Mapping of Distributed Generation Pilot Installations: History - Examples - Conclusions

Closing seminar of the Technology Programme

Helsinki, October 22/23, 2007

Dr. Britta Buchholz
Sr. Project Manager Research Area “Smart Grids”, Corporate Technology and Innovation

MVV Energie
History of Pilot Installations
Annual reviews in 2004, 2005 and 2006

- Overview of 23 Pilot Installations in Germany, Spain, Greece, The Netherlands, Austria and other European countries

Observation: active distribution grids

- Tendency from a connect and forget philosophy towards an integration approach
- Virtual power plants with centralized dispatching versus market based approach with decentralized intelligence
- Microgrids
- Size of pilot installations grows
Overview of European Pilot Installations for Integrating Renewable Energy Sources and Distributed Generation into the Electricity Grid as of 2006

11 National Projects

- Energy Supply of Juehnde, Hofer, Austria
- Virtual Power Plant Unna, KonWerl, Werl
- Virtual Fuel Cell Power Plant, Muehlbach, Hollersbach
- EDISon, Bad Schoenborn
- Pellworm
- DINAR, Kassel
- Energiepark Clausthal
- Virtual power plant Rhineland-Palatinate
Classification of Pilot Installations

- General information
- Tasks and problems
- Technology combinations
- Social and political environment
Int. Renew. Energy Sources and Distributed Generation into the European Electricity Grid

Pilot installation: Settlement „Am Steinweg“ in Stutensee, Germany

| Duration        | DISPOWER: 01.01.2002 - 31.12.2005  
|                 | Long Term Test since 2006          |

| Pilot profile   | DG capacity el.  | 68.8 kWp                        |
|                 | DG Technology    | Photovoltaic, piston-CHP, battery, |
|                 | Classification   | Residential                      |
|                 | Project leader   | MVV Energie                      |

| Tasks           | Improved Energy Management for economic operation of DG components with PoMS |
|                 | Capability of zero electricity flow at transformer                            |
|                 | Follow-up: Long Term Test                                                      |

www.dispower.org
smartgrids@mvv.de
Long Term Testing Goals: Settlement „Am Steinweg“, Germany

- Grid operation for one year under normal conditions
- Robustness, stability of energy management
- Availability and maintenance requirements for CHP and PV
- Requirements for training of operational staff
- Cost-benefit analysis
Virtual islanding mode for settlement „Stutensee“

- Reduction of power flow over transformer for several hours to approximately zero
- Development of an algorithm based on measurement data available for the whole year 2003
- Results:
  -> Even in periods without PV generation up to 6 hours are possible (winter)
  -> In periods with high PV generation and medium load up to 14 hours are possible (spring)
- Restrictions:
  - Discharge of battery never below 30 % SOC
  - Discharge up to 100 kW, charge up to 30 kW
  - Operation of CHP between 6:00 am and 7:00 pm
Results: Settlement „Am Steinweg“, Germany

- There exists an intelligent energy management system which optimises the operation of different components in terms of variable criteria
- There exist variable mechanisms for the reliable prognosis of thermal and electrical loads and generators
- The energy management system optimises the energy flow over the transformer from the medium-voltage grid: it reduces the maximum load flow
- The communication system is reliable and allows for online-monitoring and remote-control
Pilot installation: Bay of Gaidouromandra, Kythnos Island, Greece

Duration
Since 2003

Pilot profile
- DG capacity el. 22 kWp
- DG Technology PV, battery, diesel-gen, extension to wind
- Classification rural, off-grid
- Grid Operator CRES

Tasks
- Microgrid operation
- Multi master control method for improvement of available peak power and system reliability
Long Term Testing: Goals for Bay of Gaidouromandra, Kythnos, Greece

- Energy Management runs since 2003
- Continuous improvement of power quality
- How can a sensitive islanded system be expanded with wind generators
- Expansion to other distributed generators
Pilot installation: Residential Area „Mannheim-Wallstadt“, Germany

Duration
- Started August 2006

Pilot profile
- DG capacity el.: 35 kWp
- DG Technology: PV, CHP, storage
- Classification: residential
- Grid Operator: MVV Energie

Tasks
- Customer integration
- Socio-Economic evaluation
- Microgrid development
Load shifting in Mannheim-Wallstadt based on price signals with 24 households

- **Average load and cumulative energy consumption for days with price signal 10am-1pm**
- **Average load and cumulative energy consumption for days without price signal**

**Graph Details:**
- **Power**
  - 0.8 kW
  - 0.5 kW
  - 0.2 kW
  - 0.0 kW
- **Energy**
  - 8 kWh
  - 0 kWh
  - 0 kWh

**Timeline:**
- 0.5 kW: 10 am - 1 pm
- 0.8 kW: 12 am - 12 am

**Notation:**
- **Shifted energy**
Demonstration Sites in the MoreMICROGRIDS project:

OESTKRAF

Continuon

Source: ARMINES
Ongoing projects in 2007 and outlook for 2008

- Additional pilots in the IRED cluster
- 7 new pilot sites in the project MoreMICROGRIDS
- Project CRISP (PowerMatcher)
- Project fenix -> presented on October 22
- Project GROW-DERS
- E-Energy: New “model regions” in Germany in 2008
Conclusions

- Importance of standards for ICT, e.g. for metering

- Increasing attention is paid to the storage issue to increase benefits from DG sources
  - Kythnos (CRES) – lead acid battery in real island grid
  - Italy (CESI-RICERCA) – several battery types in test grid
  - Netherlands (Continuon) – lead acid battery in holiday housing estate with PV
  - Germany (MVV Energie) – lead acid battery in real grid with DG

- Laboratory tests and pilot installations for smart grids must go hand in hand
  - Evaluate customers response
  - Lessons learned for further development
  - Interaction with complex processes in utilities
  - Preparation for market introduction
Thank you very much for your attention!

- Peer reviewed DER Journal: http://www.der-journal.org
- IRED research cluster: http://www.ired-cluster.org
- Information on projects in the IRED reference sheets
- Film „Smart Grids: Energy Management in Distribution Grids" :
  - http://english.mvv-energie-ag.de/  →  Company  →  Innovation
  - Direct link: http://english.mvv-energie-ag.de/text/gruppe/videos/dispower_engl.wmv
- Web address MVV Energie: http://english.mvv-energie-ag.de