

RED
ELÉCTRICA
DE ESPAÑA

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

IEA DSM agreement
Task XVII Seoul
Workshop

September 9th 2008

Demand side management
department



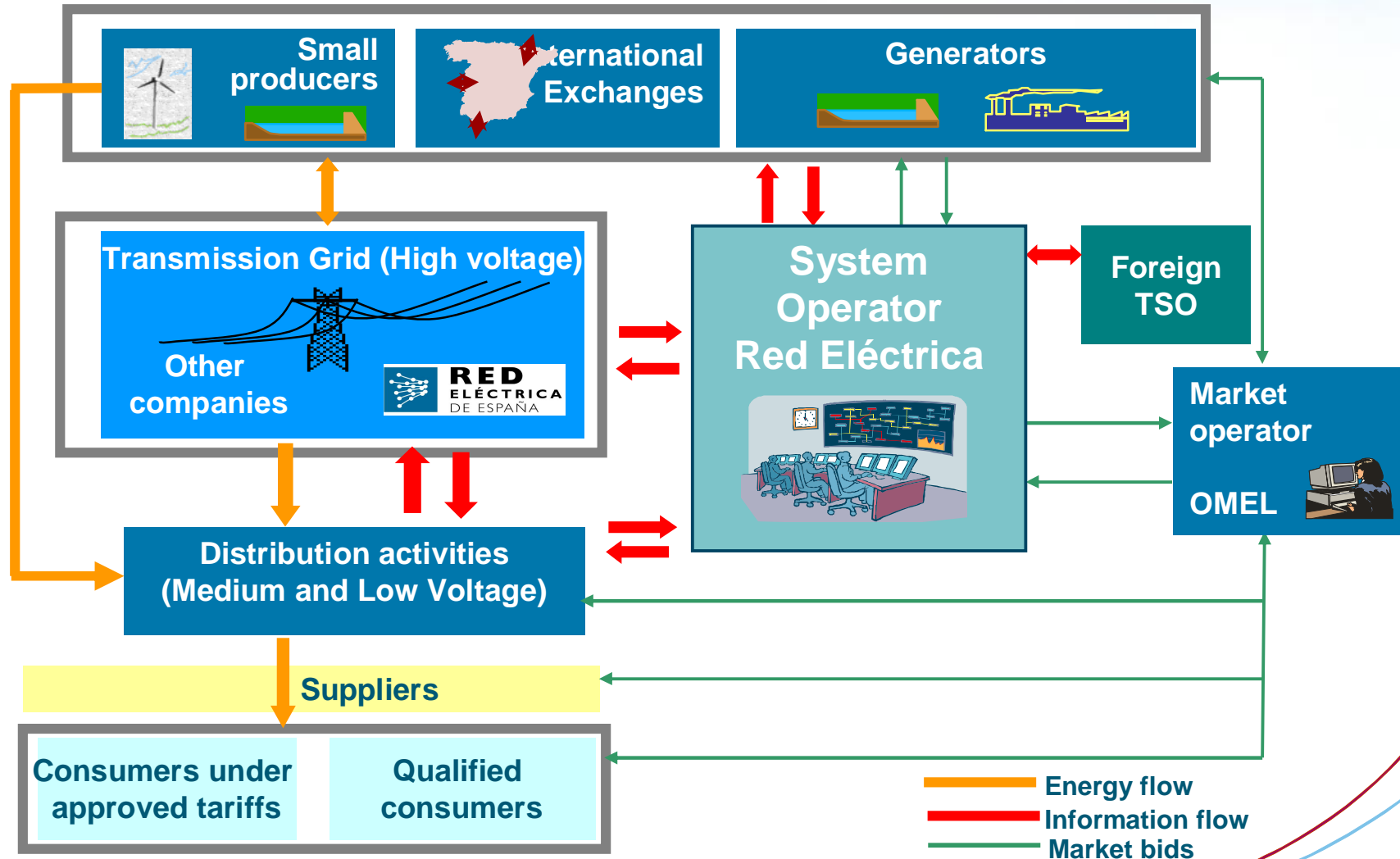


INDEX

- ❑ **The Spanish electricity system**
- ❑ **Electricity demand behaviour**
- ❑ **DG, RES, DR/DSM**
 - Policies
 - Status and Target
 - Perspective
- ❑ **Renewable energy challenges**
- ❑ **Control Centre for the special Regime (CECRE)**
- ❑ **Interruptibility service**

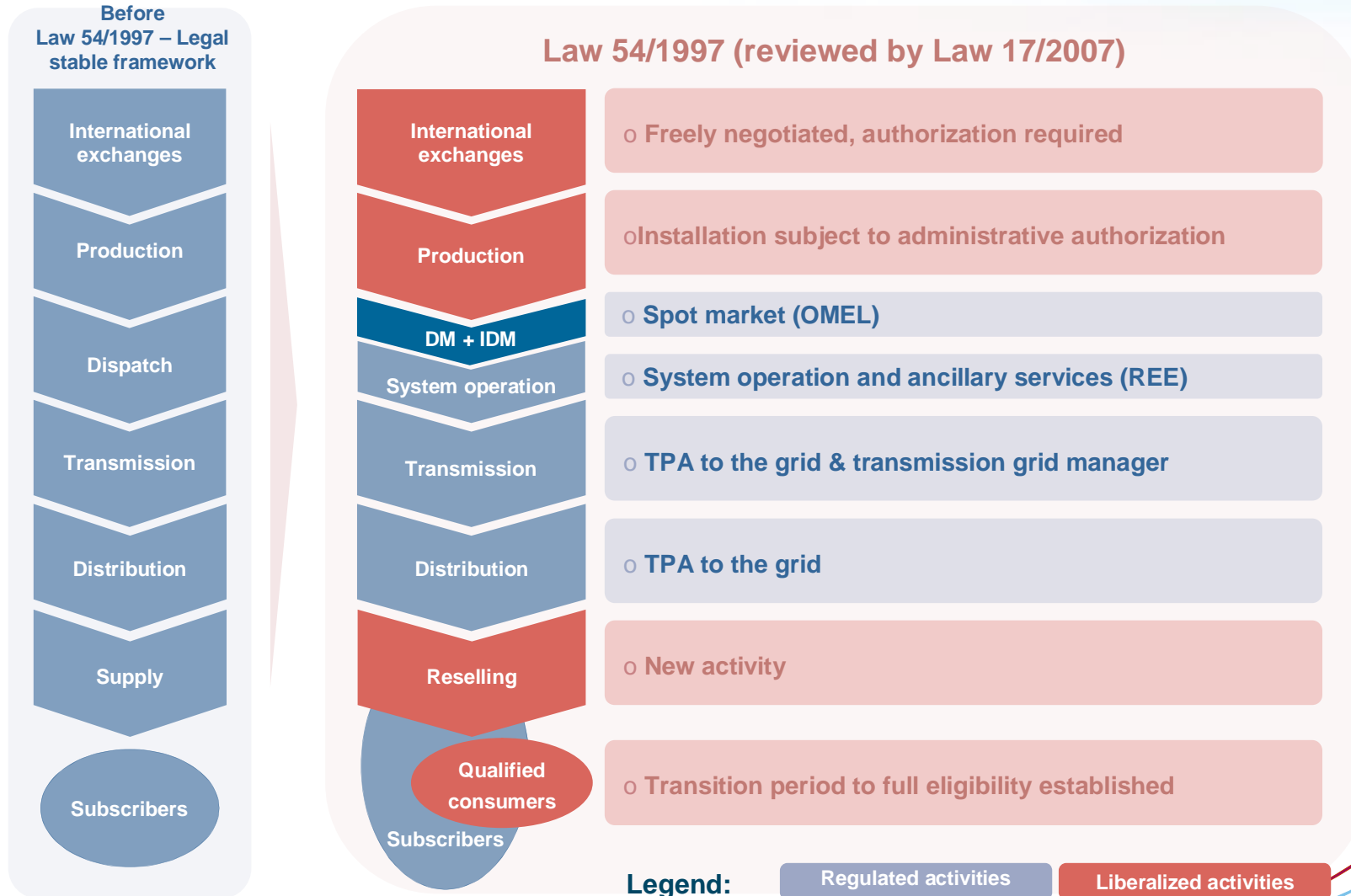


The Spanish electricity system



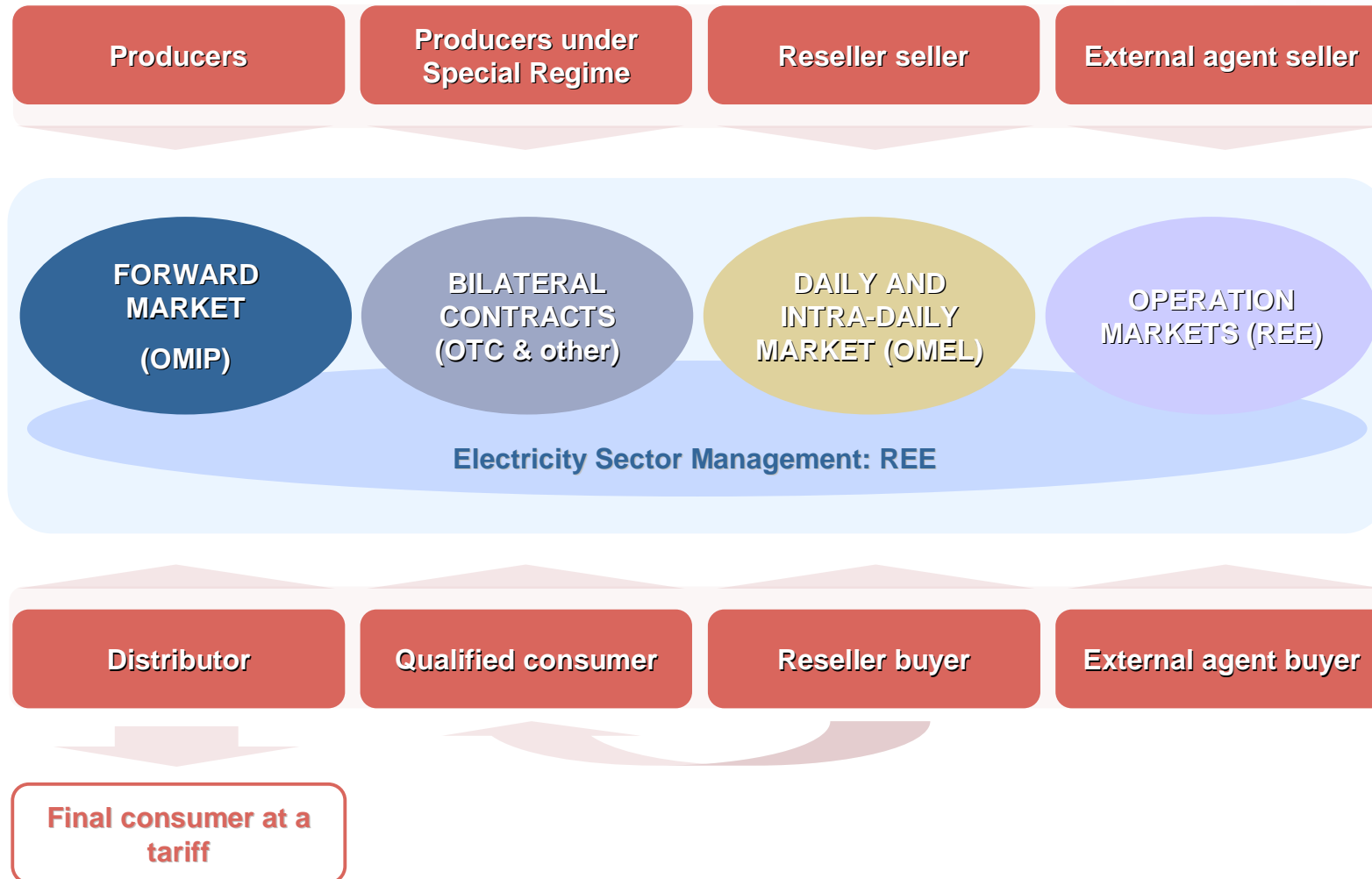


The activities according to Law 54/1997





General scheme of the electricity market



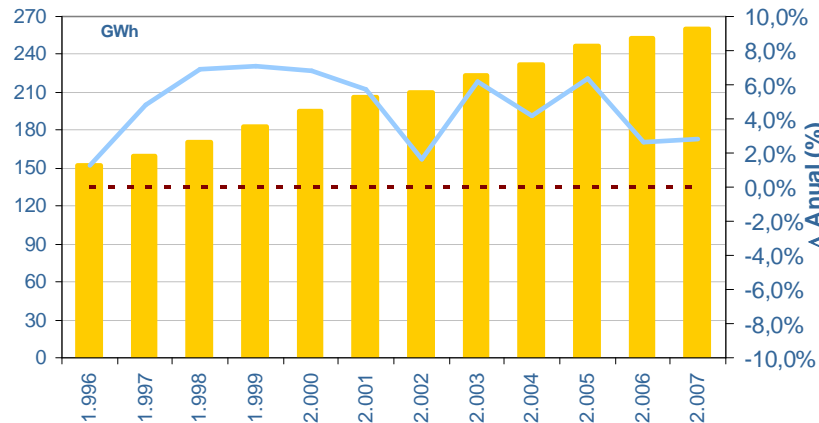


Electricity demand behavior

1

Sustained growth

Demand evolution 1996-2007

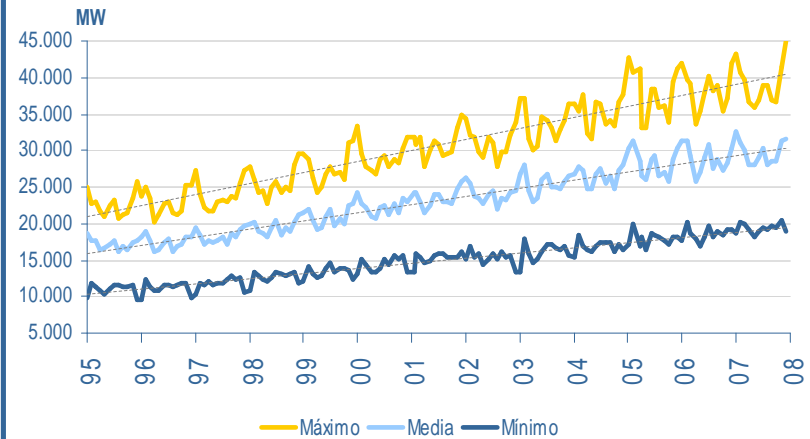


Average year-to-year growth of 5% since 1996

2

Peak demand growth

Monthly peak evolution

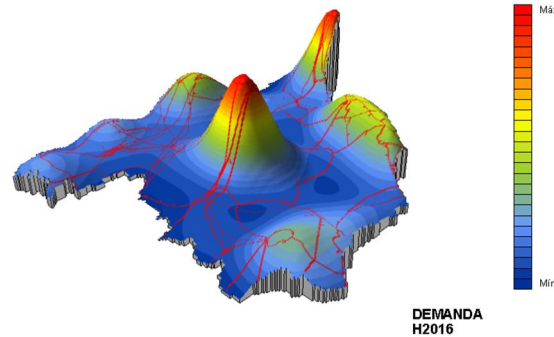


Peak demand growth is higher than average demand increase

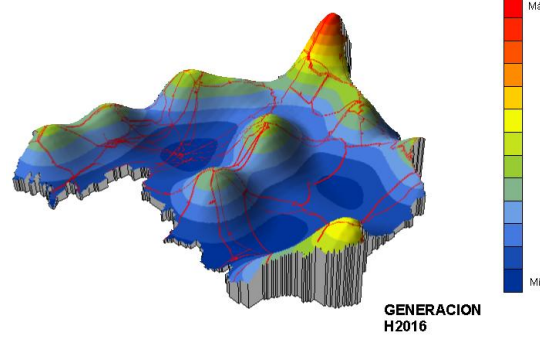


Increasing need for infrastructure. Geographic vision

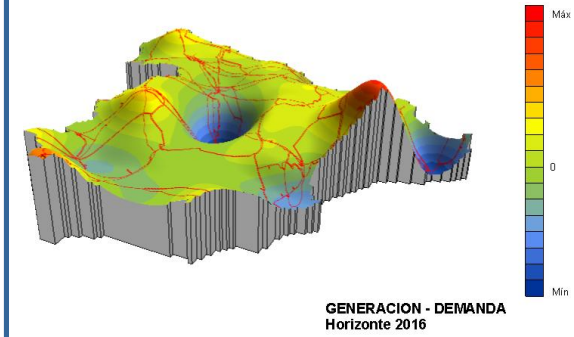
1



Demand



Generation



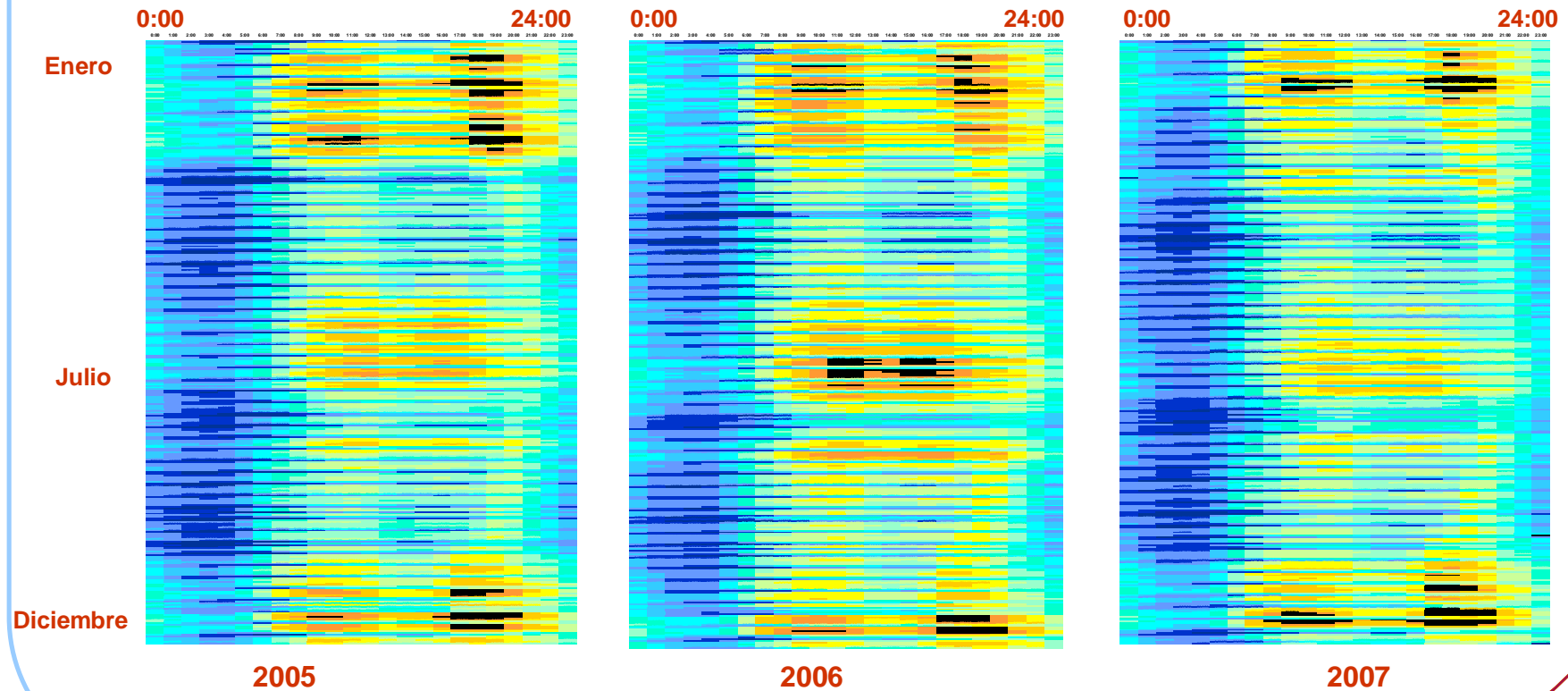
Generation - Demand

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

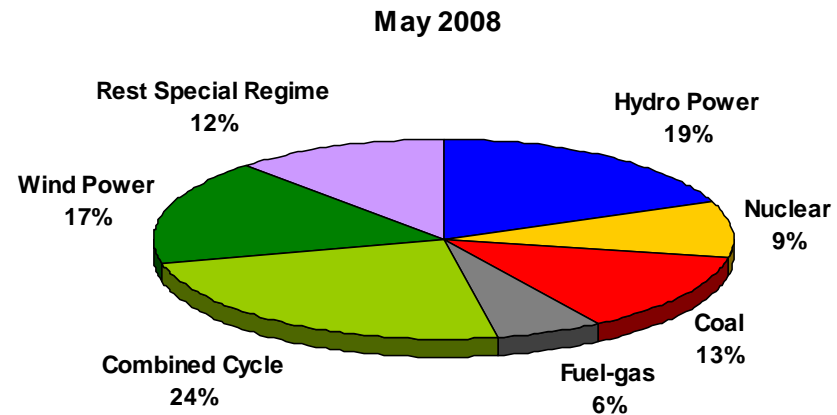
- RES, CHP & Waste up to 50 MW
- Establishes administrative procedures to be followed to install the facility
- Provides two options to sell electricity: guaranteed price / premium
- Offers incentives for frequency control
- Offers higher payment for most efficient CHP plants

DR/DSM: Smart metering down to household consumers

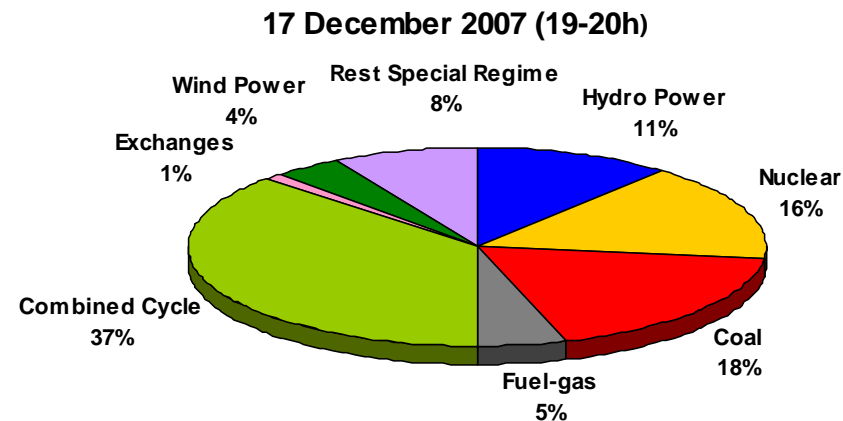


Status and target for DG, RES, DR/DSM

System Installed capacity* - May 2008:
87,919 MW

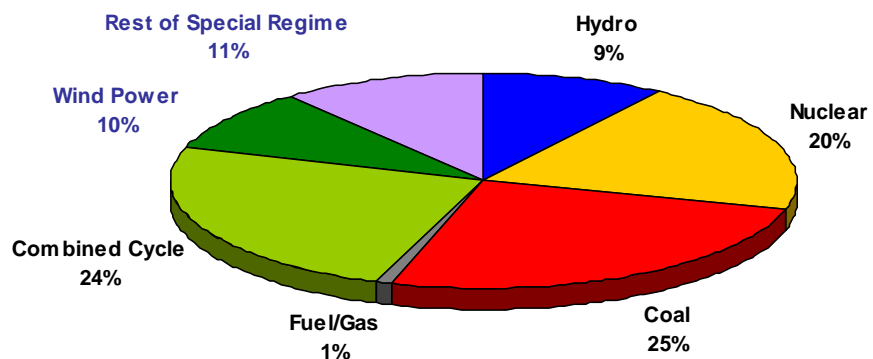


Record peak demand – December 17th 2007 (19-20h):
44,880 MW

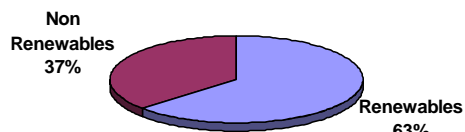


* Inland System

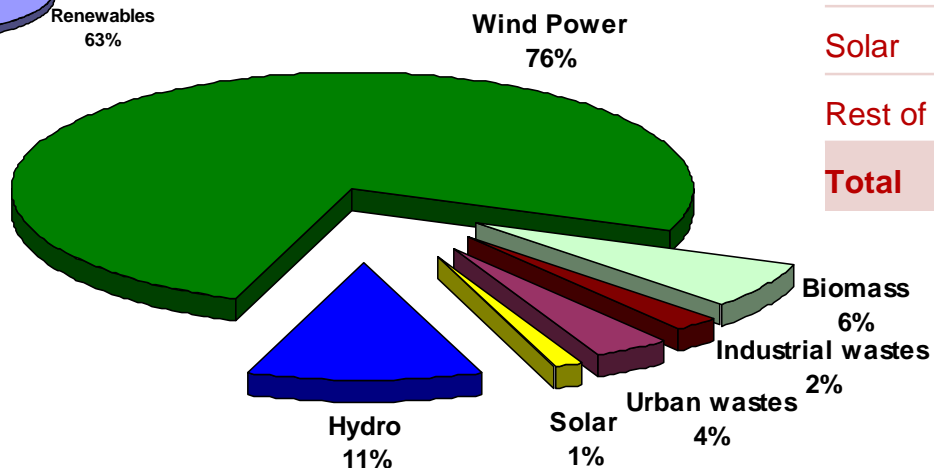
Energy sold to the system by DG in 2007



Special Regime



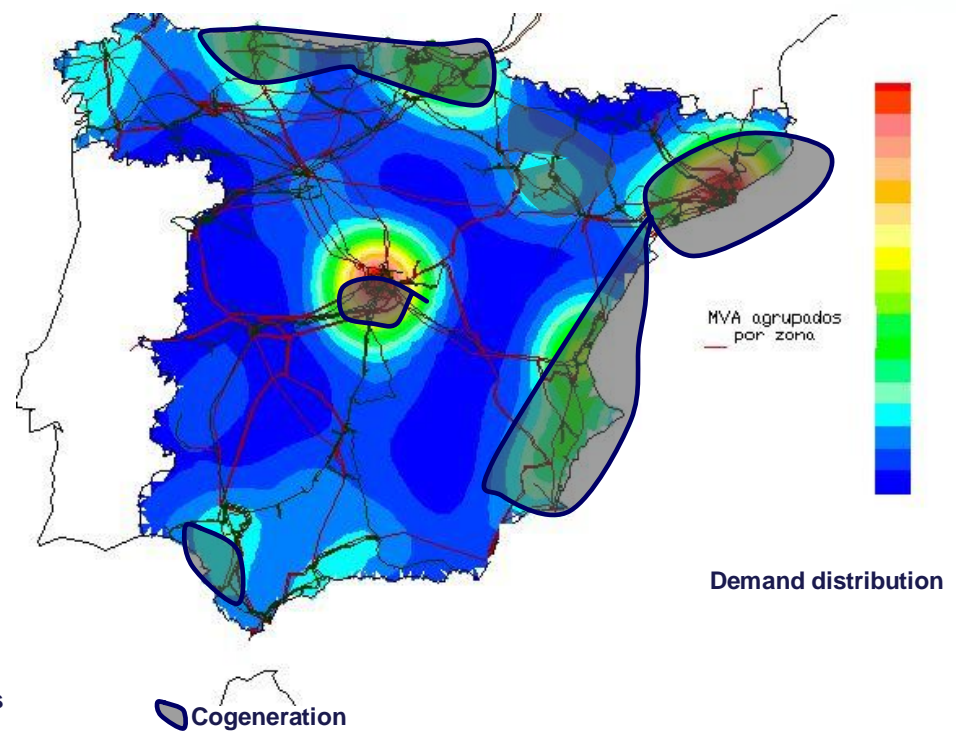
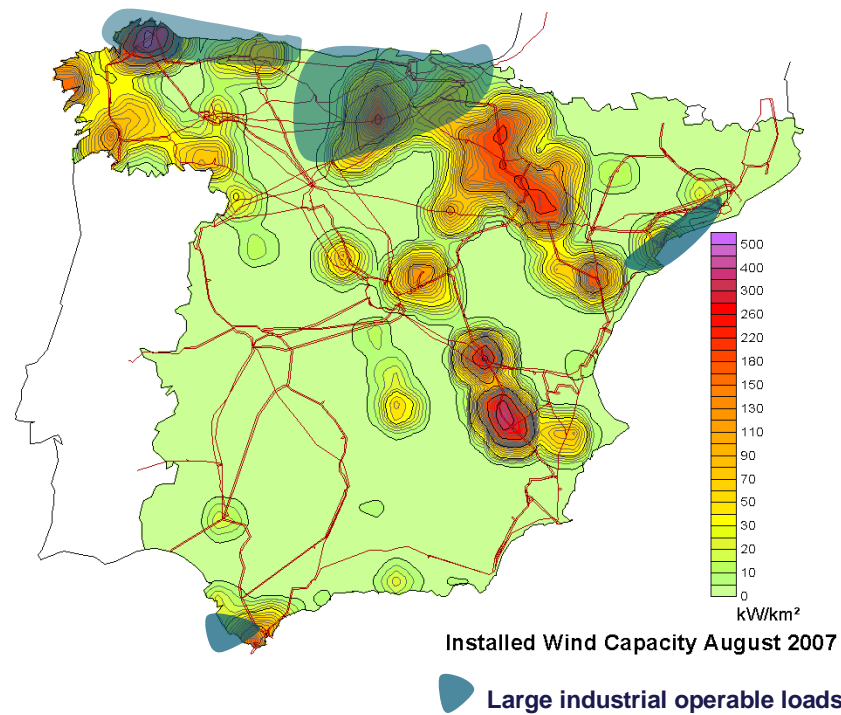
Renewable



Total Gross Generation	Energy (GWh)	%
Total	280 127	100
Distributed Generation (Special Regime)	Energy (GWh)	%
Renewable	35 730	12.8
Non Renewable	20 574	7.3
Total	56 304	20.1
Renewable	Energy (GWh)	%
Wind	26 888	9.6
Solar	457	0.2
Rest of Renewable	8 385	3.0
Total	35 730	12.8

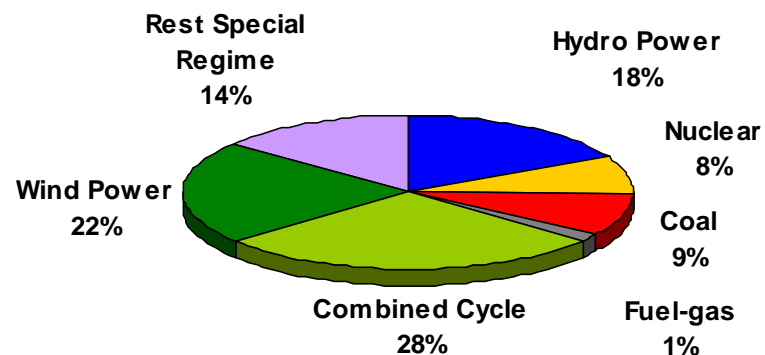


Geographic distribution of wind - DR and CHP - demand

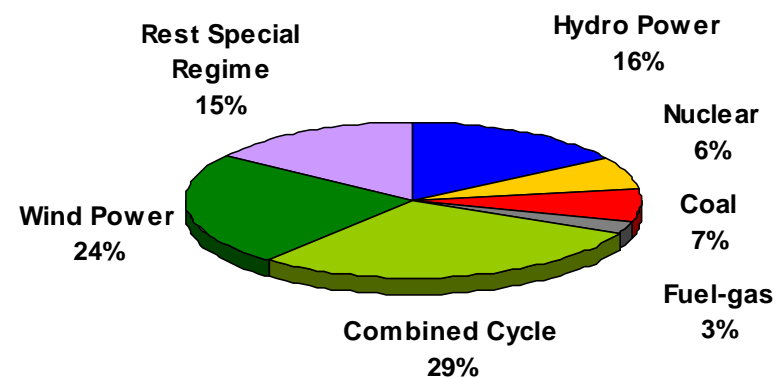


Perspectives for DG (S.O. prevision for years 2011 and 2016)

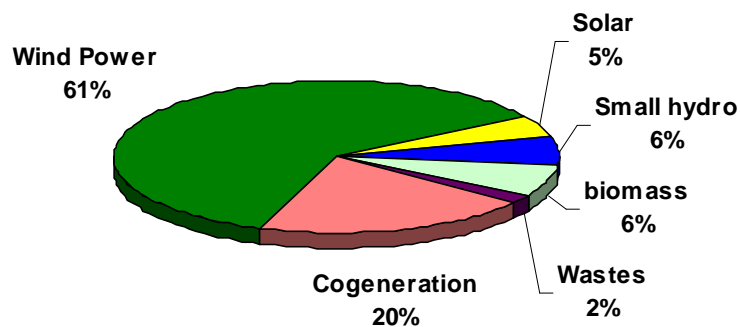
System Installed capacity* 2011: **100,586 MW**



System Installed capacity* 2016: **121,643 MW**

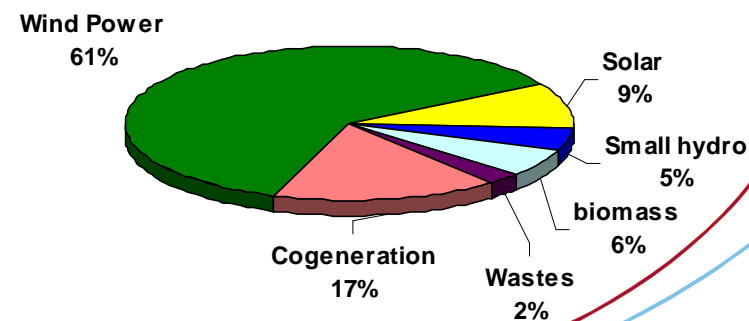


Special Regime capacity* 2011: **36,380 MW**



* Inland System

Special Regime capacity* 2016: **47,670 MW**





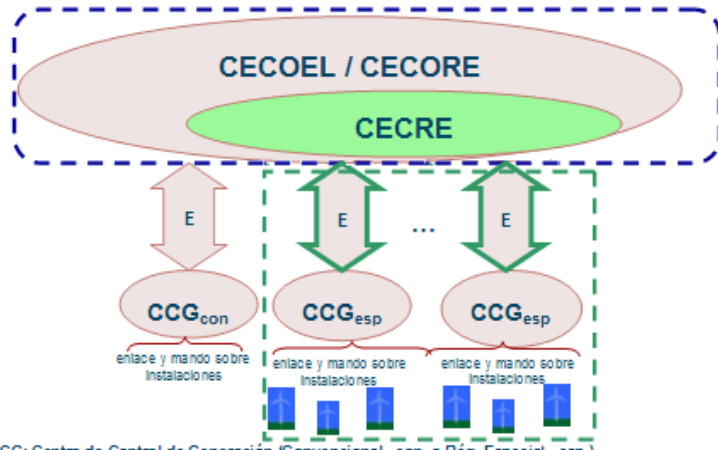
Renewable Energy Challenges

- ❑ **Challenging characteristics of intermittent power sources:**
 - Uncontrollability
 - Variable production
 - Difficult forecast
 - Wind: ride through capabilities (with high penetration)
- ❑ **Consequences:**
 - Increasing need for balance power and reserve capacity
 - Possible grid congestions
 - Increase of grid losses in some cases
 - More reactive power compensation might be needed in some cases
 - In some cases, load flows can affect neighbouring transmission systems and/or the available cross border trading capacities



Control Centre for the Special Regime (CECRE)

- ❑ **Generation Control Centres (CCG):** Installations over 10 MW must be attached to a control centre that maintains communication with the System Operator and that transmits instructions from the S.O. to the producer, with the scope of keeping the reliability of the system at desired levels. (RD 1454/2005)
- ❑ **System Operator's position:**
 - Elaboration of legislative proposals
 - **Creation of the Control Centre for the Special Regime (CECRE)**
 - For the Supervision and control of all installations included in the Special Regime (renewable, cogeneration and wastes) over 10 MW
 - It seeks to maximise the penetration of Special Regime generation technologies in the operation of the system without endangering its security and efficiency
 - It communicates with installations through Generation Control Centres
 - It is associated to the CECOEL/CECORE, the Electric Control Centre



CCG: Centro de Generación (Convencional -con- o Rég. Especial -esp-)
E: Enlace (lccp)



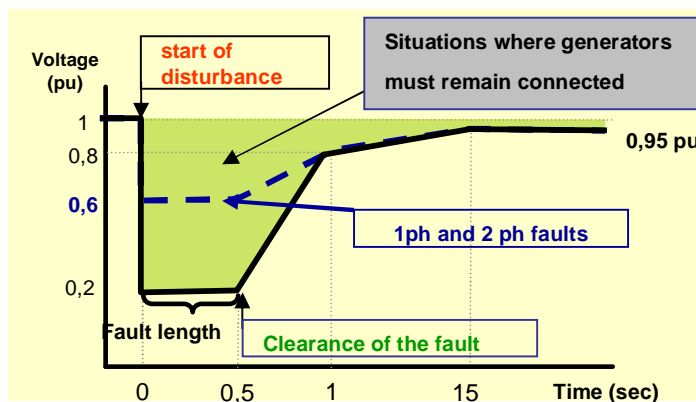
□ Main objectives and functions of the CECRE:

- Integrate the Special Regime energy production taking into account the necessities of the electrical system
- Receive in real time the relevant information to manage the system
- Give to the CCGs the setting of the maximum power output per node
- Coordinate maintenance plans of the transmission system with those of the rest of the system
- Get the dispatchable generation programs and give generation previsions for non dispatchable generation (wind energy)



Network Access. Voltage Dip Generation Tripping 01/06/05-31/05/07

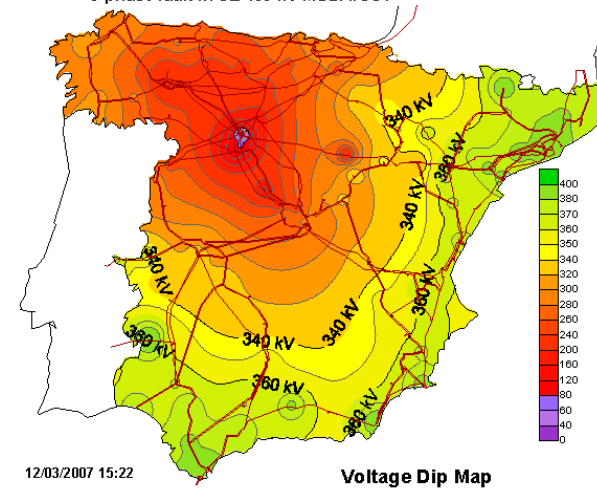
Operational Procedure 12.3



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

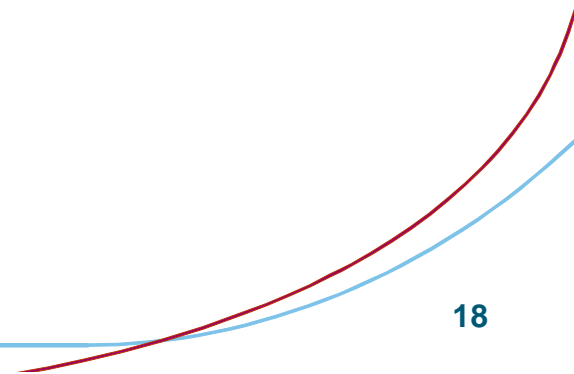
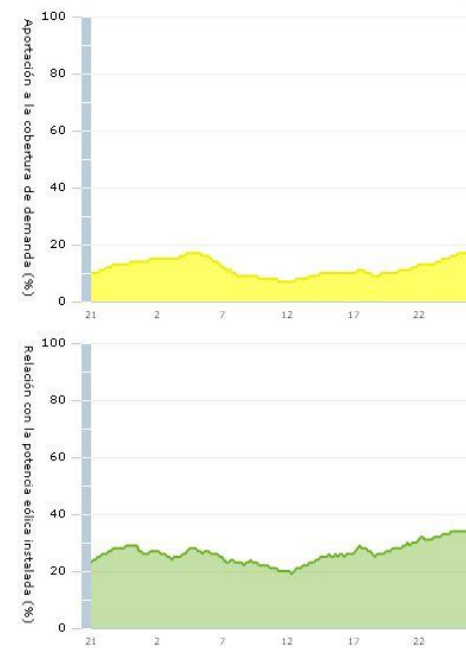
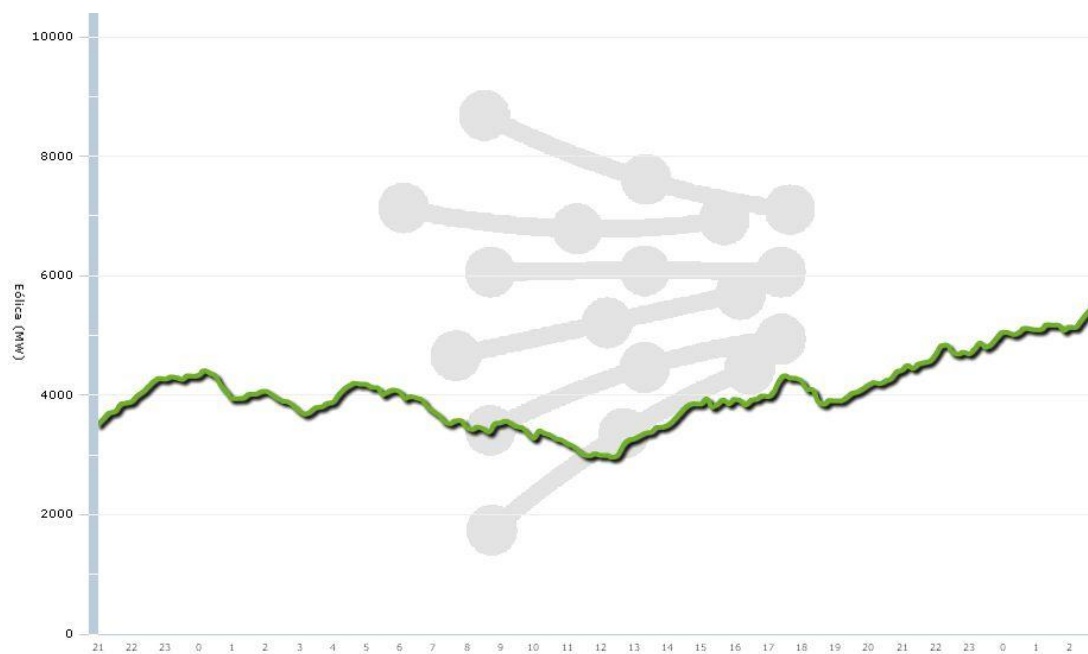
Real Time Risk Assesment

3-phase fault in SE 400 kV MUDARRA





Wind energy production curve in November 19th, 2007





Interruptibility service



19 of November of 2007

✓ Interruptibility "C" used from 17:40 to 20:40 h & from 17:45 to 20:45

✓ Interruptibility "C" used from 19:00 to 22:00 h & from 19:05 to 22:05

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

