DEE-24136 Distributed Energy Resources in Electricity Networks
Exam 7.4.2016

Sami Repo

Use of own programmable calculator is allowed in this exam.
Answers in English and Finnish are accepted.

Answer only to <u>five</u> questions.

1. Demand response.
   a) Describe with your own words what demand response is.
   b) Provide examples of small-scale resources and applications of demand response.
   c) Explain also how demand response might be utilized in distribution network management.

2. Protection blinding of medium voltage feeder is a serious consequence of distributed generation.
   a) Describe in what kind of circumstances protection blinding is possible.
   b) Explain the reason behind the blinding effect.
   c) Describe also possible solutions for the problem.

3. Today distribution network planning is based on worst case planning principle.
   a) Explain what kind of planning cases are needed to analyse while a new distributed generation unit will be connected to medium voltage network.
   b) Describe the main differences between firm and non-firm connection capacity of distributed generation.
   c) How the analysis of non-firm connection capacity of distributed generation should be done?

4. Active voltage control of distributed generation may remarkably increase the hosting capacity of distribution network for distributed generation.
   a) Describe how distributed generation unit contribute to active voltage control.
   b) Explain the reasons why these contributions will increase the hosting capacity.
   c) Provide examples how the proposed active voltage control methods might be implemented in practice.

5. Forecasting of wind power has important role in the market operation of producer.
   a) Explain shortly the main idea of large-scale wind power forecasting.
   b) What consequences forecasting error has for the producer?
   c) What factors influence on wind power forecasting error? How the error might be reduced?

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6. Explain why and how the smoothing of wind power variation is realized. Explain also what kind of benefits smoothing has for power system operation.

7. Explain with your own words the meaning and the purpose of active network management. Concentrate on overall concept and principles of active network management without describing technical details of network management functionalities.