

Energy Economics – Exam 13.06.2023

2h of time; Total of 10 points

1) (3 points)

a) What are proven reserves?

b) Two emitters A and B who want to abate emissions with respective total cost:

$$TC_A = 10E_A + 0.25(E_A)^2$$

$$TC_B = 7E_B + 0.35(E_B)^2$$

The goal for total emissions reduction is 450. The social cost of carbon per ton of CO₂ is 140€. What is the optimal abatement effort for both?

c) For a given gas market in a country, there is one monopolistic importer and a monopolistic producer. The cost of extraction of gas is 15€/m³, while the transport cost is 5€/m³.

Total demand in the gas market in given country is

$$q_D = 100(100 - p_D)$$

What is the price that end-consumers face?

Note by student: this question alludes to the concept of double marginalization and can be solved by using the Stackelberg model.

2) (3 points)

In France, a new policy will prohibit short-duration domestic flights which can be replaced with slightly longer but less polluting alternative means of transport. Evaluate this policy.

Note by student: since domestic flights are already covered by the ETS system, this new policy might not be cost-efficient etc.

3) (4 points)

In a EU gas market where gas is imported both via pipelines and LNG terminals, we have the following demands:

$$Q_L = 125(1 - p_L) \text{ for } 3760\text{h}$$

$$Q_H = 150(1.3 - p_H) \text{ for } 5000\text{h}$$

Extraction cost of gas is 0.25€/m³ and transport cost is 0.15€/m³ (for both pipeline and LNG imports). The total pipeline capacity is constant and fixed at 100million m³/h.

The annuity for a capacity of 1m³/h of gas per year is 1000€.

- Find prices for both periods and determine capacity.
- Russia supplies 40million m³ of gas via pipelines to the EU. Due to the war between Russia and Ukraine, the EU imposed a boycott on Russia. What are the short-term effects in terms of price?
- In the long run, the EU wants to reduce overall gas consumption and managed to bring about a new peak demand of

$$Q_H = 125(1.2 - p_H)$$

What will be the equilibrium price(s) and capacity in the long-run?

- Illustrate all above mentioned points along with the answers you provided graphically.