

## DEE-53106 Introduction to Renewable Energy Sources

Examination on 9.3.2015

1. Which of the following statements are true and which are not? Answer just true or false.
  - a) Welfare and standard of living are directly proportional to the consumption of electrical energy.
  - b) Natural resources of peat are the largest energy resources globally in the world.
  - c) It has been estimated by IEA that global investments to renewable energy power production capacity will be much higher than to fossil energy based power production capacity during the period from 2014 to 2035.
  - d) The fuel of fusion nuclear power plant has the highest energy density (in TJ/kg) of all the energy sources in operational power plants.
  - e) Germany has the highest cumulative wind power production capacity in the world.
  - f) Rotor diameters of the largest operational windmill turbines are more than 200 m.
  
2.
  - a) Name the top four primary energy resources (and technologies) of electric power production capacity installed globally in 2013 in order of magnitude.
  - b) Name the top four primary energy resources of net electric power production capacity added in the European Union (EU 27) in 2013. What are their shares of the added total net capacity?
  - c) The velocity of wind is  $v$  and the length of the windmill blade is  $l$ . Derive equations for the energy and power of wind facing a windmill turbine starting from the basic equation of kinetic energy.
  
3.
  - a) What is the most commonly used energy conversion principle (from one form of energy to other) in electricity production worldwide?
  - b) What energy conversion principle is the second common in use in electricity production worldwide?
  - c) What primary energy sources are converted to electrical energy using both of those conversion principles? Name at least eight primary energy sources.