
You can answer in English or in Finnish

1. Are the following statements true?

You have three options to be selected (Y=yes / N=no / DK = don't know). Right answer means one point (+1p) and the wrong answer one minus point (-1p). If you choose the option DK (= don't know), you will get zero point (0p).

- a) A microgrid can be determined as a segment of Smart Grid with intended island operation capability.
- b) European Union's 20-20-20 targets means that 60 % of energy consumption in EU comes from renewable resources.
- c) One essential feature of Smart Grids is that the power flows are controllable and multi-directional.
- d) In Nordic electricity market there is only one common electricity exchange for the wholesale market, but independent transmission system operators (TSOs) in each countries.
- f) In meshed (i.e ring) configuration relay protection practices are simple and power losses are higher than in radial configuration of power grid.
- g) In the traditional concept of power balance management customers' consumption has followed production, but in the concept of Smart Grids production follows consumption (i.e. frequency is controlled only by generators)

2. Define shortly the following terms or concepts (1.5 p/each)

- a) Day-ahead (spot) market
- b) Time-of-use pricing
- b) HEMS
- c) V2G

3. List

- a) the main benefits which can be achieved by "Demand Response" (3p)
- b) the drivers and barriers for electrification of road transportation (3p)

4. Describe briefly

- a) Reasons why power electronics is increasingly widely applied in distribution networks (3p)
- b) The reclose sequence of MV feeder protection relay for temporary and permanent faults (3p)