Integration of DSM, Distributed Generation, Renewable Energy sources and Energy Storages Issues in the Spanish system

IEA DSM agreement

Task XVII Petten Workshop
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Labein
Demand side management department
The Spanish electricity system

- Generators
- Small producers
- International exchanges
- Distribution activities (Medium and Low Voltage)
- Consumers under approved tariffs
- Qualified consumers
- Suppliers
- External companies
- System Operator (Red Eléctrica)
- Foreign TSO
- Market operator (OMEL)

Energy flow:
- Orange
- Information flow:
- Red
- Market bids:
- Green
The activities according to Law 54/1997

**Before Law 54/1997 – Legal stable framework**

- International exchanges
- Production
- Dispatch
- Transmission
- Distribution
- Supply

**Law 54/1997 (reviewed by Law 17/2007)**

- **International exchanges**
  - Freely negotiated, authorization required
- **Production**
  - Installation subject to administrative authorization
- **DM + IDM**
  - Spot market (OMEL)
- **System operation**
  - System operation and ancillary services (REE)
- **Transmission**
  - TPA to the grid & transmission grid manager
- **Distribution**
  - TPA to the grid
- **Reselling**
  - New activity
- **Qualified consumers**
  - Transition period to full eligibility established

**Legend:**

- **Regulated activities**
- **Liberalized activities**

DSM and DER integration Spain Task XVIII IEA DSM
General scheme of the electricity market

Producers
Producers under Special Regime
Reseller seller
External agent seller

FORWARD MARKET (OMIP)
BILATERAL CONTRACTS (OTC & other)
DAILY AND INTRA-DAILY MARKET (OMEL)
OPERATION MARKETS (REE)

Electricity Sector Management: REE

Distributor
Qualified consumer
Reseller buyer
External agent buyer

Final consumer at a tariff
Scheduling Scheme

**Day D-1**
- Daily Market
- Intradaily 1
- Intradaily 2
- Day D
- 4 7 11 15 12 15 20 24

**Day D**
- Capacity daily auction Spain-France (RTE)
- Daily energy sched. sent to REE by agents
- Build up of base energy program
- Secondary reserve market
- Intradaily capacity auction (I) S-F (REE)
- Forecasted deviations management
- Tertiary reserve usage
- Real Time constraints solving process
- Intradaily capacity auction (II) S-F (REE)
Electricity demand behavior

1. Sustained growth

- Sustained growth
- Average year-to-year growth of 5% since 1996

2. Peak demand growth

- Peak demand growth is higher than average demand increase
Increasing need for infrastructure. Geographic vision

Geographically unbalanced growth in generation and demand, which requires new infrastructure → Difficult development
Demand behavior

- Black lines represent the 120 h peak hours in 2005, 2006 and 2007
Policies for DG, RES, DR/DSM

**DG/RES: Royal Decree 661/2007 for Special Regime**

- RES, CHP & Waste up to 50 MW
- Establishes administrative procedures to be followed to install the facility
- Provides two options to sell electricity: guaranteed price / premium
- Offers incentives for frequency control
- Offers higher payment for most efficient CHP plants

**DR/DSM: Smart metering down to household consumers**
Policies for DR/DSM

From a tariff supplement...

- Tariff supplement
- Load interruption supplement
- Time of use tariffs
- Reactive power supplement

...to a operation service

- Market framework
- Load interruption service
- Market prices
- Voltage control service
Power reduction from big consumers down to previously agreed values and with a determined warning time, as a request of the TSO or the DSOs.

- **Interruptibility “C”** used from 17:40 to 20:40 h & from 17:45 to 20:45 h.
- **Interruptibility “C”** used from 19:00 to 22:00 h & from 19:05 to 22:05 h.
Status and target for DG, RES, DR/DSM

System Installed capacity August 2007 (MW): Total: 82,689 MW
Record peak demand: 44,880 MW

System Installed capacity 2011 (MW): Total: 96,626 MW
### Produced Energy DG 2006

#### DG production

- **Renewable**
  - Wind: 21,977 GWh
  - Hydro: 4,049 GWh
  - Photovoltaic: 96 GWh
  - Biogas: 581 GWh
  - Agricultural and forest waste: 1,485 GWh

- **Cogeneration**
  - 15,133 GWh

- **Waste Treatment (natural gas)**
  - 3,367 GWh

- **Industrial/Urban Waste**
  - 2,022 GWh

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#### Distributed Generation

<table>
<thead>
<tr>
<th>Energy (GWh)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Renewable</strong></td>
<td>28,188</td>
</tr>
<tr>
<td><strong>Cogeneration</strong></td>
<td>15,133</td>
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<tr>
<td><strong>Waste Treatment (natural gas)</strong></td>
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<td><strong>Industrial/Urban Waste</strong></td>
<td>2,022</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>48,711</td>
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</tbody>
</table>

#### Renewable

- **Wind**: 21,977 GWh
- **Hydro**: 4,049 GWh
- **Photovoltaic**: 96 GWh
- **Biogas**: 581 GWh
- **Agricultural and Forest Waste**: 1,485 GWh

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**Total**: 28,188 GWh (10.8%)
Geographic distribution of wind, CHP and RD and demand
DG Access

Network Access

- **Transmission network.** Clearly established rules.
- **Distribution network.** Each DSO applies his own rules. Only common rules for PV – LV.

Market Access

- Wholesale market (1 MW)
- Ancillary services
Network Access. Voltage Dip Generation Tripping
01/06/05-31/05/07

Operational Procedure 12.3

- New wind turbines installed (1/1/2008)
- Already installed wind turbines: deadline for compliance 1/1/2010
Thanks for your attention!
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