# Pilots and case studies review

VTT TECHNICAL RESEARCH
CENTRE OF FINLAND

09/07/2008

IEA-DSM meeting

Corentin Evens

Business from technology

# Autonomous grids / microgrids

- Association of a low voltage **distribution network**, small local generation units, loads and storage units having some local coordinated functions*.
- Often planned to improve local grid reliability by providing local voltage control and/or by offering the possibility to work islanded from the main network.

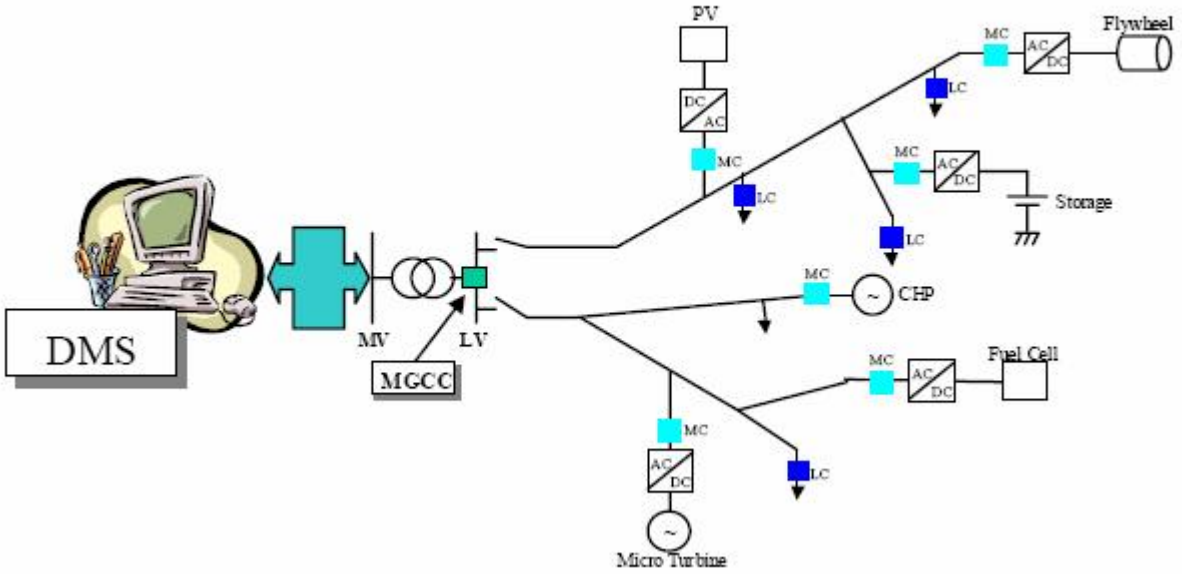
*: definition from the “Microgrid” project.

# Autonomous grids / microgrids

- Architecture:

DMS: Distribution Management System

- MGCC: MicroGrid System Central Controller
- MC: Local Microgenerator Controller
- LC: Load Controller

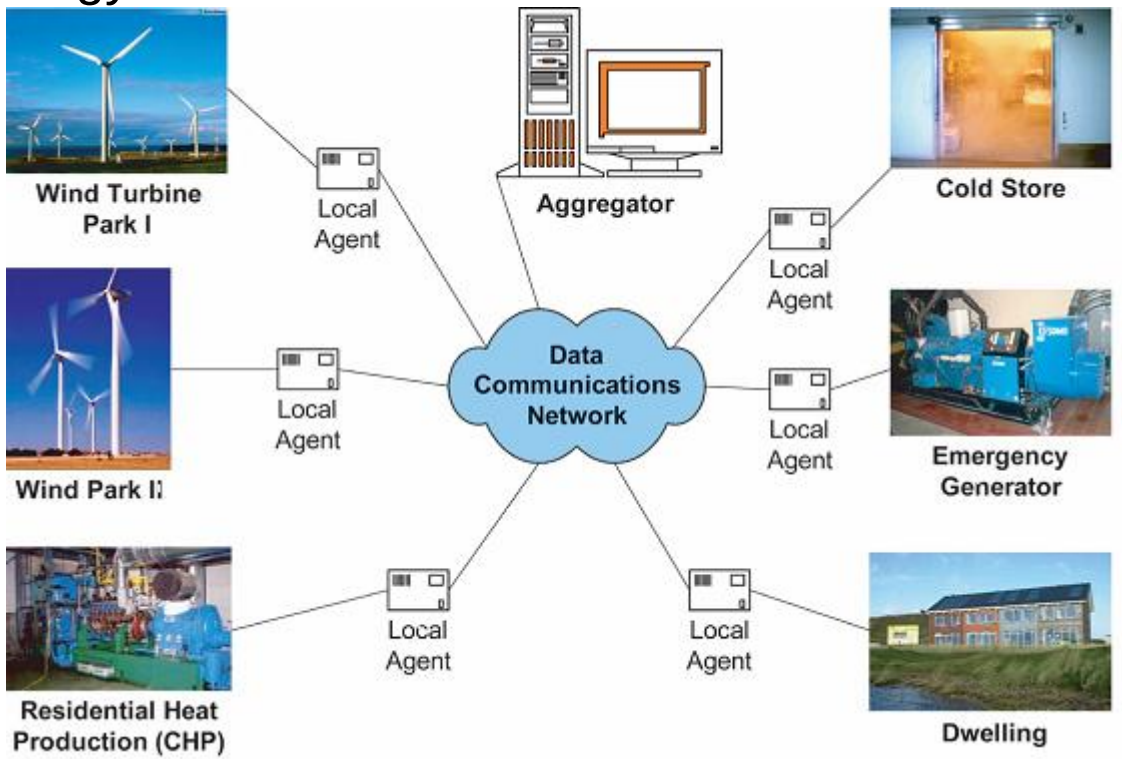


# Autonomous grids / microgrids

| Name | Country | Advancement | Islanded operation | Notes |
|---|---|---|---|---|
| Microgrids | Europe | Field test | Yes | |
| DINAR – Pool-BEMI | Germany | Research | No | |
| Qurrent | Netherlands | Research | ? | |
| Dispower | Germany / Spain | Field test | Yes | Battery storage |
| IRON | Austria | Research | No | |
| Microrred | Spain | Research | Yes | Battery storage |

# Commercial VPP

- A Virtual Power Plant (or VPP) aggregates dispersed DG, loads or storage units to act on energy markets.
- In this case, there is no or little interaction with the network.
- Most of the reviewed projects aggregate only DG units.



# Commercial VPP

| Name | Country | Advancement | Type of units | Goal |
|---|---|---|---|---|
| Electrotek | USA | Field test | Controllable DG | Act on the market |
| Real Energy | USA | Exists | Controllable DG | Optimise enterprise's DG operations |
| NRE | Korea | | All DG | Collect production data |
| Local energy resources | Finland | Research | Controllable DG | Aggregate small units |
| Multipower | Finland | Research | | Develop a DG testing environment |
| Cogeneration systems | Korea | | CHP | Use of local DG units to avoid peak prices |
| EU-Deep – Task force 3 | Europe | Demonstration | CHP | Increase of CHP flexibility through DR |
| Weiland proef | Netherlands | Demonstration | µCHP | Observe the electrical behaviour of an aggregated set of µCHP |
| Clustered operation of µCHP cluster | Netherlands | Field test | µCHP | Use of dispersed local µCHP to offer power flexibility |
| Use of fuel cells | Korea | Field test | Fuel cells | Assessment of fuel cells operation |
| Crisp | Netherlands | Field test | All distributed resources | Aggregate different types of units. |
| Fenix VPP | Netherlands / Spain | Field test | All distributed resources | VPP operation |

# DG balancing

- Particular case of the VPP.
- Aims primarily at reducing the imbalances due to variable and difficultly predictable DG units (wind and solar).

| Name | Country | Advancement | Balanced DG | DR |
|---|---|---|---|---|
| Night wind | Netherlands | Demonstration | Wind | Cold storage |
| Smart-A | Germany | Demonstration | Renewable & cogen | Domestic load shifting |
| EEG – Integration of wind energy | Austria | Research | Wind | All |
| Green VPP | Austria | Research | Renewable | All |
| VPP and DSM | Austria | Research | Wind | Heating, cooling, washing, drying and dish washing |
| EU-Deep – TF 1 | Europe | Demonstration | Wind | All and local generators |
| Solar cities | Australia | Field tests | PV | Energy efficiency |
| Acciona solar building | Spain | Exists | PV | Energy efficiency in one building |
| Antondegi / Sarriguren | Spain | Exists | Solar, Wind, biomass | Energy efficiency |

# Small point

- Technology
  - Metering and communication technologies exist, but their cost remains high when applied to a lot of small DER units.
  - Control algorithms are being developed and optimized.
- Regulations
  - Possible aggregation of production and consumption
  - Unbundling of DSO and retailers for microgrids
- Socio-economic
  - DR potential for small consumers not well known.

# Traditional DR or DSM

| | | |
|---|---|---|
| ToU | All participating countries | Earnings and consumption must be sufficient to justify the meter's costs |
| Real-time pricing | Finland, Spain, Netherlands, USA | For large consumers.<br>Finland: smaller consumers, must have a hourly meter. |
| Direct load control | Austria, Finland, USA | Does not include emergency load control, which exists in all the participating countries |
| Retail markets | Austria, Finland, USA | |
| Regulating markets | Finland, Netherlands, USA | Load must be large enough or part of an aggregated set of units |
| Ancillary services | Finland, Spain, Netherlands, USA | Only for large/industrial consumers |

# Delay network investments

- Choice made by some DSO to promote energy efficiency or direct load control in order to delay network investments.

- Finland: direct control of electric heating at peak hours.
- Australia (Castle Hill): energy efficiency.

- Ireland (winter peak): energy efficiency to increase security of supply.