Inputs for the

Framework Guidelines on Grid Connection

Key concepts and comments on the draft Impact Assessment

Juan Jose Alba Rios
Chairman of EURELECTRIC WG Wholesale Markets & Trading

ERGEG Workshop on FG on electricity grid connection
Brussels, April 16 2010

Agenda

1. Preliminary considerations: connection and access
2. Connection: investment and operational requirements
3. Some solutions and recommendations

Preliminary considerations: Connection and access are two closely linked issues

Connection:

Installations which have to be developed to link the existing grid with the new generation (or load) facilities:

- It does not modify the existing network.
- But could require network reinforcements
- Connection procedures also involve the technical conditions/requirements which should be applied for all the lifetime of the connected facility.

Access:

The right to deliver (or take) energy to/from the grid.

- Is the existing grid capable of moving freely the energy
- Would the generation output (or consumption) be restricted depending on some external variables, out of the users' control?

Two separate network codes, but need for a common framework

eurelectric
ELECTRICITY FOR EUROPE

Preliminary considerations: Connection and access are two closely linked issues

Connection (Performance) ⟺ Access (Capacity)

Terms for connection & access

SECURITY

1. Efficient cost allocation:
   - No cross subsidies
   - No stranded investments
   - No windfall profits

2. Do not jeopardize security of supply
   - Harmonization of requirements and criteria for RES and non-RES

MARKET

3. No discrimination
   - Among RES
   - Between RES and non-RES
   - For administrative procedures
   - For connection & reinforcement cost allocation

4. Do not hamper market integration

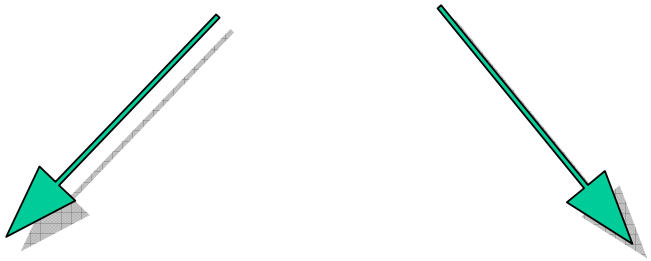
To avoid:

- Investment risk
- Access conflicts
- Discriminations
- Disturbances

Preliminary considerations: Access - capacity reservation

Existence of capacity reserve of the network

- When assessing access capacity, how should existing generators be treated?
- How should expected generators be treated?



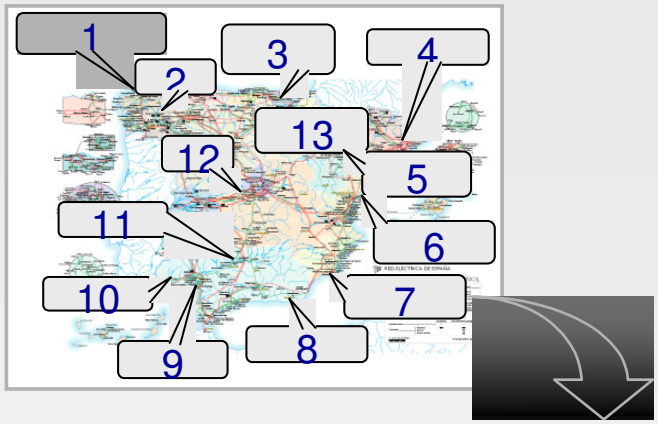
- For existing agents
- For new agents

- For RES
- For No-RES generators

Risk of creating stranded investments

Access and capacity reservation: Example - *North-Western Spain*

Limitation on production of several thermal units



Causes

- **a** Insufficient investment
  - **Insufficiency of the Cartelle-Compostilla transmission line**
  - **Increase in the installed wind production connected to the same line**
- **b** Delays **(see next page)**
- **c** Lack of mitigating operational measures

Connection (and access): Investment and operational decisions

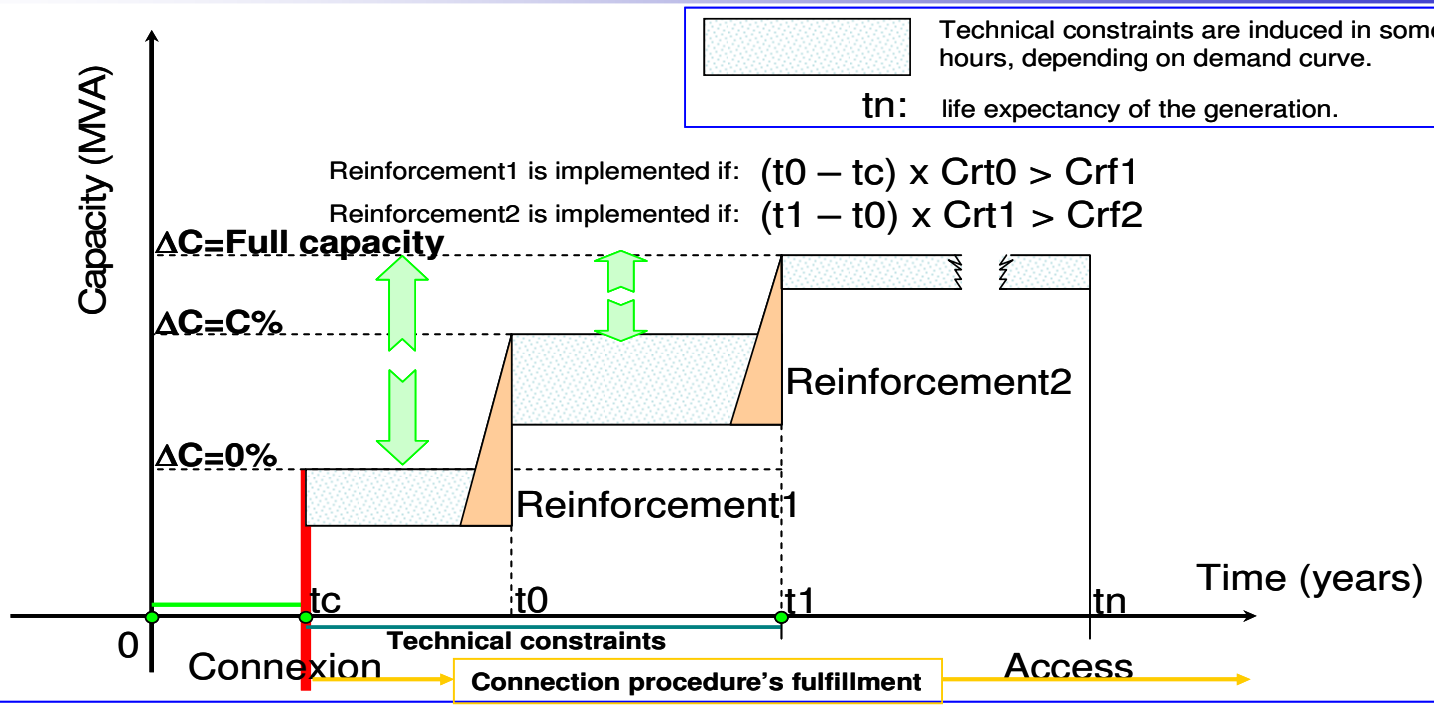
1. Investment decisions

- What kind of connection should fulfill the operational requirements depending on the user?
- Is the capacity of the existing network enough? Any reinforcements needed?

2. Operational requirements

- How should the connected generation (load) behave
  - ✓ Facing disturbances?
  - ✓ Providing/using ancillary services?
- If capacity is not enough, how will constraints be managed in the operation/dispatch?

Connection: investment decisions
When do we need to expand the network?



Crf1:	Network reinforcement cost, so that generator can evacuate C% of total generation capability.
Crf2:	Network reinforcement cost ,so that generator can evacuate 100% of total generation capability.

tc:	Time duration for connexion, since application.
t0-tc:	Time duration where technical constraints are in place until Reinforcement1's deployment.
t1-t0 :	Time duration where technical constraints are in place until Reinforcement2's deployment.

Crt0:	Technical constraint marginal cost since connexion until Reinforcement1 is in place([1]).
Crf1:	Technical constraint marginal cost since t1 until Reinforcement2 is in place([1]).

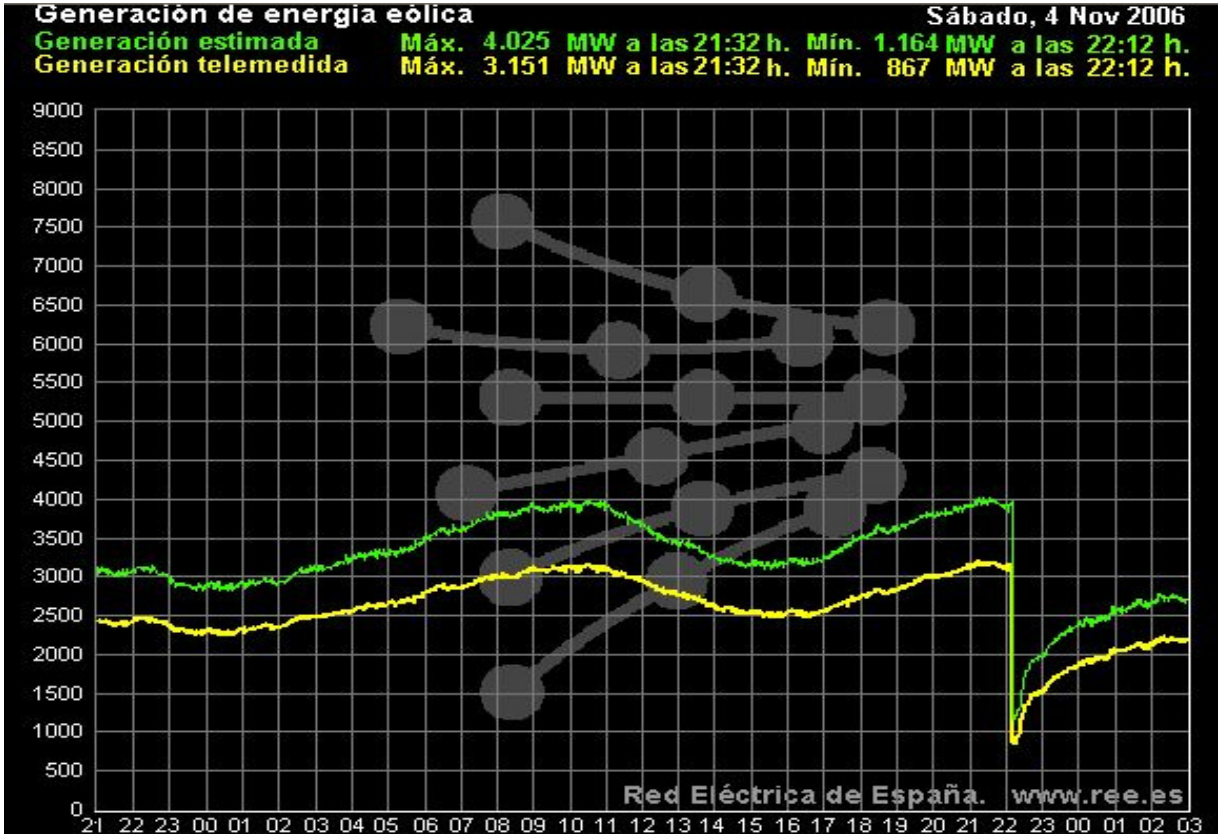
([1]) This cost includes the costs of producing energy in a more expensive way and the cost of loosing primary energy in the cost effective or renewable way.

Connection: operational requirements

What do we need to require from connected entities?

- ✓ Operating frequency
- ✓ Operating voltage range
- ✓ Frequency control and active power reserves
- ✓ Reactive power generation and voltage control requirements
- ✓ Specific connection requirements
- ✓ System stability requirements
- ✓ Protection schemes and settings
- ✓ Controllability and real-time information exchanges
- ✓ Black-start capability, house load operation, island grid operation
- ✓ Testing of requirements
- ✓ Allowed disturbance level (EMC)
- ✓ Protection schemes and settings
- ✓ Load shedding
- ✓ Information exchange
- ✓ Coordination with TSO/DSO
- ✓ Fault analysis
- ✓ System restoration after collapse (OEP)
- ✓ Etc.

Connection: operational requirements
An example of what could go wrong



- Nov/4/2006: incident occurred in the German HV grid caused a temporary frequency fall in the majority of the European Electricity System
- In Spain, this led to the automatic disconnection of 2.800 MW of wind generation: at the time, wind producers were not requires to stand frequency
- This bad regulation resulted in a major power supply failure
- Wind generators are now required to support voltage and frequency dips.

What do we expect from the code (1)?

Two issues to be addressed

1. Connection behaviour, facing network disturbances
2. Allocation of costs for connections, reinforcements and management of constraints, avoiding cross subsidies

quality and security of supply

efficiency and competitiveness

Harmonization of connection requirements:

- ➔ Uniform criteria, based on technical characteristics of the generators, for
  - ➔ Technical requirements of the connection
  - ➔ Behaviour of the generator when facing disturbances
  - ➔ Requirements and incentives concerning Ancillary Services

Harmonization of cost allocation criteria:

- ➔ Uniform rules to allocate
  - ➔ Connection costs
  - ➔ Network reinforcement costs
  - ➔ Constraint management

For all generators, RES and non-RES

What do we expect from the code (2)?

- Definition of roles: TSOs, DSOs, generators, (loads?)
- Clarity, transparency and non-discrimination of connection requirements for generators
  - All solutions have an impact on competition and on existing generators
- Cost effective criteria for a safer connection to the network:
  - When is network reinforcement preferred to constraint management?
  - Who will be bear the cost?
  - Which are the economic incentives for an efficient solution?