

A CELL CONTROLLER FOR AUTONOMOUS OPERATION OF A 60 KV DISTRIBUTION AREA

Per Lund^a, Sunil Cherian^b, Thomas Ackermann^c

^a Energinet.dk, TSO Denmark

Fjordvejen 1-11, 7000 Fredericia, Denmark

Phone +45 (0)7622 4423, Fax +45 (0)7624 5180, E-mail: plu@energinet.dk

^b Spirae Inc., 4405 Gray Fox Rd.

Fort Collins, CO 80526, USA

*^c Energynautics G.m.b.H., Mühlstrasse 51,
63225 Langen, Germany*

Keywords: distributed generation; grid integration; cell controller

ABSTRACT

The power systems of Denmark are characterised by a high penetration of distributed generation (DG) comprised of small to medium scale combined heat and power plants (CHP) and wind turbines (WTs). This is especially true in the western part of Denmark where 75% of all Danish WTs are situated. In 2004 local CHP made up 30% and WTs 23% of the electricity consumption of that area. Today, more than 50% of the total production capacity is dispersed throughout local distribution grids of 60 kV voltages and below. As a consequence, it has become more difficult to predict and to control the total electricity generation. The daily operation of a power system with massive infeed from uncontrolled CHP and WTs is not without problems as the CHP units operate on the basis of heat demand and time of day tariffs and WTs according to the wind, whereas the demand profile is determined by the consumers. So far, the strong interconnections to neighbouring areas and efficient international power markets have prevented malfunctions. However, the impacts on power markets, system operation and security of supply are causing concern. Hence Energinet.dk is developing new solutions for optimal management of the large DG base at hand. This paper shortly introduces the newly formed Energinet.dk, the power system of western Denmark and the need for a new system architecture. The concept of 60 kV distribution grid cells is introduced before concentrating on the Cell Controller Pilot Project that Energinet.dk is currently undertaking.