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| Regulation & Antitrust Policy (Econ 180) | Signature: |  |
| Drake University, Spring 2011William M. Boal | Printed name: |  |

**QUIZ #11 VERSION A**

**"Regulation of Electric Power"**

INSTRUCTIONS: This exam is closed-book, closed-notes. Simple calculators are permitted, but graphing calculators or calculators with alphabetical keyboards are NOT permitted. Mobile phones or other wireless devices are NOT permitted. Points will be subtracted for illegible writing or incorrect rounding. Point values for each question are noted in brackets.

**I. Multiple choice:**  Circle the one best answer to each question. [2 pts each: 18 pts total]

(1) Wholesale markets for electricity are regulated by

1. local governments.
2. state utility commissions.
3. the Federal Trade Commission.
4. the Federal Energy Regulatory Commission.

(2) To sell electricity in wholesale markets, an electricity producer must

1. have retail customers.
2. be owned by a local government.
3. be regulated by a state commission.
4. all of the above.
5. none of the above.

(3) Assume that in some wholesale electricity market, all producers get paid the same equilibrium price, and that no firm has the ability to manipulate the final price. Then each firm's optimal bid is

1. greater than its true marginal cost.
2. less than its true marginal cost.
3. equal to its true marginal cost.
4. zero.

(4) In wholesale electricity markets that use “pay as bid” pricing, each supplier's optimal bid is usually

1. less than its true marginal cost.
2. equal to its true marginal cost.
3. greater than its true marginal cost.
4. zero.

(5) If there *is* transmission congestion in a large regional wholesale electricity market, then suppliers at different locations

1. receive prices that depend on local supply.
2. receive prices that depend on local demand.
3. both (a) and (b).
4. receive the same price everywhere.

(6) Spot prices for wholesale electricity are volatile during peak periods because wholesale

1. demand and supply are both price-elastic.
2. demand is price-elastic but supply is inelastic.
3. supply is price-elastic but demand is inelastic.
4. demand and supply are both price-inelastic.

(7) In wholesale electricity markets, producers

1. are less likely to have market power during peak periods.
2. are less likely to have market power during off-peak periods.
3. are equally likely to have market power during all periods.
4. can never have market power.

(8) One lesson from the California electricity crisis of 2000-2001 is that if retail electricity prices are fixed but wholesale prices fluctuate,

1. utilities are forced to bear too much price risk.
2. retail customers are forced to bear too much price risk.
3. generators may malfunction, causing a blackout.
4. transmission lines may develop excess capacity.

(9) Which of the following changes would *not* reduce market power in wholesale electricity markets?

1. Implementing flexible pricing at the retail level.
2. Connecting more power producers to the system.
3. Requiring large producers to sell most of their power through long-term forward contracts.
4. Using “pay as bid” prices to compensate power producers.

**II. Problems:** Insert your answer to each question below in the box provided. Use margins and graphs for scratch work⎯only the answers in the boxes will be graded. Work carefully⎯partial credit is not normally given for questions in this section.

(1) [Peak-load pricing: 40 pts] Suppose cost and demand for electricity are given by the following graph. Costs are shown as short-run marginal cost (SRMC) and long-run marginal cost (LRMC) curves. LRMC includes the cost of building new capacity. Demands are shown as peak demand and off-peak demand. Assume for simplicity that peak and off-peak periods are the only periods, and they are of equal duration.

a. Explain in words why SRMC bends up vertically at 70 thousand kilowatt hours.

First, suppose efficient peak-load pricing is used.

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| b. Find the price of electricity during the peak period. | $ per kWh |
| c. Find the quantity of electricity demanded during the peak period. | thousand kWh |
| d. Find the price of electricity during the off-peak period | $ per kWh |
| e. Find the quantity of electricity demanded during the off-peak period. | thousand kWh |

Now suppose instead a uniform price of **$ 0.12** per kilowatt-hour is used in both peak and off-peak periods.

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| f. Find the quantity of electricity demanded during the peak period. | thousand kWh |
| g. Find the quantity of electricity demanded during the off-peak period. | thousand kWh |
| h. Would generation capacity have to *increase, decrease*, or *stay the same* to accommodate uniform pricing? |  |
| i. By how much? | thousand kWh |
| j. Compute the social deadweight loss from uniform pricing. | $ thousand |

(2) [Wholesale power markets, economic dispatch: 20 pts] Suppose you manage the Regional Transmission Organization (RTO) for a power grid and you have received the following four "asks" from power suppliers (“generators”) for the hour ending 3 PM:

* Generator A: 30 megawatt-hours at $30 per megawatt-hour.
* Generator B: 10 megawatt-hours at $70 per megawatt-hour.
* Generator C: 40 megawatt-hours at $60 per megawatt-hour.
* Generator D: 50 megawatt-hours at $20 per megawatt-hour.

and the following three "bids" from power demanders (“loads”) for the same hour:

* Load #1: 60 megawatt-hours at $80 per megawatt-hour.
* Load #2: 10 megawatt-hours at $70 per megawatt-hour.
* Load #3: 40 megawatt-hours at $90 per megawatt-hour.



a. [4 pts] Plot demand and supply curves for these asks and bids.

b. [8 pts] Given these asks and bids, what amount of power will you order each generator to supply?

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| Generator A | megawatt-hours |
| Generator B | megawatt-hours |
| Generator C | megawatt-hours |
| Generator D | megawatt-hours |

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| c. [4 pts] What price for electric power will you set for this hour? | $ per megawatt-hour |
| d. [4 pts] Suppose an unexpected event (increased demand or failure of a generator) requires you to find another megawatt-hour of power. Which generator will you call on to deliver that extra power? |  |

(3) [Sources of market power: 16 pts—2 pts each box] According to the model of "dominant-firm price leadership," the dominant firm's residual elasticity of demand is given by the formula

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where εDF denotes the residual elasticity of demand faced by the dominant firm, εM denotes the total market elasticity of demand, sDF denotes the market share of the dominant firm, and βCF denotes the elasticity of supply of the "competitive fringe" of other suppliers.

Consider the application of this formula to the market for wholesale electric power, where the "dominant firm" is an individual power generator (possibly small), and the "competitive fringe" consists of all other power generators in the same market.

First, suppose the individual power generator's market share = sDF = 0.1, the market elasticity of demand = |εM| = 0.1, and the elasticity of supply of all other power generators = βCF = 0.3.

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| a. Compute the absolute value of the individual power generator's elasticity of demand (|εDF|). |  |
| b. Compute the individual power generator's price-cost margin (or Lerner index). |  |

Second, consider the effect of the following changes.

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|  | Does the absolute value of the individual power generator's elasticity of demand (|εDF|) *increase, decrease,*orremain *constant?* | Does the individual power generator's price-cost margin (or Lerner index) *increase, decrease,*orremain *constant?* |
| c. Market demand for wholesale electric power becomes **less** elastic. |  |  |
| d. The individual power generator's market share **increases**. |  |  |
| e. The supply of all other power generators becomes **more** elastic. |  |  |

**III. Challenge question:** Write a one-paragraph essay answering the following question. [6 pts]

Classrooms at Drake University are used both for regular-term courses and summer-term courses. These classrooms are almost constantly in use during the regular term but are mostly empty during the summer term.

a. Are Drake classrooms a *joint cost* or a *common cost* [[1]](#endnote-1) for regular-term courses and summer-term courses? Why? Justify your answer and illustrate it with a production-possibility curve.

b. Assume that Drake wants to set tuition so as to price courses at marginal cost. Should the cost of classrooms be included in regular-term tuition only, in summer-term tuition only, or both? Why?

Summer-term courses

Regular-term courses

[end of quiz]

1. Use Kahn's definitions of *common cost* and *joint costs*. Alfred E. Kahn, *The Economics of Regulation: Principles and Institutions*, Volume 1, New York: Wiley, 1970, pp.78-79. [↑](#endnote-ref-1)