RED ELÉCTRICA
DE ESPAÑA

Spanish System and Network-driven DSM Resources Description

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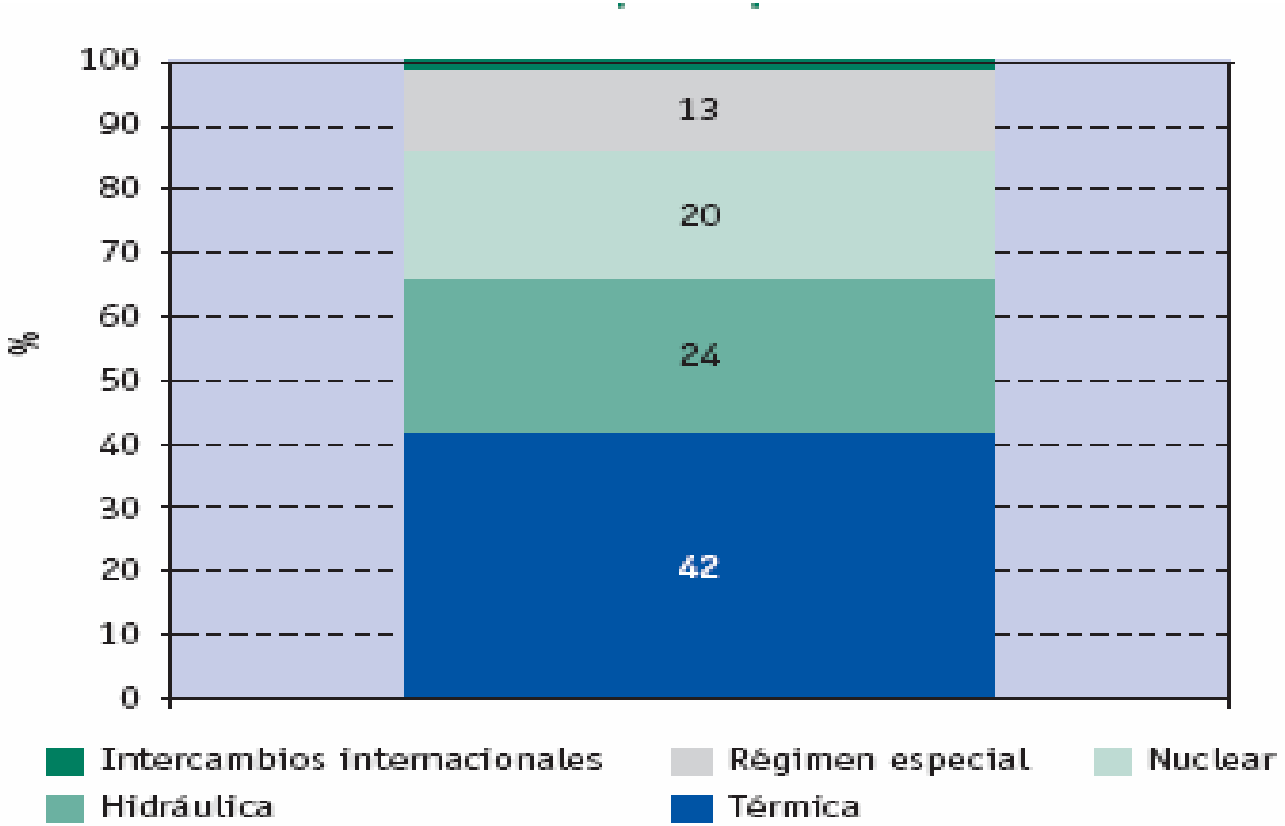
Network Driven DSM

Disaggregation of system peak

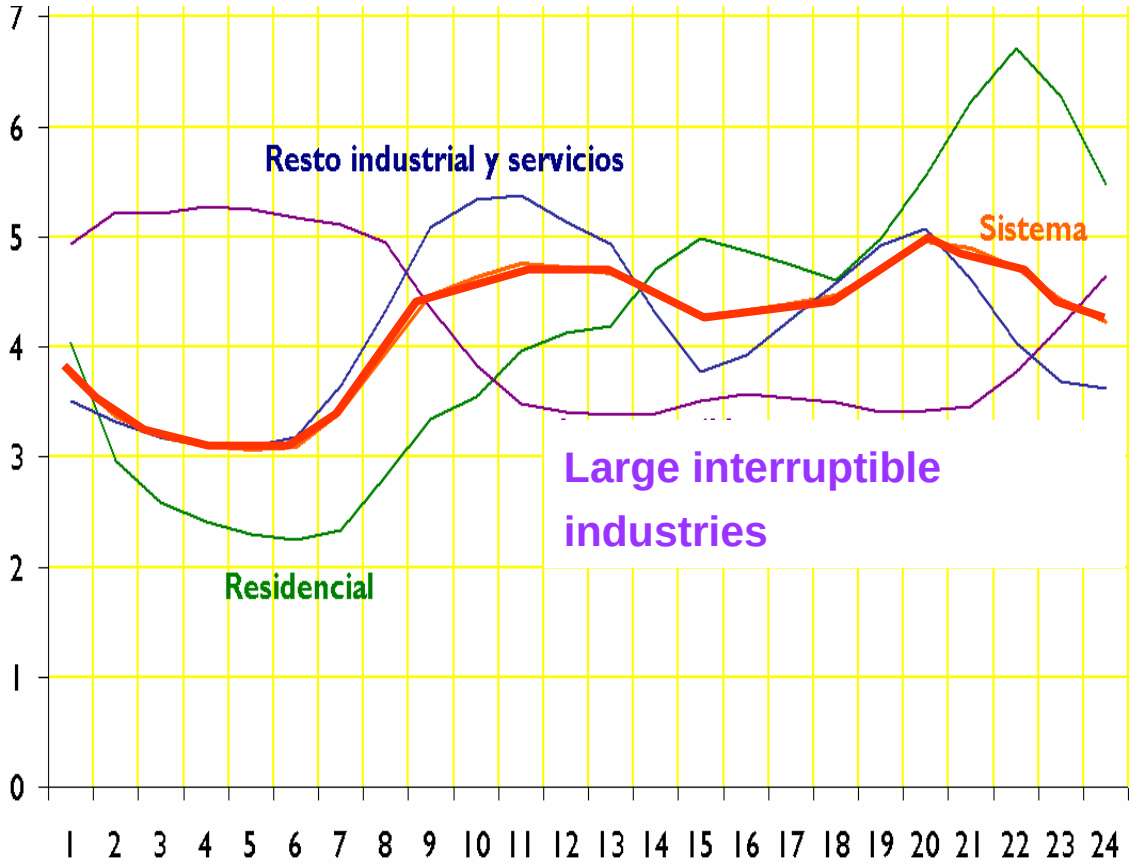
- Maximum system peak of 37,200 MW was in winter 2003



Fuente: Red Eléctrica.

Disaggregation of load curves

Winter working day

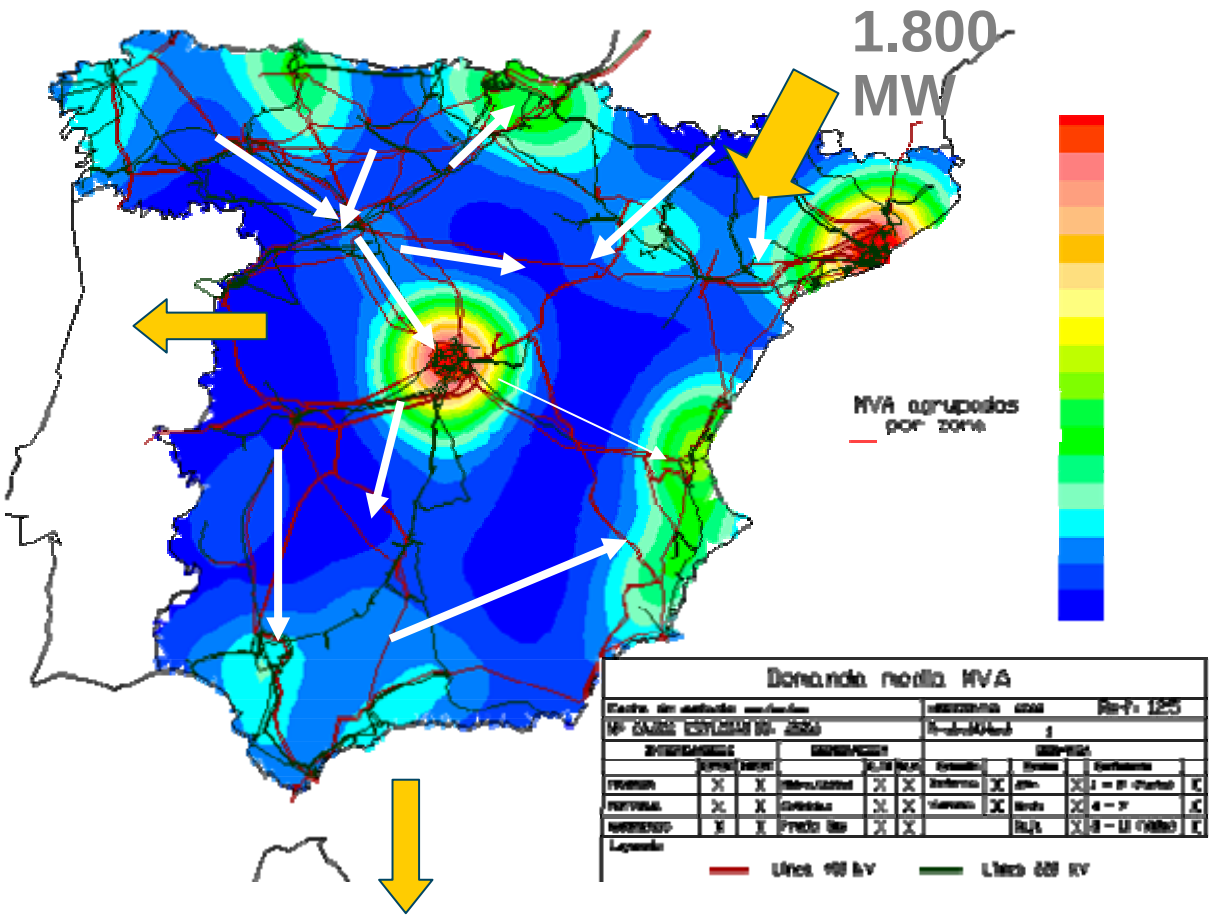


Segmentos y usos	Consumo anual	Peso máximo del segmento		Peso en punta 20 h.
	%	%		%
Grandes industrias	25,0	30	5	10
Comercial restauración	1,7	3	22	2
Comercial alimentación	1,2	6	12	4
Resto de industria y servicios	52,1	59	11	50
Sector residencial	20,0	52	23	34
Calefacción	1,9	16	22	11
Iluminación	4,7	9	1	9
Televisión	2,3	9	22	4
Agua caliente	1,0	4	8	2
Frigorífico	5,5	4	5	3
Otros usos	4,6	8	14	6

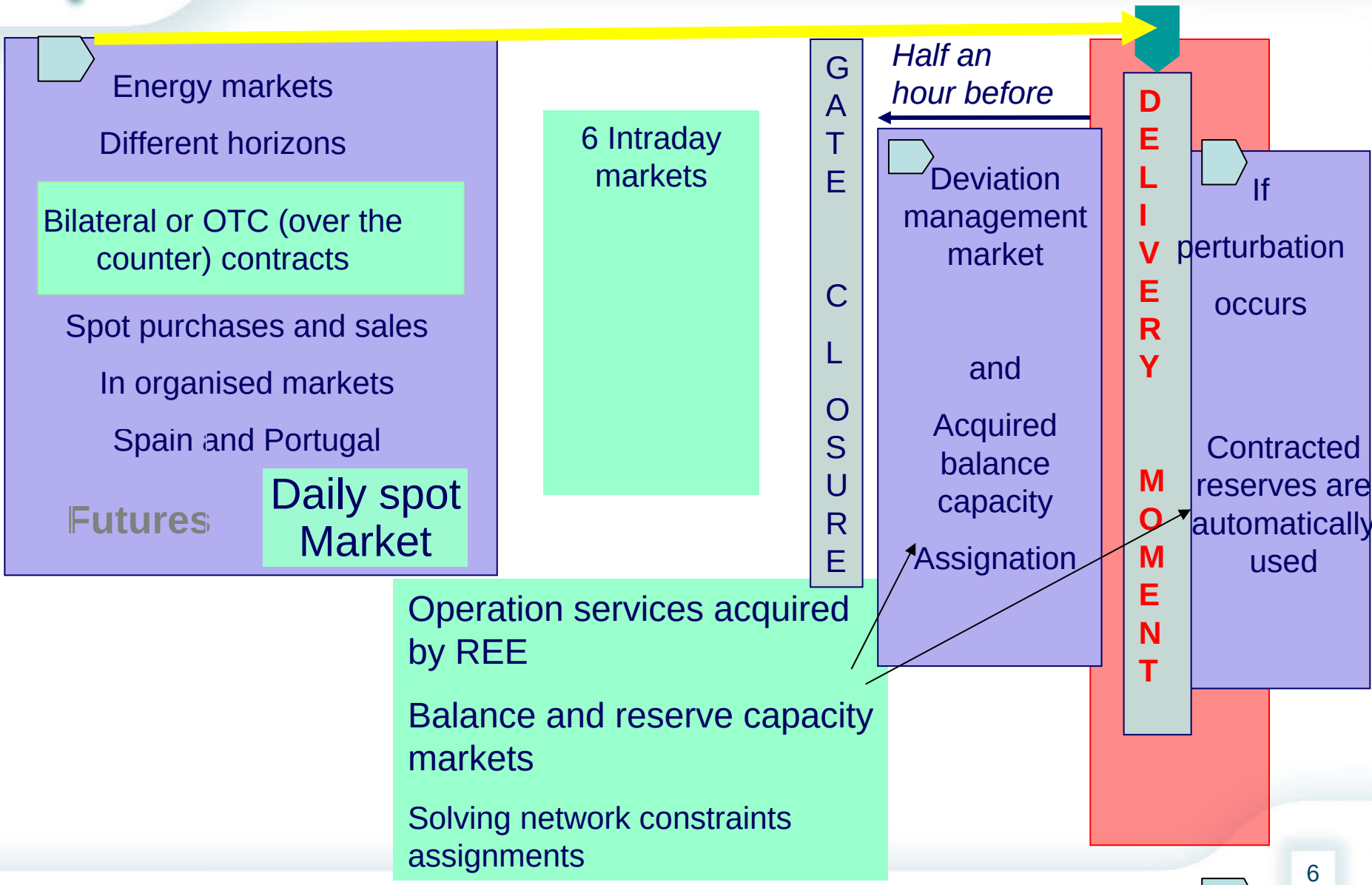
Estimados para un día laborable medio de invierno 1.997

INDEL Project: End use load curve explanation. REE

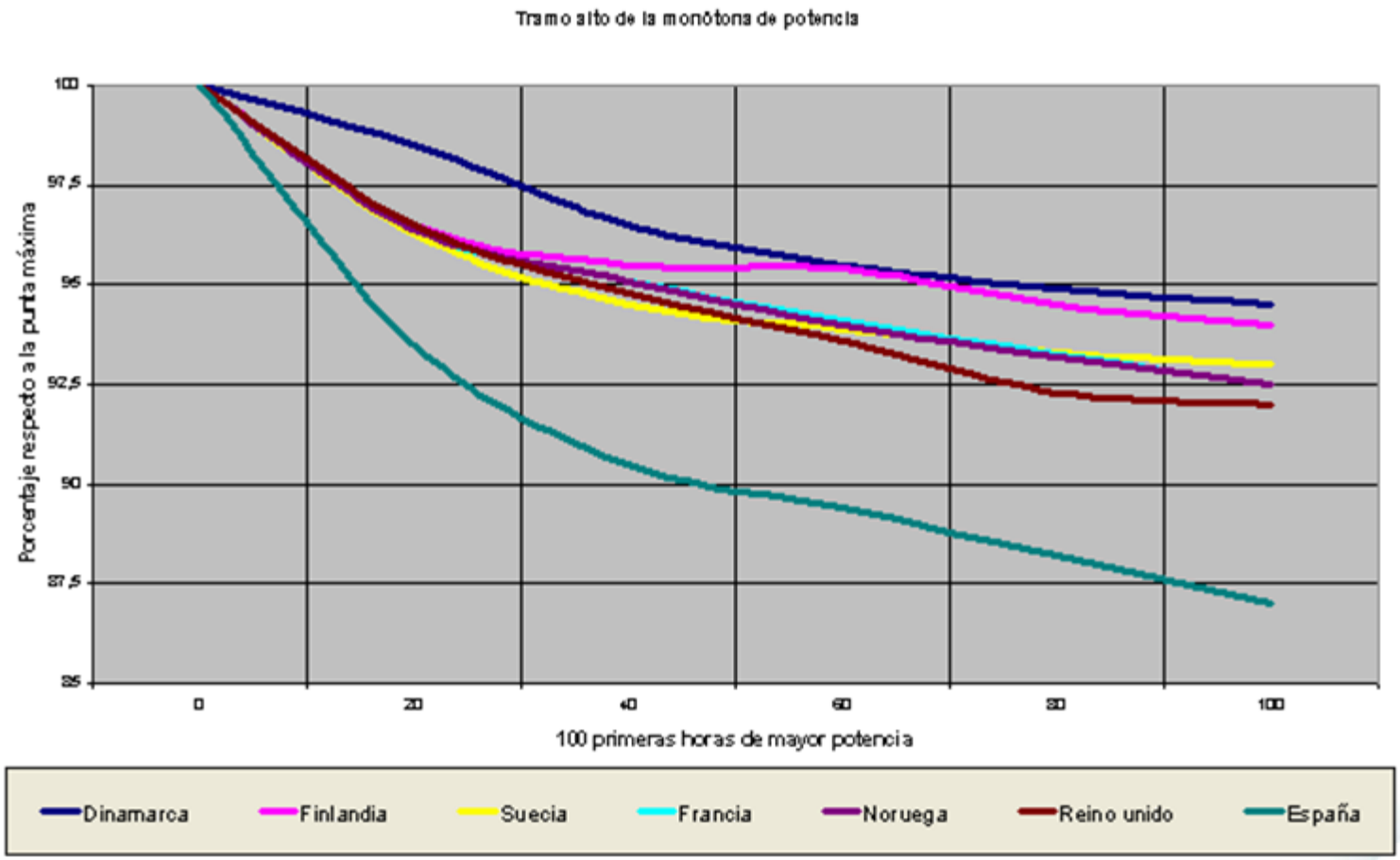
Geographical distribution of demand and load flows



Market framework



Load duration curves for European countries in 2001
Very cold weather in Europe

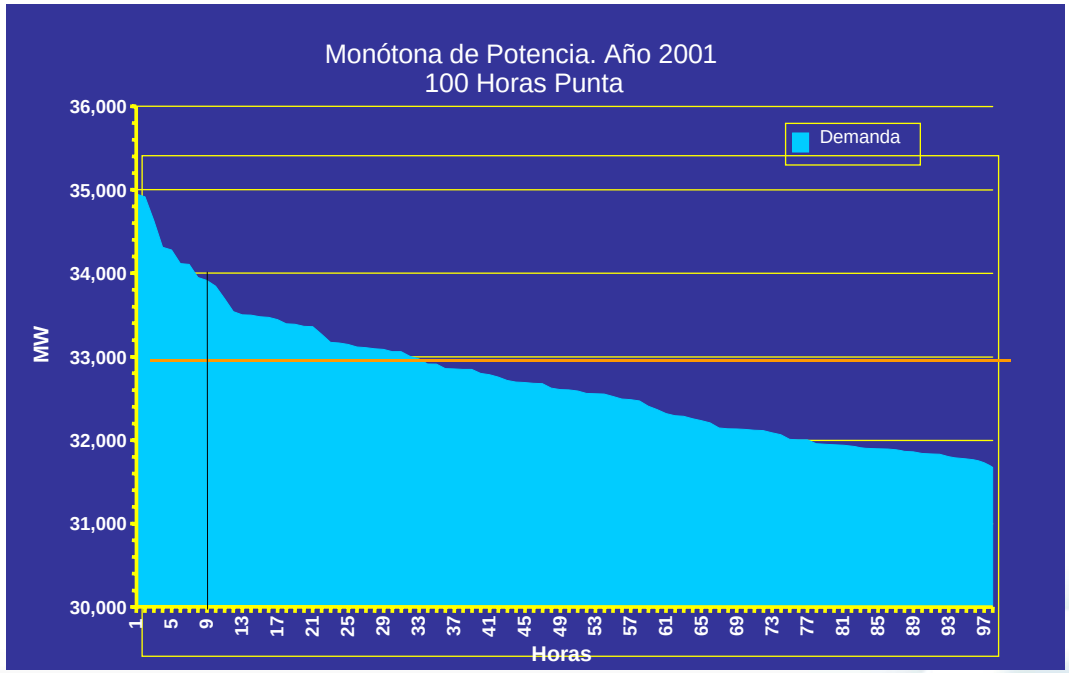


Load duration curve for Spain in 2001

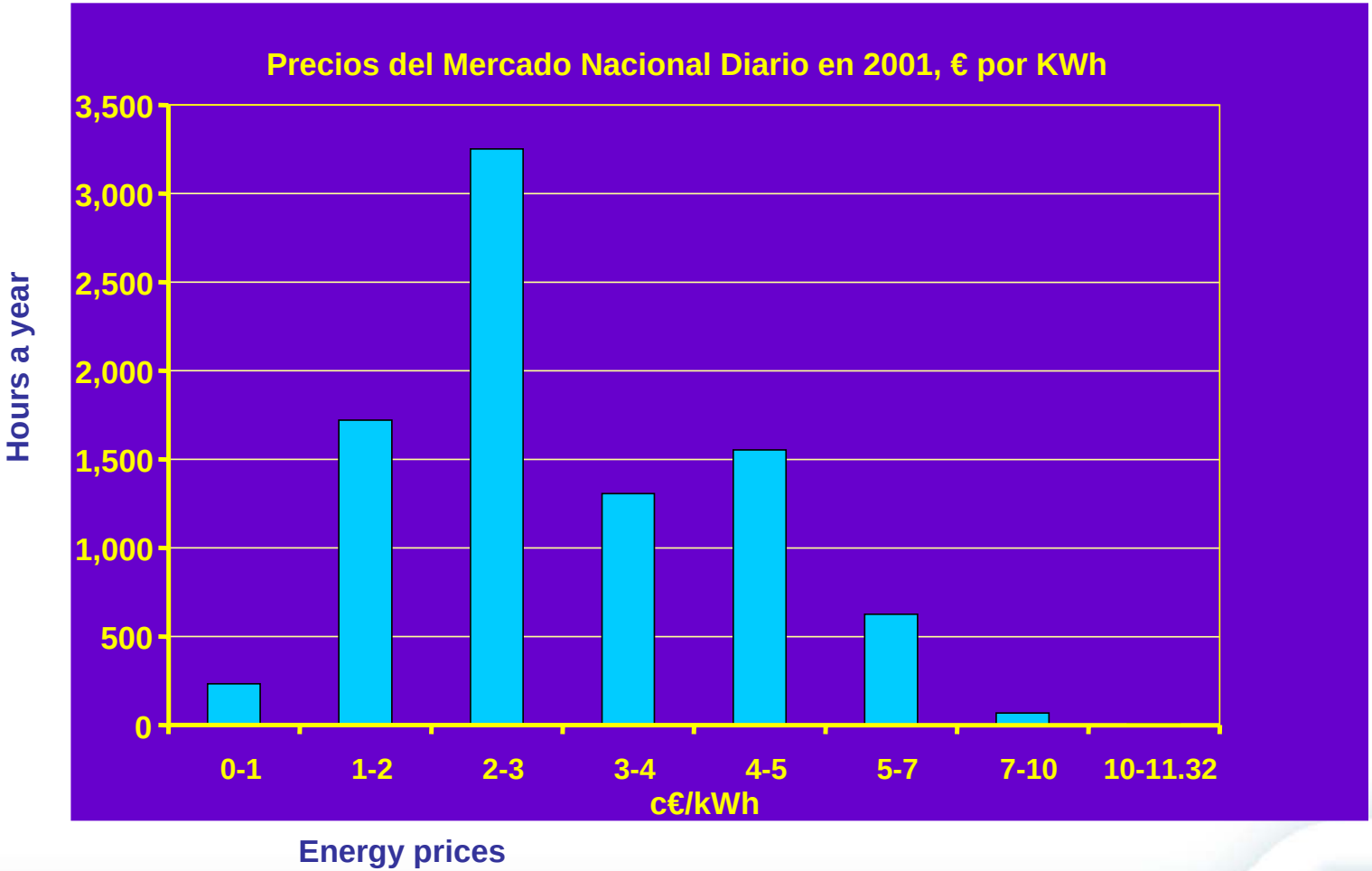
In 2001, the final 1,000 MW of capacity was used for only 9 hours during the year.

Hourly pool prices reached 10 to 11.33 euro cents. However, these prices were not passed through to customers by retailers.

The next 2,000 MW blocks of capacity were used for only 35 and 87 hours respectively during the year.

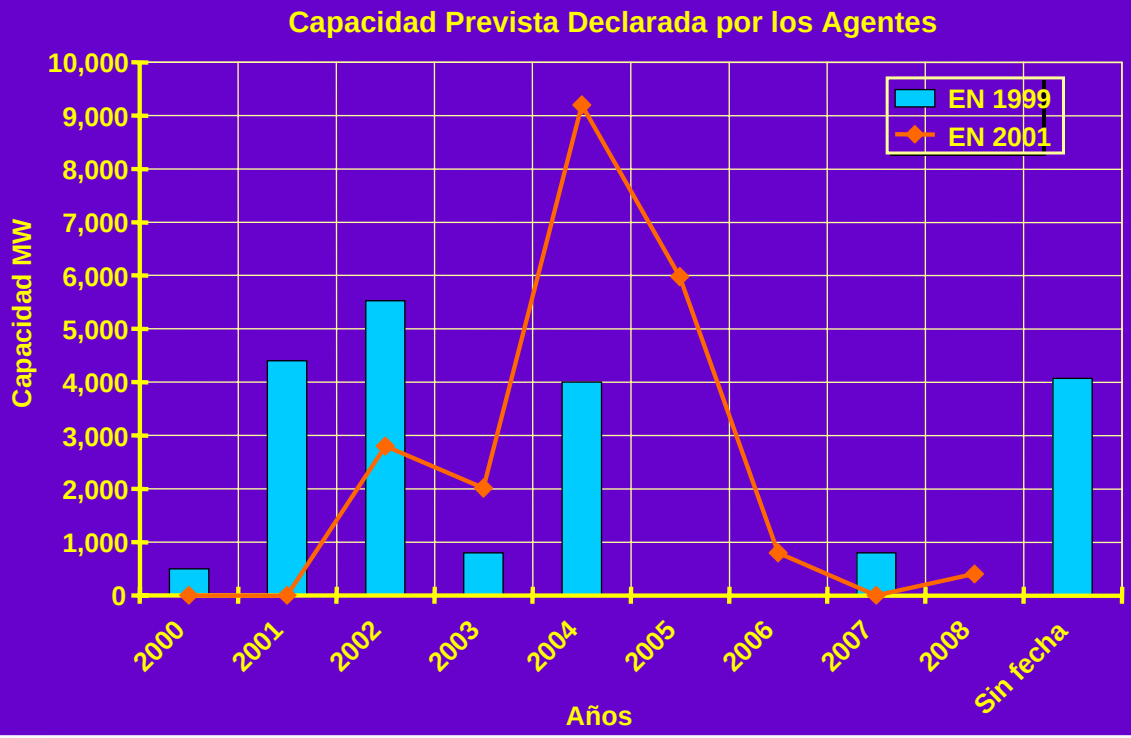


Spot market price variability in 2001



New generation capacity requirement

Forecast growth in generation capacity
(2001 forecast compared with 1999 forecast)



- CCP investment plans slow down as oil prices increase.
- Spanish wind farms with total capacity of 6,000 MW were able to provide only 300 MW during last June system emergency.

What is the economic value of Network driven DSM, ToU DSM?

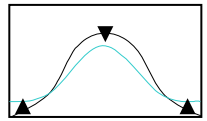
Network planning

- **Estimated 25% expansion of the network required to 2010**
  - **1/3 of this requirement is explained by demand growth, which is expected to be 17% per annum**
  - **2/3 is needed to**
    - **Provide access to the market for new generation projects**
    - **Provide access to short term market assignations**
    - **Provide stability to the system**
  - **Calculations based on 18000 MW of wind farm capacity**

Network-driven DSM

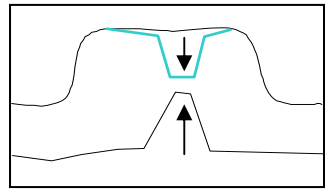
Three types of demand-side resources are required for system planning and operation

1. **Transforming the consumption pattern by reducing demand peaks in response to long-term variations in energy market prices and/or to non-economic factors**



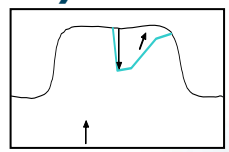
2. **Developing quick demand-side responses to short-term energy price variations, demand-side bidding (DSB)**

   Develop consumers' quick response capabilities



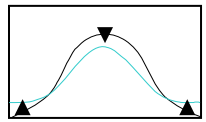
3. **Developing products which provide quick demand-side responses to system operation requirements, demand-side operation (DSO)**

   Develop consumers' quick response capabilities to be sold as system services

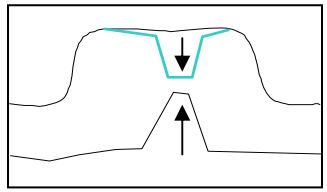


Network-driven DSM resources in Spain

1. **Long-term variations in energy market prices: No response**

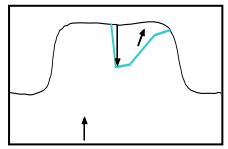


2. **Time of use tariffs: Significant large and medium industrial consumers response**



3. **Short-term energy price variations, DSB: No response**

4. **Response to system operation requirements, DSO:**



200 large industrial consumers already purchasing by the regulated interruptible tariff.

2500 MW 2 hours notice for 12 hours duration
15 minute notice for 30 minute duration

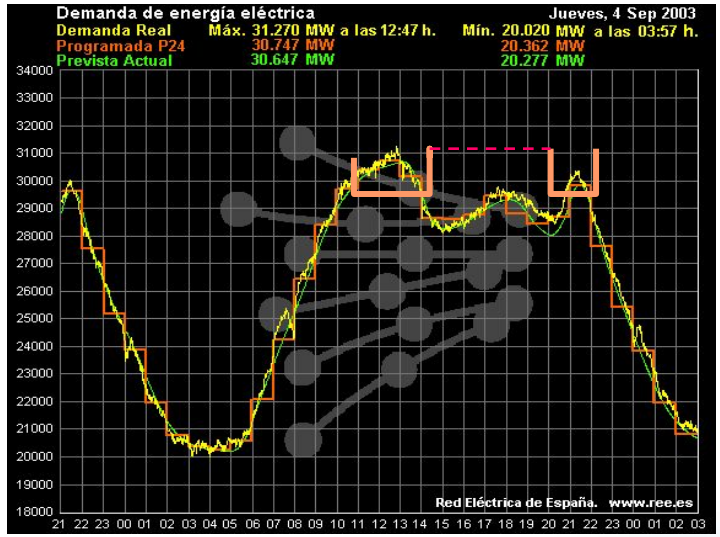
500 MVar injection in the network (voluntary offers in substitution of a part of the active offer).

Flexible interruptible response - New network tool developed

Gestión flexible de la interrumpibilidad, GFI

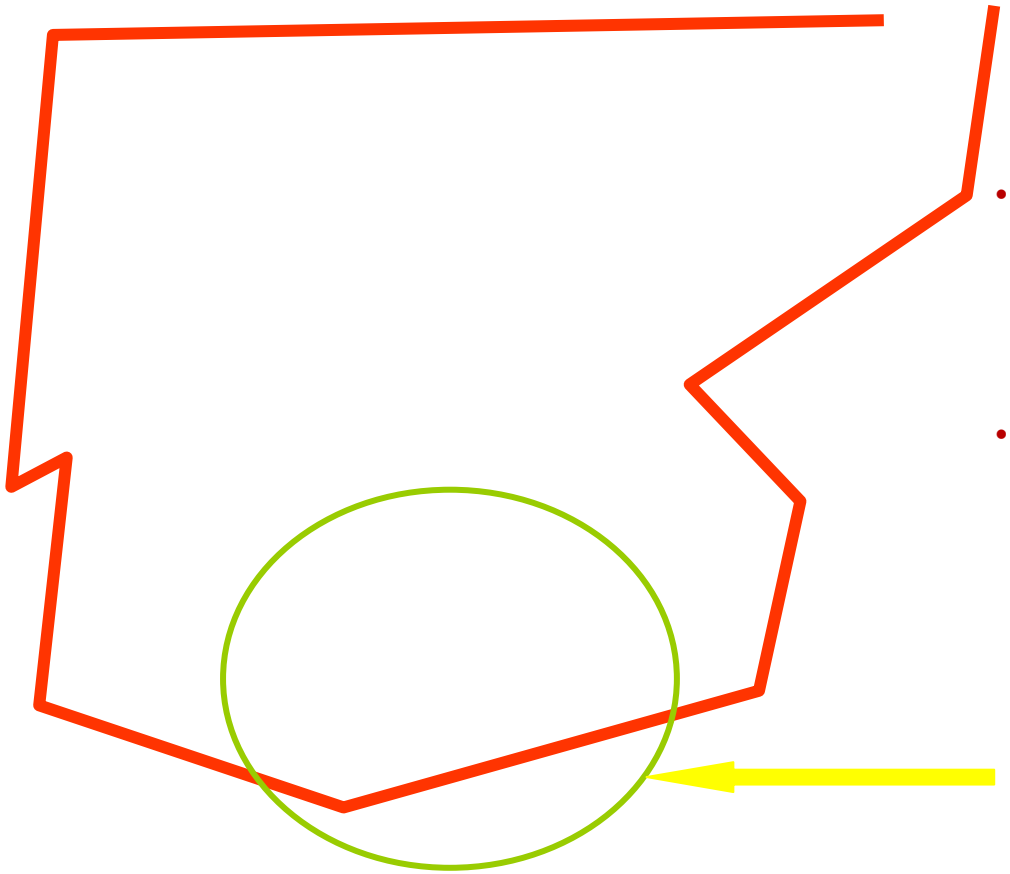
- Continuous consumption programs information to Red Eléctrica
- Real time consumption information to TSO: 4 seconds period

Electrical Control Center of Red Eléctrica (CECOEL)



System summer load curve

Creating DSO products



- **Last Jun, large consumers gave to the network 300 MVAr in Andalucia, when air conditioning intensive use created serious problems.**
- **They avoid active consumption interruption orders.**

Proposal (1)

- To build a first catalog of DRR products to be traded
  - Choose a number of products which are now traded or in planning phase
  - Characterize them by their relevant qualities

Proposal (2)

- Carry out studies of all the catalog products to characterize them further:
  - Potential
  - Economic evaluations
  - Operational
  - Quantities and prices statistics
  - Bench-marking
- Share the catalog with related IEA DSM Tasks XI, XII, XV

Characteristics of DRR products from the perspective of the customer as a consumer

1. Ability to reduce or increase active or reactive power
2. Duration of the response
3. Period of notice
4. How frequently the response can be done
5. For which period the delivery could be negotiated
6. How variable could be the response
7. How predictable
8. How the response can be measured
9. …

From the perspective of the customer as a DRR provider (1)

1. Ability to reduce or increase active or reactive power
2. Duration of the response
3. Period of notice
4. How frequently the response can be done
5. For which period the delivery could be negotiated
6. How variable could be the response
7. How predictable
8. How the response can be measured
9. …

Changing only one of these characteristics.

DDR products have different utilization and value for system operators and for market players

From the perspective of the customer as a DRR provider (2)

1.	Ability to reduce or increase active or reactive power	To reduce active consumption
2.	Duration of the response	15 minutes
3.	Period of notice	No notice
4.	How frequently the response can be done	Once a day
5.	For which period the delivery could be negotiated	Next month
6.	How variable could be the response	Constant power delivery
7.	How predictable	Deterministic
8.	How the response can be measured	Metered
9.	…	

For system operator as client is Secondary reserve

1. Ability to reduce or increase active or reactive power	To reduce active consumption
2. Duration of the response	15 minutes
3. Period of notice	No notice
4. How frequently the response can be done	Once a day
5. For which period the delivery could be negotiated	Next month
6. How variable could be the response	Constant power delivery
7. How predictable	Deterministic
8. How the response can be measured	Metered
9. …	

For several market players is negotiable in Balance market

1. Ability to reduce or increase active or reactive power	To reduce active consumption
2. Duration of the response	1 hour
3. Period of notice	No notice
4. How frequently the response can be done	Once a day
5. For which period the delivery could be negotiated	Next month
6. How variable could be the response	Constant power delivery
7. How predictable	Deterministic
8. How the response can be measured	Metered
9. …	

Could be used by Spot market players

1. Ability to reduce or increase active or reactive power	To reduce active consumption
2. Duration of the response	1 hour
3. Period of notice	One day ahead
4. How frequently the response can be done	Once a day
5. For which period the delivery could be negotiated	Next month
6. How variable could be the response	Constant power delivery
7. How predictable	Deterministic
8. How the response can be measured	Metered
9. …	

Could be acquired by the TSO to delay new network investment needs

1. Ability to reduce or increase active or reactive power	To reduce active consumption
2. Duration of the response	1 hour
3. Period of notice	One day ahead
4. How frequently the response can be done	240 hours a year
5. For which period the delivery could be negotiated	Next 5 years
6. How variable could be the response	Variable power delivery
7. How predictable	Probabilistic
8. How the response can be measured	Metered
9. …	

Objective

- **To build a first catalog of DRR products to be traded**
  - Choose a number of products which are now traded or in planning phase
  - Characterize them by its relevant qualities
  - Give them a name
- **Share the catalog with related IEA DSM Tasks XI, XII,XV**
- **Carry out studies of all the catalog products to characterize them further**

Bibliography

- **Technical rules for Demand Side bidding, Annex XIII, Demand Side Bidding AIE project, 2002**

  By Linda Hull and Rob Green; EA technology UK ; Mark Bailey Gaz De France Energy Uk; Davidson PBRE, UK; Bjorn Grinden and Ove S. Grande, SINTEF Norway; Kunt Loneland STATNETT, Norway; Anita Eide ENOVA, Norway; Margareta Bergstrom STEM, Sweden; Egil Ofverholm, STEM Sweden; A. Sijben NOVEM Nederland; Jan Griffioen HETNET Nederland; Seppo Karkkainen, VTT, Finland; Victoria Catalá, ENDESA, España; Carmen Rodríguez Villagarcía, Red Eléctrica de España.