

Integration of Demand Side Management, Distributed Generation, Renewable Energy Sources and Energy Storages

Policy, regulation, market in participating
countries

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Business from technology

Background

Short summary of markets, regulation and policies in participating countries (Italy is missing until now) based on

- answers to the questionnaire and
- country reports

More specific information can be obtained from answers and country reports

Market structure

	Countries	Power pool
Liberalized / Competitive market	Finland Netherlands Austria Spain ¹ Some US states	Nordpool APX EXAA Omel
Regulated market	Korea Some US states	KPX ²
1: In Spain, LV customers can still choose to have a regulated tariff.		
2: KPX is a cost based power pool		

Demand Response: demand response efforts

Type of DR	Country	Note
Time of use	Finland Spain Austria Netherlands USA Korea	Retail and network ToU, usually for customers over 10 to 15MWh per year Compulsory above 50kW, otherwise optional Industrial and commercial consumers
Real-time pricing	Finland Spain Netherlands USA	Some suppliers are offering this form of pricing for small customers if customer has an hourly meter For large consumers For large consumers Exists and is viewed to increase
Curtailment and direct load control programs *	USA Austria	Most of the DR programs are of this type
In retail market	Finland USA Austria	
In regulating power markets	Finland Netherlands USA	Minimum capacity of 10 MW, activation time \leq 10 min, offers must be submitted latest 30 min before the delivery hour Consumer itself or as part of an aggregated set of units
As ancillary services	Finland Netherlands Spain USA	In practise, only industrial consumers Only for large consumers



* Does not include emergency curtailment programs that exist in all the participating countries

Demand response potential estimates

Country	Contracted by TSO	Others observed	Short and medium-term potential	Pessimistic estimation
Finland	365 MW	140 MW	2900 MW	2500 MW
Nordic countries (total)	2075 MW	1660 MW	14535 MW	12000 MW
Netherlands				
Austria		660MW		

Electricity market transactions

	Country	Note
Day-ahead market	Finland Netherlands Spain USA Korea	Min bet: 10MW Min bet: 1MW Fixed retail price
Intra-day market	Finland Netherlands Spain USA	
Capacity/Balance management market	Finland Netherlands Spain Austria USA	Minimum capacity: 300MW

Renewable energy incentives

	Country	Note
Investment subsidies	Finland	30% (40% for wind power)
Tax exemption	Finland	
Feed-in tariffs	Spain Austria Korea	Optional if under 50MW
Fixed premium	Netherlands Spain	Optional if under 50MW
Green certificates		
Quota	Austria	For balancing areas

Installed capacity (in MW) for DG and renewal

Country	Wind	Solar	CHP	μCHP	Small hydro	Others	Total prod.
Finland	122	5	294	N/A	Total of hydro: 3000MW of which 9% <10MW	Biogas: potential 300, now < 20	16.200
Netherlands	1560	53	8500	N/A	Marginal		
Spain ≤15MW	1019	413	3132	0.788	1465	397*	47.900
Spain 15<P<25MW	2686	0	1082	-	237	141*	
USA	9,44**	1,96**				101,4**	789.475
Austria	1032	36	402	6165MWh	952 (<10MW)	1	19.182
Korea	177,7	35,9	3455	148	60 (<5MW)	81	68.300
*: In Spain, others are biomass, biogas and municipal solid waste fired units **: Not capacity, production expressed in 10 ⁷ MWh							

Energy storage capacities

	Pumped hydro	Heat storage (large scale)	Heat storage (consumer's level)
Austria	2,7 GW / 18,3 TWh		Yes
Finland	No	About 17 GWh and 900 MW _h (non- coincident)	Yes
Korea	3,9 GW	699Gcal/h	649 MW (ice storage)
Netherlands	No	Yes	Not really
Spain	2,7 GW		
USA	Yes	Yes	Yes

Driving forces

- The main driving force in the participating countries is a law that forces or encourages the introduction of renewable distributed generation. Those laws are themselves responding to a growing worldwide concern for climate change, but also a concern for energy security and security of supply.
- Behind the concern for climate change, the participating countries, except the USA, have ratified the Kyoto protocol. It has been transmitted in Europe through EU targets and directives that have been transposed into national laws in the EU countries.
- Another driving force is the rise in energy prices, linked directly to the rise in the prices of oil and gas. This encourages energy efficiency measures and makes the investments in renewable energies more attractive.
- Two more driving forces for the use of DR or DSM are the possibility to take advantage of a growing price volatility or to avoid or reduce imbalance costs.
- A last driving force has been mentioned in the Netherlands. It is the ageing of the current grid system. Some thought is therefore given to take advantage of the required renewing of the grid to move to a more intelligent and more active system.

Problems and future development

- The slow spread of advanced meters that allow customers to participate in ToU rates and sophisticated demand response offerings
- The lack of widespread dynamic rates and price signals to reveal to customers the value of electricity across time and place.
- Since there are few end-use customers with dynamic pricing, there is little ability to analyze and predict how customers will respond to price-responsive demand response options.
- The difficulties in monetizing demand response to increase compensation for DR providers, particularly in places where there is a functional separation between generation, transmission and distribution, and commodity electricity provision.
- The existence of price caps and automatic price mitigation in regions (in some US states) with central spot markets, which suppress the true value of electric scarcity and reduce the potential compensation to both the curtailment provider and the customer reducing her electricity usage.
- .In the USA, because federal regulators have jurisdiction over wholesale electric markets but state regulators have control over retail electric rates, the jurisdictional and policy gaps make it difficult to implement deliberate, coordinated, wide-scale policies to achieve demand response, advanced metering, and smart grid goals.