# Examen Energietechnologie en-economie / Energy Technology and Economy Juni 2020

**Energy Economy**

Question 1: photo of regime shifting (monopoly → perfect competition → monopoly)

a. Why is the price after the price jump T1 below the price that would have been obtained if regime had been perfect competition all along?

b. Why is the price after the price jump T2 above the price that would have been obtained if the regime had been monopoly all along?

Question 2: Question about the influence of Corona on the oil industry. There was a decrease of 3,5% (not sure) of the economic activity. The demand of 2019 was 100 MMBD and due to the corona crisis, there is a decrease of 9,3% in demand for the next year. The price per barrel in 2019 is $57.

According to the estimations the price of oil is $20 in the next year.

a. Construct the demand curve before the start of the pandemic.

b. At the moment OPEC supplies 30 MMBD exogenous. If they want to keep the price on $50, how much supply will they need to cut?

c. Which regions are affected most in the oil market

d. How is the oil (or gas?) market influenced? Is this also dependent on region?

Question 3: photo load duration curve and cost curve of 3 technologies. We apply average costing in this question. For each technology, the firm builds one power plant. Assume the demand is inelastic.

Table: not sure about the numbers

| | Capital costs | Variable costs |
|---|---|---|
| Technology 1 | 2100 | 10 |
| Technology 2 | 3600 | 0,28 |
| Technology 3 | 5400 | 0,1 |

a. Find the optimal mix. For each technology:

i. What is the optimal capacity?

ii. How long will the technology work at full capacity?

b. Would your decision be different if we work with real time pricing instead of average pricing?

**Energy Technology**

Dutch exam
D'haeseleer
Question 1
Give the relation between the COP of a heat pump and the COP of a cooling machine.
Question 2
What is the relationship between the 'dampspanningscurve' and F(p,v,T)=0?
Question 3
What are the similarities between isotherms and isobars in the two phase area?

Delarue

1. a photovoltaic installation has a capacity of 5kW. The performance is shown in the graph (graph with total of 16kWh on a day). What is the load factor and ENOH?
   Answer: CF=16/(5*24)=13.33%, ENOH=1168h

2. There is nuclear energy (5000MW) with MC of 15 and no CO2, there is gas energy (6000MW) with 4euro/GJprim, 50% efficiency, 57kg/GJprim CO2. Draw the schedule (no CO2 cost).
   Answer: first 5000MW bar with 15 euro cost, then 6000MW bar with 28 euro cost

3. Imagine you would like to save 4% of CO2, how much capacity in PV installations from question 1 do you need?
   Answer: 5000MW*4%/CF=1500MW

4. How much money would you save if you had that capacity?
   Anwer: 50 million

Driesen
What losses do you have in a 1 phase transformer? Where is there heat generation?
Answer: ijzerverliezen en jouleverliezen, opwarming in kern en windingen?

**English exam**
Question 1: find entropies and enthalpies of rankine cycle with IE of turbine = 0.85 and IE of pump = 1.

Question 2: question on a freezer. The pump of the freezer has an efficiency of 100%.

a. Calculate the COP and draw the energy flow.
b. calculate the efficiency of the motor of classification IE1 when it has a rated efficiency of 4 kwh.
c. When the line voltage is 400V. What is the RMS value of the grid current
d. Calculate the apparent power and the reactive power

Question 3: The wavelength is 430 nanometer
a. What color is this?
b. Calculate the frequency and period

Question 4: Wind power: hub at 90 m. Speed at 10m is 6 m/s. Turbine in long grass at the ground. Density of air … . Efficiency of 54% The diameter is 50m.
a. calculate the active power
b. calculate the reactive power when power factor = 0,