Financial Risk Management in Electric Power Markets

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


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 LMP₃ = 10.00 $/MWh.