

## Fault Ride Through – European Developments



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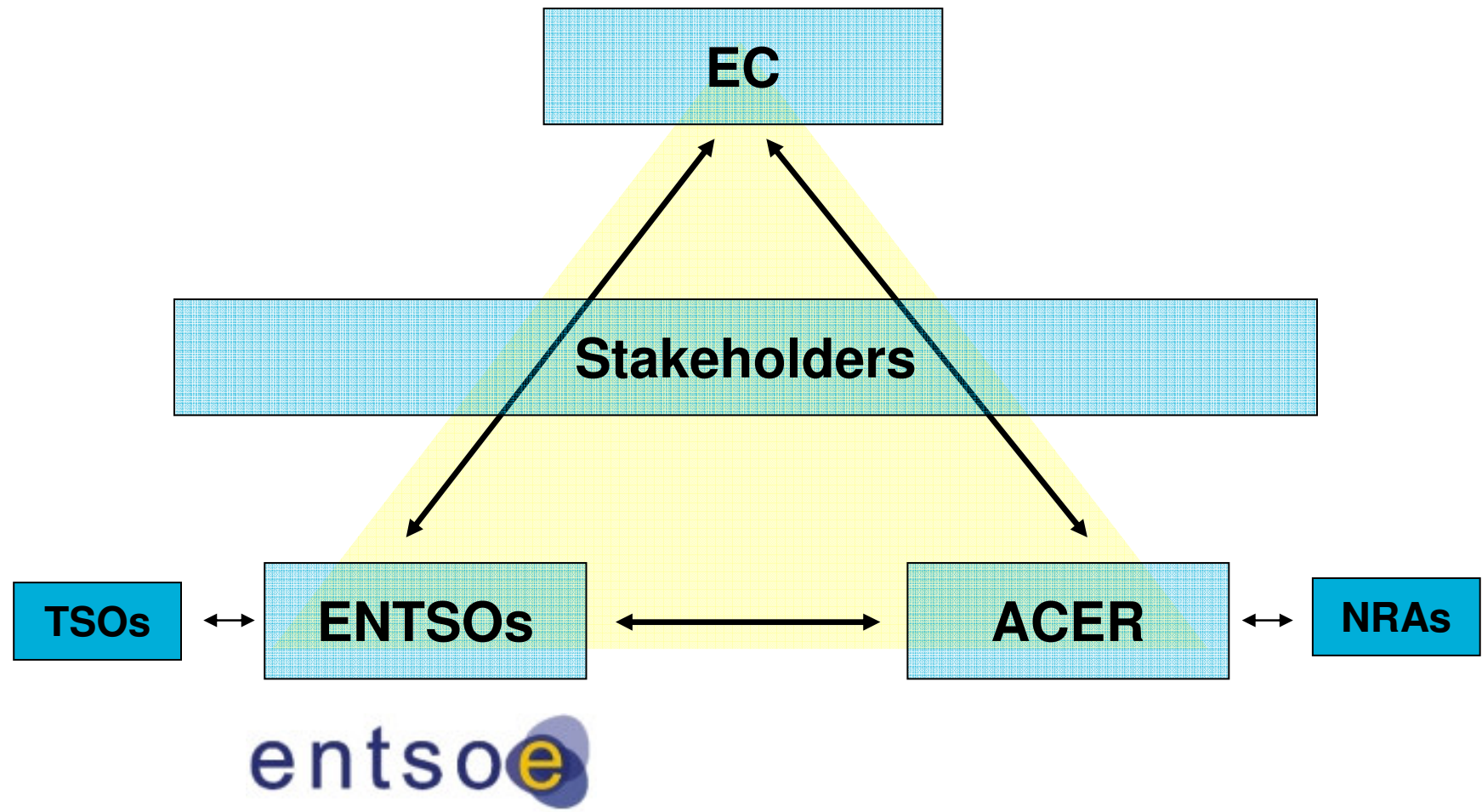
# The European Grid Code

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- Background to the European Code
- ENTSO-E RfG Fault Ride Through requirements
- ENTSO-E RfG Fault Ride Through Profiles
- Comparison with current GB Code
- Early adoption of the ENTSO-E RfG may be a possible way forward

# Third Energy Package: Code Development

## The 3 main bodies given the responsibilities



# One FWGL gives rise to four Network Codes

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Early priority Network Codes (NC), available for a pan European market in Electricity by end 2014

- Requirements for Generators (RfG)
- Demand Connection Code (DCC)

To follow on shortly thereafter

- HVDC Connection Code (HCC)
- Connection Procedures Code (CPC)

# ENTSO-E Requirements for Generators - Process

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- In January 2012 the ENTSO-E Network Code Requirements for Generators was published for consultation
- 6052 comments received following consultation closure in March 2012
- Revised RfG Code issued in June 2012
- The RfG Code will be submitted for Comitology later this year with approval expected in 2013 and implementation subsequently taking place over the next few years (with the other codes) scheduled for 2016
- Once implemented, the European Code will sit above the National Codes and be binding
- The RfG contains mandatory requirements for Fault Ride Through with specific parameters being specified by the National TSO (ie NGET but subject to Regulatory Approval).

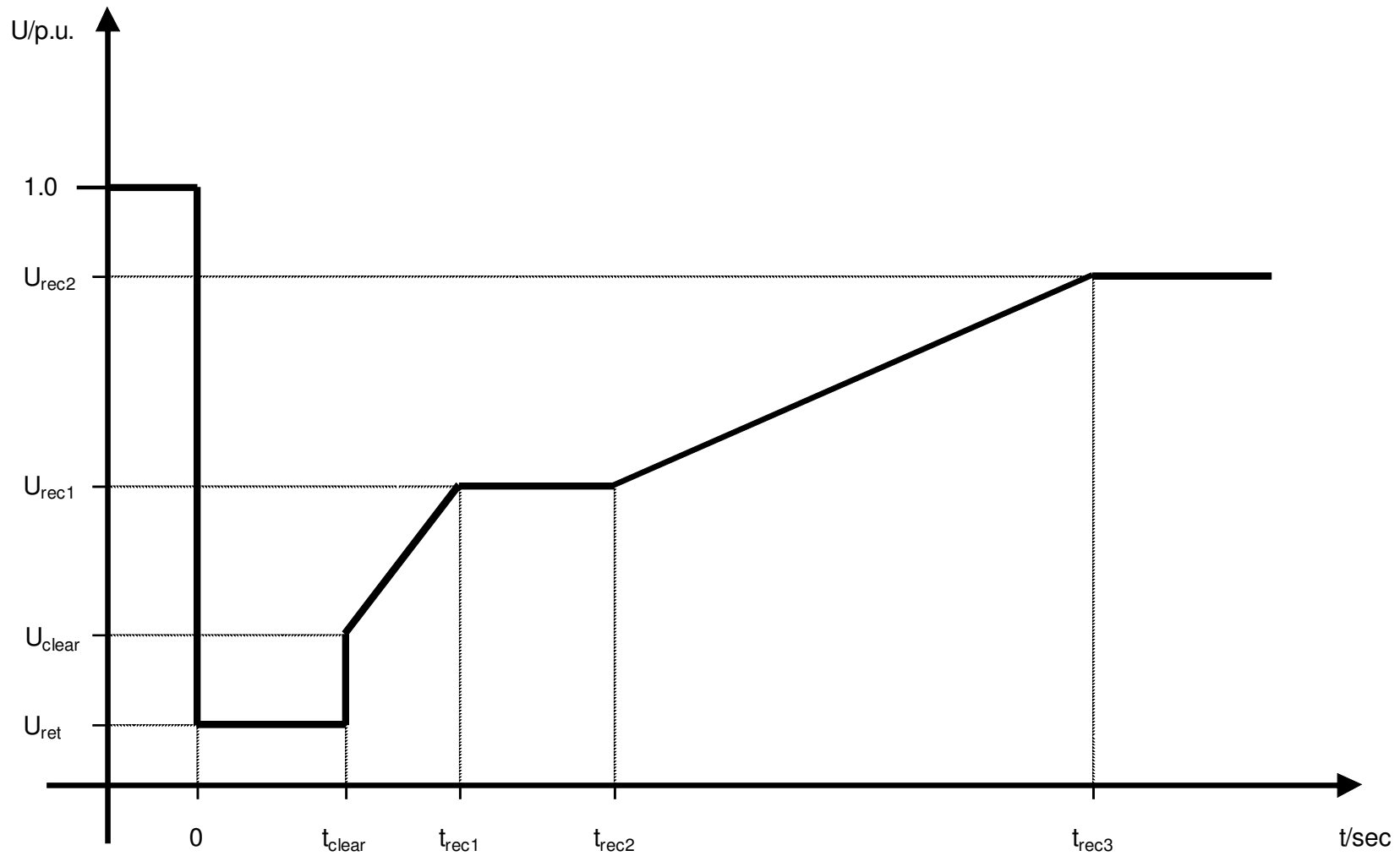
# European and GB Generation Thresholds

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- In GB the Grid Code defines Generating Units and Power Park Modules as to the size of Power Station to which they reside. These definitions vary as to the Transmission Area to which the Power Station is located
    - Small
    - Medium
    - Large
  - In Europe, classification is based on Generating Unit or Power Park Module size with requirements specifically adjusted to each Synchronous area. In Europe the current proposed thresholds are:-
    - Type A – 800W – 1MW and connected below 110kV
    - Type B – 1MW – 10MW and connected below 110kV
    - Type C – 10MW – 30MW and connected below 110kV
    - Type D – 30MW and above or connected at or above 110kV

# ENTSO-E RfG - Fault Ride Through Requirements

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- Defined by a Voltage against time profile
  - The profile shape is defined by the ENTSO-E Network Code RfG but the specific parameters are defined by each TSO within the range set by the ENTSO-E RfG.
  - In these examples, Type D Generating Units will be used as the fault ride through issues being considered as part of this workshop are largely associated with directly connected synchronous generating units.
  - Under the ENTSO-E, Fault Ride Through requirements also apply to Type B and C Units but are outside the scope of this presentation.

# ENTSO-E RfG - Fault Ride Through Requirements – Voltage Duration Profile – Figure 3





# ENTSO-E RfG - Voltage Duration Parameters – Table 7.1 – Type D Units

Voltage parameters [pu]		Time parameters [seconds]	
Uret:	0	tclear:	0.14 – 0.25
Uclear:	0.25	trec1:	tclear – 0.45
Urec1:	0.5 – 0.7	trec2:	trec1 – 0.7
Urec2:	0.85 – 0.9	trec3:	trec2 – 1.5

Table 7.1 – Fault Ride Through Capability of Synchronous Power Generating Modules

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  - Questions