Distribution Control Center

Control and Management to Mitigate the Impact of Distributed Resources

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Presentation Content

- Demo location
- Actors in the demo
- Demo system architecture
- Demonstration scope
- Lessons learned
- Benefits for TSO and DSO
- Conclusion

The selected network

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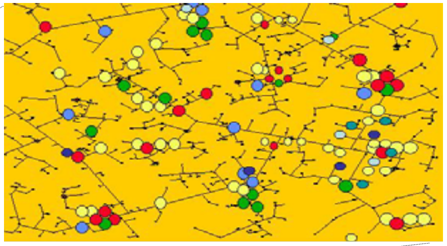

Alava Network

- **Area around 3.000 km^2**
- **169.001 Low Voltage Customers**
  - **70% Urban**
  - **12% Suburban**
  - **17% Rural**
- **1.234 MVA = Total Capacity**
  - **687 MVA Installed capacity**
  - **547 MVA Contracted capacity**
- **1.907 Km of lines**
  - **80% aerial**
  - **20% underground**

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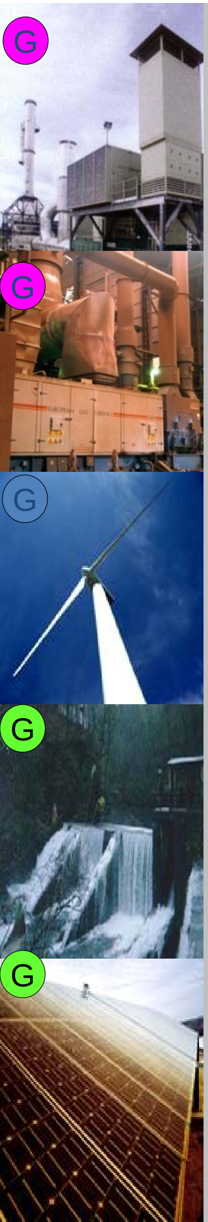
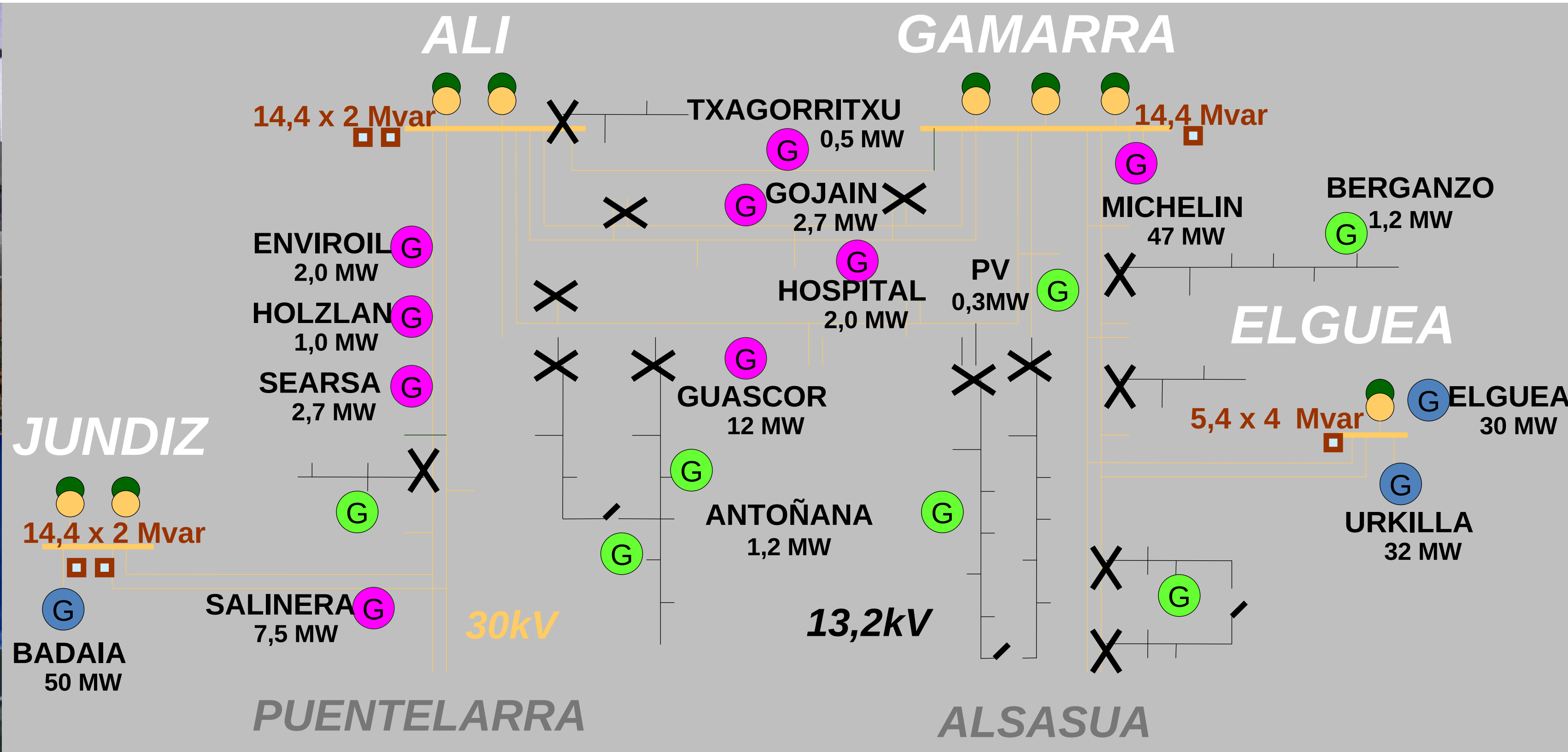
Alava DSO – 30/13,2kV simplified network





Transformer 220/30 kV - TSO-DSO Boundary

Capacitors MVAR

DER (CHP) MW

DER (Wind farms) MW

Small Hydro and renewable units MW

Transformation 30/13,2 kV

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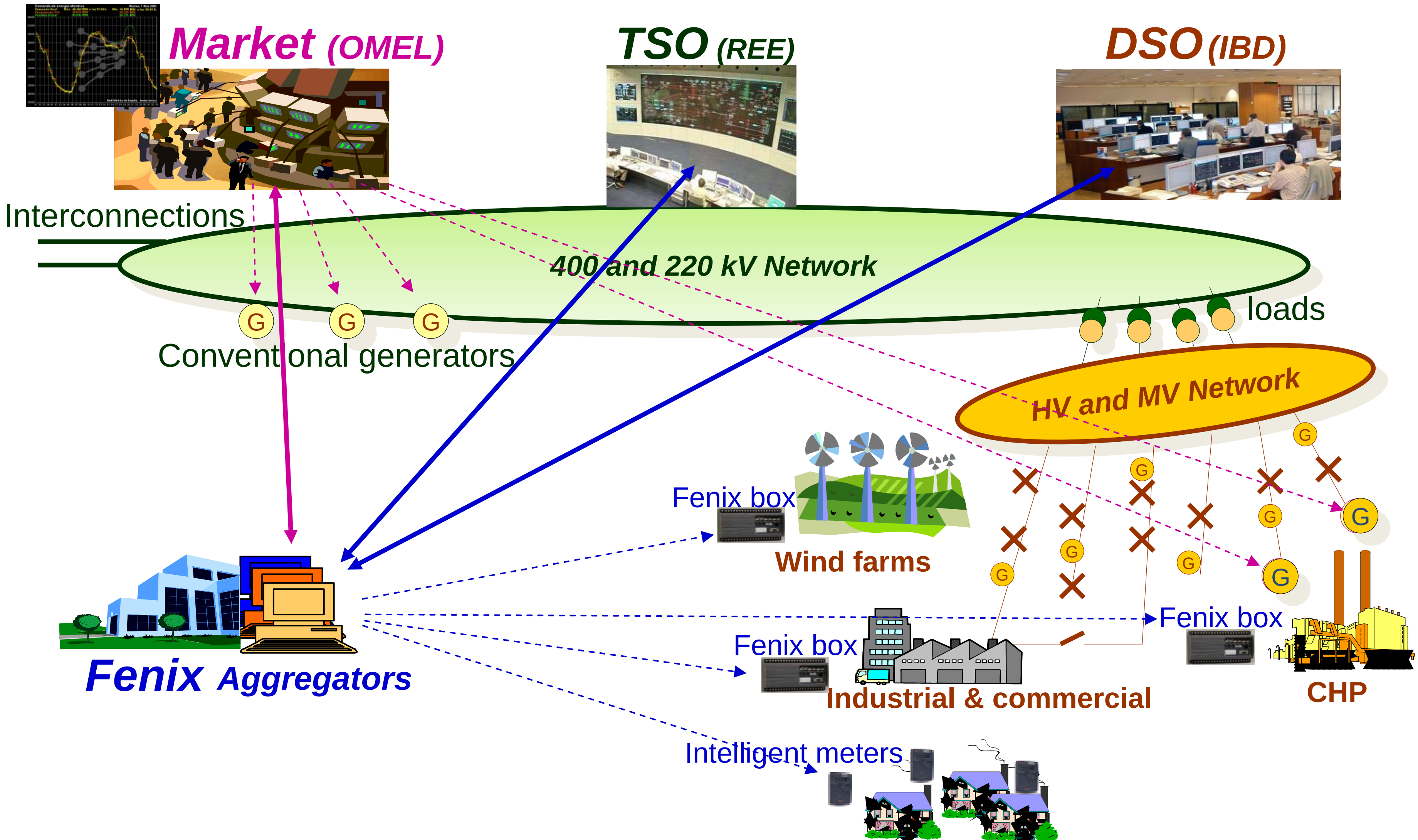
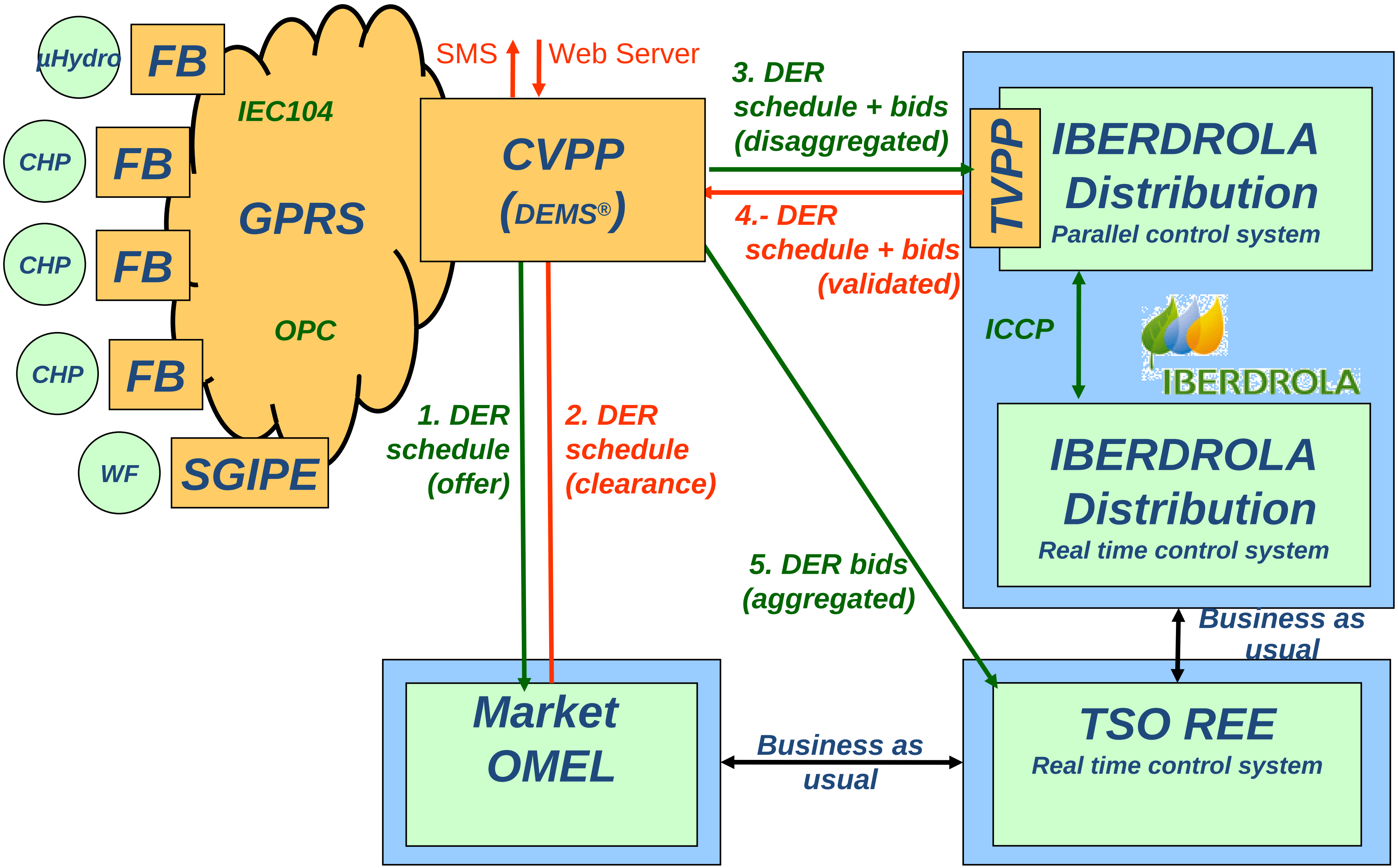
Capacitors – 96,6 Mvar

DER – 168 MVA Installed capacity

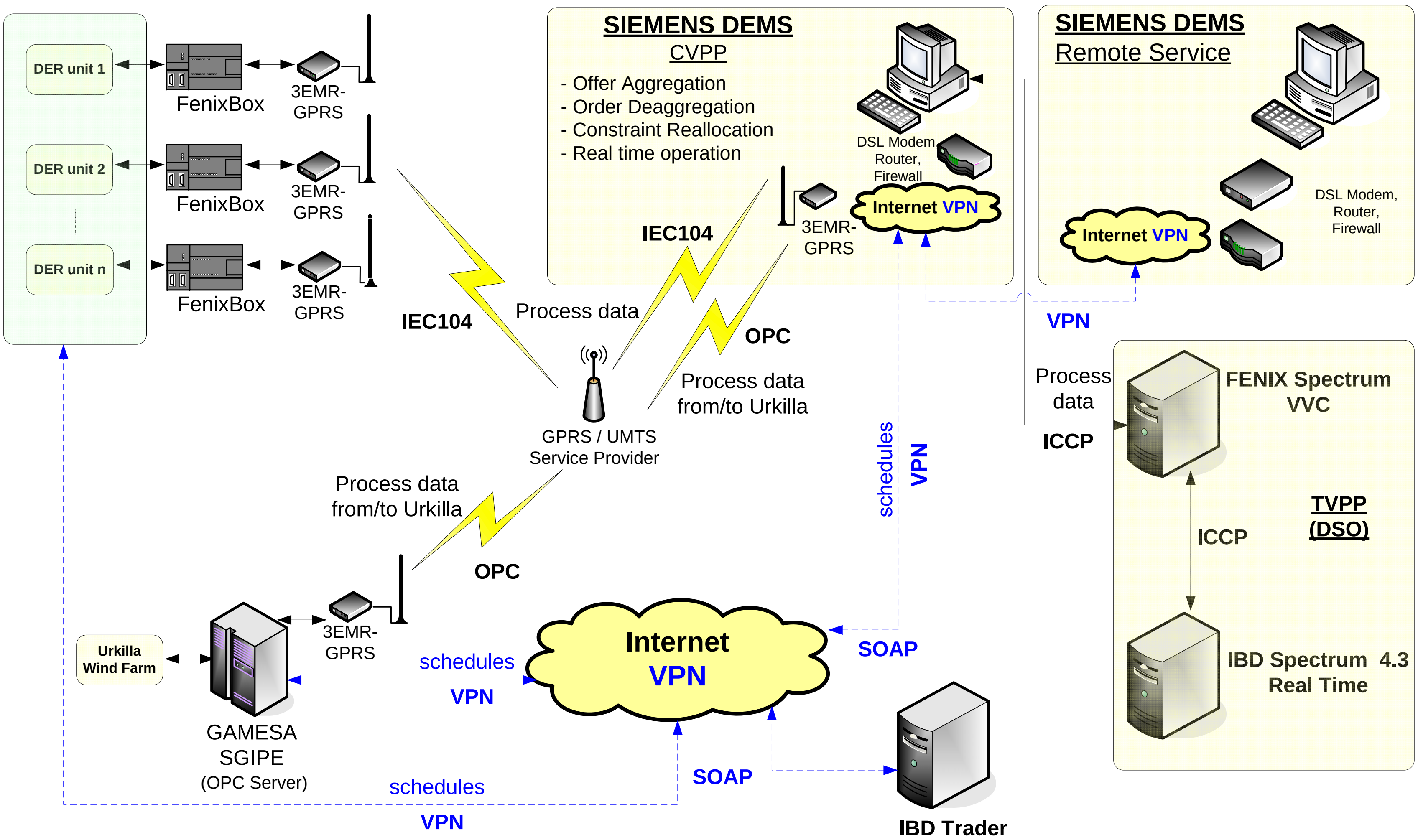
Actors in the Demo



Work Done - Demo Architecture



FENIX Southern Scenario ICT Architecture



What has been demonstrated

1. Providing global services (TSO level)
   a. Selling active power in the day ahead market -
   b. Tertiary reserve, balancing market
   c. Selling reactive power capacity

2. Providing local services (DSO level)
   a. Help maintaining voltages in lines
   b. Under equipment outages, use active power generation to avoid reconfiguring the distribution network (simulated)

Problems faced

- Complexity of large real deployments
- Including DER in the demonstration
  - ✓ They are not part of the consortium
  - ✓ DER availability (process or weather constrains)
  - ✓ Complex local adaption - DER engineered for stand-alone operation (in the best case there is a local SCADA)
- Utility reluctance to change business as usual (big inertia)
- Regulatory and administrative barriers
  - ✓ DER have already contracts with a Commercial Agent
  - ✓ Special regime in Spain is not considered to provide tertiary reserve
  - ✓ Aggregating DER of different technologies is not currently allowed in Spain

Lessons learned

- DERs impact on the network is significant
  - As the share of DERs increases the need for their optimal integration increases
- DERs and Utilities look suspiciously to each other while there are win-win situations they should search for
- DER owners are a key participant and must be considered.
  Their participation in projects has to follow a different way of partnership and contracting
- Visibility of DER enhance a lot the quality of the DPF and the knowledge of what happens in the network.
- FENIX has given a solution to all technical issues.
  Regulatory issues have been identified, but obviously exceed the project scope.
- FENIX is feasible

FENIX added value for TSO

- FENIX provides with the visibility and controllability of DER needed for System Operation with high integration of DER power production.
- FENIX provides DER with the opportunity to participate in services that were not affordable due to DER size and distributed nature.
- With FENIX TSOs obtain from DER similar contribution to System support as from conventional plants.
- The most remarkable features supplied by FENIX are:
  - ✓ Voltage control
  - ✓ Tertiary reserve
  - ✓ Wholesale energy markets

Impact of FENIX for the DSO

- With FENIX, the DSO knows DER production on real time and has the opportunity to validate this schedule (e.g. power injection of a certain generation can be rejected)
- This alone will improve the management, planning and operation of distribution grids, and it will allow a higher penetration of DER.
- FENIX enables DER to offer new services, some of them can benefit directly the DSO:
  - ✓ Voltage/reactive power control
  - ✓ Active power control, such as to reduce congestions
- FENIX allows the DSO to see DER as a mechanism to improve quality of service

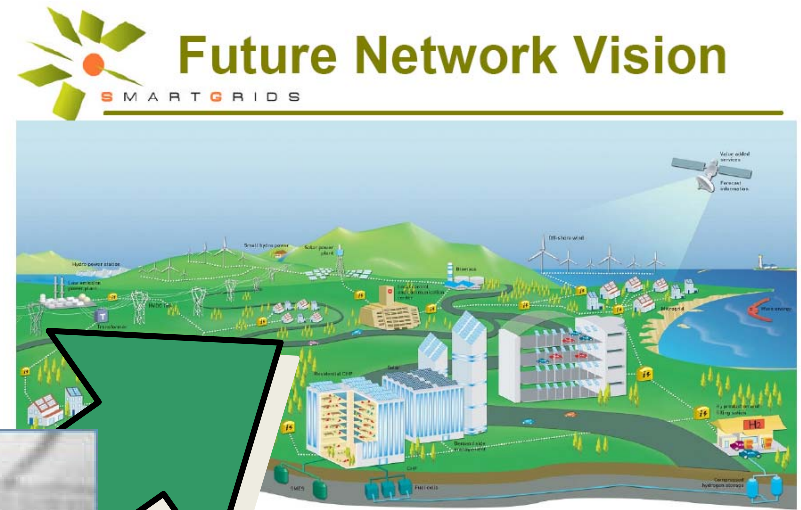
DEMO main highlights

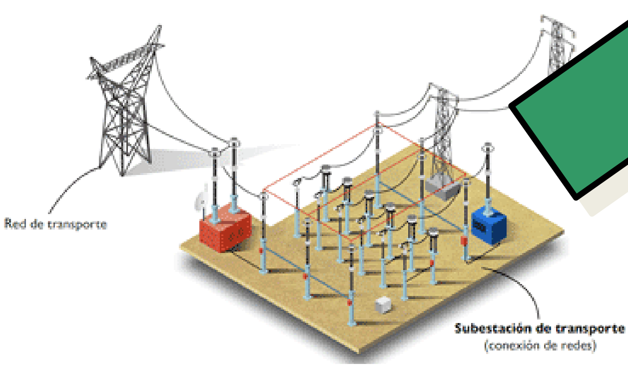
- With FENIX, the DSO has the opportunity to validate DER schedule (In Spain Generation schedules are validated only by TSO, considering the VHV network)
- For the first time a DSO has an application VVC to optimize Distribution networks that consider DER outputs as control variables (non existing before)
- FENIX has explored successfully the use of Back-up units to export energy into the network (not allowed yet)

✓ **It's the first time a SO uses DER capacities to give system support**

Next steps

We see FENIX as a *forerunner* to the future *Smart Grids.* But a lot has to be done yet.





Thank you!

For more information please click on
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