

Remember to give feedback in the Kaiku-system to get the final grade.

DEE-53106 Introduction to Renewable Energy Sources

Examination on 3.3.2017

1. Which of the following statements are true and which are not? Answer just true or false.
 - a) Natural gas has the largest known resources of primary energy in the world.
 - b) Wind and solar PV power together have been estimated to have over 20% of the total power production capacity by 2025.
 - c) Coal has the highest energy density (in TJ/kg) of all the energy sources.
 - d) Close to 20% of the global primary energy consumption is used to generate electrical energy.
 - e) Discoveries of new gas fields are of the same order of magnitude than the consumption of gas.
 - f) It takes the same time for the CO₂ content in the atmosphere to decrease back to the original level after emissions have stopped as it has taken to increase.

2.
 - a) Name the top five primary energy resources (technologies) by electric power production capacity installed globally during the year 2013 (and thereafter).
 - b) Name the top primary energy resources (and technologies) by electric net power production capacity additions globally during the year 2013 (thereafter). In net capacity additions, the decommissioned old power plant capacities have been subtracted from the new installed capacity.

3.
 - a) What will be the four leading power production technologies and primary energy sources of electrical energy in 2050 based on estimates and forecasts for the future? What are their typical conversion efficiencies from the primary energy to electrical energy?

4.
 - a) Derive the equation of available power for a wind mill turbine with diameter D as a function of wind velocity v . Start from the kinetic energy of air.
 - b) Draw current and power of a silicon solar cell as a function of voltage, when the open circuit voltage is 0.6 V and the short circuit current is 10 A.

5.
 - a) What energy conversion processes (principles) are used to convert the energy of fossil primary energy sources to electrical energy?
 - b) What sources of primary energy can be converted to electrical energy directly by using just one conversion process (principle)?