out your Excel workbook in addition to your answer.
- c. Now, assume you are an executive in charge of power purchasing decisions for OG&E. Describe how each of the following scenarios would influence your decision to purchase power from the previously described wind farm at \$37/MWh
 - i. A new state-level statute requires that a minimum amount of renewable energy is purchased by all retail electricity providers (a renewable portfolio standard), but you are currently exceeding that amount by 2%.
 - ii. Natural gas prices are historically low, but future gas prices are difficult to forecast. Provide a forecast of natural gas prices based on a change in supply and/or demand you expect to see in the next 10-20 years and discuss how this impacts your decision to purchase power from this wind farm.
 - iii. The Federal government has passed new legislation that provides a tax credit to renewable energy producers.