

## Energy in a Globalising World: Economics, Politics and Policies

### Economics of Energy Assignment, April 2024

Open the Power Station model

Insert the following assumptions:

Capacity – 750MW

Load Factor/Utilisation – 80%

Construction time – 3 years

Project Life – 20 years

Efficiency – 51%

Gas Cost - \$5.5/mmbtu

Carbon Cost - \$75/t

Corporate Tax Rate – 25%

Electricity Price - \$82/MWh

Capacity Payment - zero

For the WACC calculation please assume (insert in WACC sheet):

Cost of Interest – 6.5%

Tax Rate – 25%

Equity Market Return – 10.6%

Risk Free Rate – 4.6%

Beta – 0.9

Balance of Debt to Equity – 65%/35%

Questions (Marks)

#### Part 1: Analysis of Power Station Model

1. What is the discount rate? (1)
2. What is the NPV? (1)
3. What is the IRR? (1)
4. What is the payback period? (1)
5. What is the breakeven electricity price? (2)
6. What is the breakeven gas price? (2)
7. What is the breakeven load factor? (2)
8. If the load factor falls to 10%, what is the breakeven electricity price? (2)

9. Return the load factor to 80%. If the gas price rises to \$7/mmbtu, what is the breakeven electricity price? (2)
10. Return the gas price to \$5.5. If the load factor falls to 20% what capacity payment would you negotiate for and why? (2)
11. Using a spider graph, explain the sensitivities of the model to the gas, electricity and carbon prices and to the load factor. Explain how you interpret the graph and why the sensitivities are important. (6)
12. Write a 3 paragraph report on the economics of this project. Explain the key assumptions, the economic results and the main sensitivities. Would you recommend that the company proceeds with this project and why? What should management be most concerned about and what are the key positive features of the investment? (8)

## **Part 2: Comparison with Shale Gas Model**

Now open the Shale Gas Model and look at the sheet entitled Model Output

- 13 Write a short review of the economic results of this model. What recommendation would you make to management and why? (4)
- 14 Look at the sheet called WACC. What do the assumptions tell us about the company (Company 2) involved? (2)
- 15 Change the WACC assumptions to those for the company investing in the CCGT model (Company 1). If you were CEO of Company 1, what would you bid to buy the shale field and why? (3)
- 16 Compare the Shale Model with the CCGT model.
  - a. Is there a gas price at which both models can work? (You can adjust the gas price in the shale model in cell i43, which is highlighted) (2)
  - b. Which investment do you prefer? Explain your thinking. (4)

## **Part 3: The Wind Farm model**

16. Look at the results of the model. What are your thoughts about this investment and how does it compare to the outcomes for the CCGT plant (n.b. – compare assumptions as well as results)? (5)
17. What are the major risks to the project economics in your opinion? If you were negotiating a minimum guaranteed price from the government what would it be and why? (5)
18. What would happen if a company with a higher Beta and interest rate was investing in the project? Give some thoughts on the impact of financing costs. (5)

## **Total Marks**

Part 1 - 30

Part 2 – 15

Part 3 – 15

Total - 60