

Homework 10 (Individual, 12 Points Total)

Leigh Tesfatsion

DUE DATE: Wednesday, December 7, 2011, 11:00am EE/Econ 458, Fall 2011

Financial Risk Management in Electric Power Markets

References for Homework 10: EE/Econ 458 Syllabus Section VI

[1] ** Required materials for Syllabus Section VI.A: Markets, Contracts, and Risk-Hedging Contracts, www.econ.iastate.edu/classes/econ458/tesfatsion/Syl458Team.htm#Contracts

[2] ** Required materials for Syllabus Section VI.B: Financial Risk Management - Basic Concepts, www.econ.iastate.edu/classes/econ458/tesfatsion/Syl458Team.htm#FTR

General Exercise Instructions:

- (a) This exercise consists of TWO QUESTIONS.
- (b) 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.
- (c) Read each question part carefully before you begin your answer.
- (d) Define terms and concepts clearly and carefully.
- (e) Carefully label all graphs. This includes labels for axis variables as well as labels that carefully identify what is being graphed.
- (f) Please make an extra copy of your answer packet for use in class discussion on the due date. Individuals will be called upon to report their findings.
- (i) **Recall that late assignments will not be accepted – no exceptions!**

QUESTION 1: (6 Points Total, 2 Points Each Part).

Suppose the rules of an electricity market stipulate that all participants must trade energy exclusively through an ISO-managed wholesale spot market with congestion managed by locational marginal prices (LMP). GenCo G and LSE L are two participants in this wholesale spot market. Both GenCo G and LSE L are located at the same bus k . GenCo G and LSE L have signed a contract for difference (CFD) for the sale by GenCo G of 100MW to LSE L during a particular hour H at a strike price of 50 \$/MWh.

Part A (2 Points): Explain carefully, in words, what is meant by a *contract for difference*.

Part B (2 Points): Determine the *flow of electric power* and the *flow of money* between GenCo G and LSE L in hour H if the LMP at bus k for hour H is 60 \$/MWh.

Part C (2 Points): Determine the *flow of electric power* and the *flow of money* between GenCo G and LSE L in hour H if the LMP at bus k for hour H is 40 \$/MWh.

QUESTION 2 (6 Points Total, 3 Points for Each Case)

Answer Problem 6.15 on page 204 of the Kirschen/Strbac (K/S) textbook as restated below in expanded form.

Consider the three-bus system shown in Figure P6.5 of K/S. Let the consumer (load) located at Bus 1 in Figure P6.5 be denoted by LSE 1. Note that Generator D in Figure P6.5 is located at Bus 3.

Suppose that Generator D and LSE 1 have entered into a contract for difference (CFD) for the delivery of 100 MW at a strike price of 11 \$/MWh with reference to the nodal price at Bus 1. Show for each of the following two cases (i) and (ii) that Generator D can perfectly hedge its price risk by purchasing 100 MW of point-to-point financial transmission rights (FTR) between Bus 3 and Bus 1:

Case (i) [3 Points]: Generator D acquires the FTR for free;

Case (ii)[3 Points]: Generator D acquires the FTR for a price of r \$/MWh.

IMPORTANT NOTE: In preparing your answer to Question 2, you should make use of the answers provided by K/S on page 271 for the related Problems 6.5-6.8 on pages 202-203. In particular, you should use the fact that Generator D located at Bus 3 is dispatched at 400MW. Moreover, the (per unit) locational marginal price (LMP) that Generator D receives for this dispatch at Bus 3 is $LMP_3 = 10.00$ \$/MWh.