

ECON 3313 - Test 2

Name: _____

ID#: _____

This take-home test is due *no later than 4:00 PM Friday December 17th*.

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)

5)

6)

7)

8)

9)

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 \$62/Bbl. to break even. Further, assume that a future contract is executed to provide 11,000 Bbl. at \$64/Bbl.
 - i. If the settlement (spot) price is \$70/Bbl. at the future date how much did the producer hedge/lose?
 - ii. If the settlement (spot) price is \$58/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. Discuss your view on the feasibility that OPEC can sustain the recently announced output cut.
- d. **Bonus Question (3 points)** This screenshot was taken on April 20th, 2020.



- i. Suppose you can rent a storage facility that can hold up to 100 barrels of oil. At what monthly rental price would it be profitable to buy a May contract and sell at the June contract?

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 \$1,460,000, 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, \$/MWh) 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 have been low for the past 5-10 years, but recently prices have nearly doubled and 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.