Exercise 3 (TEAM, 30 Points Total) **Leigh Tesfatsion**
DATE: Thursday, Feb 19, 5:30pm **EE/Econ 458, Spring 2009**

EXERCISE 3

NOTE: Please answer **ALL FOUR QUESTIONS** on this team exercise. General instructions for this exercise are as follows:

- Team assignments are attached at the end of this exercise assignment.
- Please turn in only **ONE** answer packet per team.
- Be sure to show all your work so that partial credit can be given for answers even if some type of error occurs along the way.
- Read each question and question part carefully before you begin your answer.
- Define terms and concepts clearly and carefully.
- Carefully label all graphs. This includes labels for axis variables as well as labels that carefully identify what is being graphed.
- Be sure to make an extra copy of your answer packet for use in class discussion on the due date. Team members will be called upon to report their findings.
- **Recall that late assignments cannot be accepted – no exceptions! Make sure your exercise is turned in to the instructor or TA at the *beginning* of class on the due date. Do not send your exercise in via email or place it in a department mailbox as these sites might not be checked in time.**

Important Note on Terminology:

In the K/S problems 2.3 and 2.4 referred to below, the market buyers are consumers and the market sellers are producers. Consequently, total net buyer surplus (TNBS) is what K/S call "consumers' net surplus," total net seller surplus (TNSS) is what K/S call "producers' profit" (with sale reservation prices interpreted as marginal costs of production), and total net seller-buyer surplus (TNSBS) is what K/S call "global welfare." Recall that the terms TNBS, TNSS, and TNSBS are carefully defined in the required *Market Basics* lecture materials from Section II.A of the EE/Econ 458 course syllabus.

QUESTION 1: (4 Points Total, 1/2 Point Each Part)

Carry out Problem 2.2 (all eight parts a. through h.) on page 45 of the Kirschen/Strbac (K/S) textbook, as follows.

Final answers to each part of Problem 2.2 are provided in the K/S Appendix (p. 265). **Your** team's task is to carefully derive each of these provided answers to establish its correctness (or to carefully show why you believe a provided answer is not correct if that is what you conclude).

QUESTION 2: (2 Points Total, 1 Point Each Part)

Carry out Problem 2.3 (both parts a. and b.) on page 45 of the K/S textbook, as follows.

Final answers to each part of Problem 2.3 are provided in the K/S Appendix (pp. 265-6). **Your** team's task is to carefully derive each of these provided answers to establish its correctness (or to carefully show why you believe a provided answer is not correct if that is what you conclude).

QUESTION 3: (3 Points Total, 1 Point Each Part)

Carry out Problem 2.4 (all three parts a., b., and c.) on pages 45-6 of the Kirschen/Strbac textbook, as follows.

Final answers to each part of Problem 2.4 are provided in the K/S Appendix (p. 266). **Your** team's task is to carefully derive each of these provided answers to establish its correctness (or to carefully show why you believe a provided answer is not correct if that is what you conclude).

QUESTION 4: (21 Points Total)

Part (a): (1 Point) What, currently, is the approximate break-down of *average fuel usage* (in percentage form) for the hourly wholesale generation of electric power (MW) in your assigned energy region during a typical "winter" day? Be sure to provide complete citations for all information sources used to answer this question.

> **Important Note:** If possible, try to find data for a typical *January* day for better cross-region comparisons when the various teams discuss their Ex 3 findings. The next-best choice would be a typical February day or a typical December day. In any case, however, try to restrict your data to the "winter" months December, January, and/or February.

Part (b): (1 Point) Using your findings from Q4(a), what is the approximate current *fuel cost* (\$/MBtu) for each of the major types of fuels currently used for wholesale electric power generation in your assigned energy region during a typical "winter" day? Be sure to provide complete citations for all information sources used to answer this question.

Part (c): (2 Points) What, currently, is the approximate *heat rate* (Mbtu/MWh) for each of the fuels you identified in Q4(a) as major fuels for the wholesale generation of electric power in your assigned energy region? Be sure to provide complete citations for all information sources used to answer this question.

Part (d): (1 Point) What, currently, is the approximate hourly wholesale electric power generation (MW) during a typical "winter" day in your assigned energy region? Be sure to provide complete citations for all information sources used to answer this question.

Part (e): (6 Points) Using your answers for Q4(a) through Q4(d), carefully construct and graphically depict an approximate *short-run total variable cost (SRTVC) function* (\$/h) and *short-run marginal cost (SRMC) function* (\$/MWh) for hourly wholesale electric power generation in your assigned energy region during a typical "winter" day, assuming variable costs are entirely determined by fuel costs. Show your work.

Part (f): (4 Points) What other factors might significantly affect SRTVC and SRMC for hourly wholesale electric power generation in your assigned energy region during a typical "winter" day? Justify your assertions carefully, and be sure to provide complete citations for all information used to answer this question.

Part (g): (6 Points) Explain as carefully as you can how the additional factors you identified in Q4(f) might significantly affect the form of the approximate SRTVC and SRMC functions for hourly wholesale electric power generation that you derived in Part (e) for a typical "winter" day in your assigned energy region based only on fuel costs. Use graphical depictions to illustrate these possible significant effects.

Ex 3 Team Assignments by Energy Region **L. Tesfatsion**
EE/Econ 458, Spring 2009

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