Stakeholder discussion EUR

Network Code for Generators

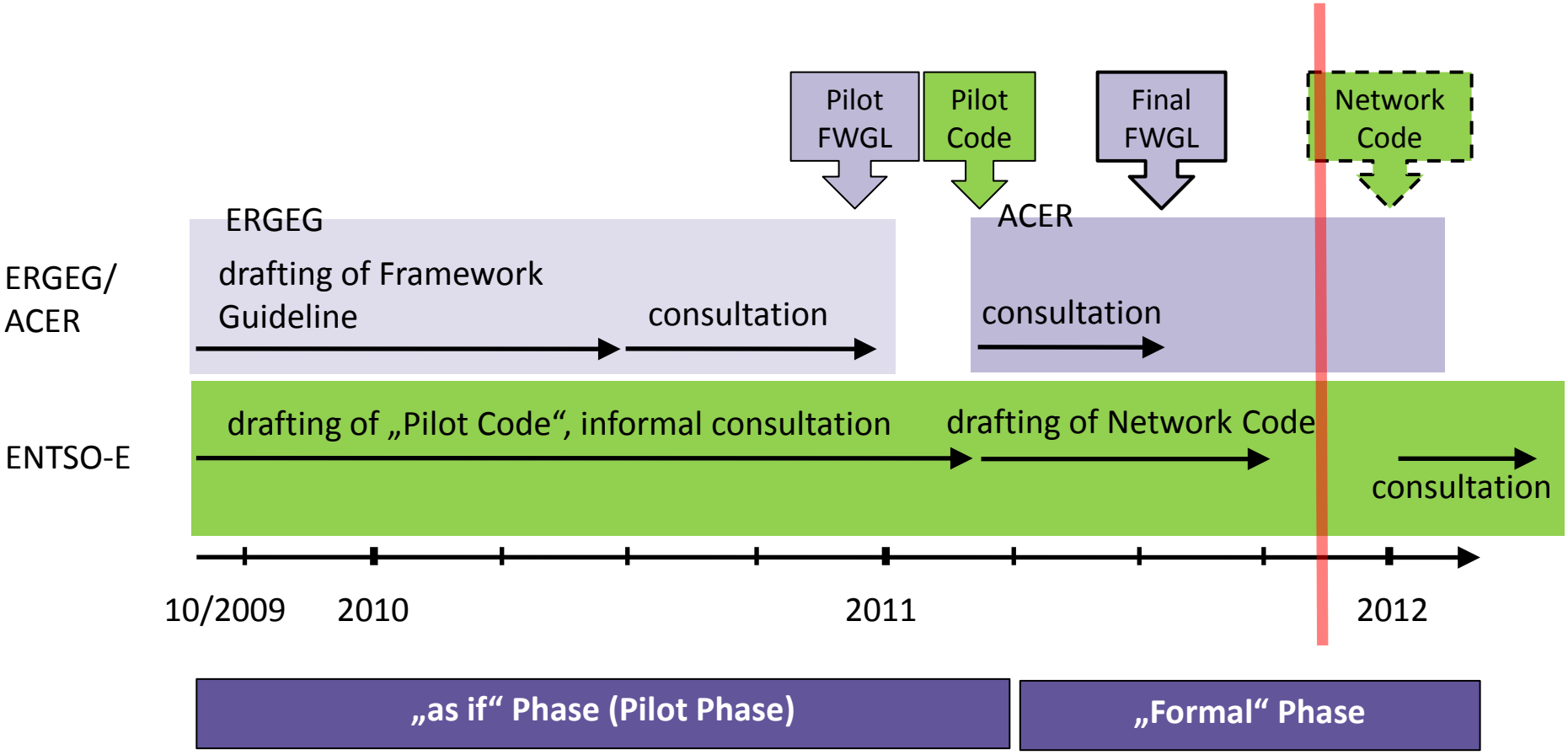
10 November 2011, London
10h00 – 13h00

entsoe
Reliable Sustainable Connected

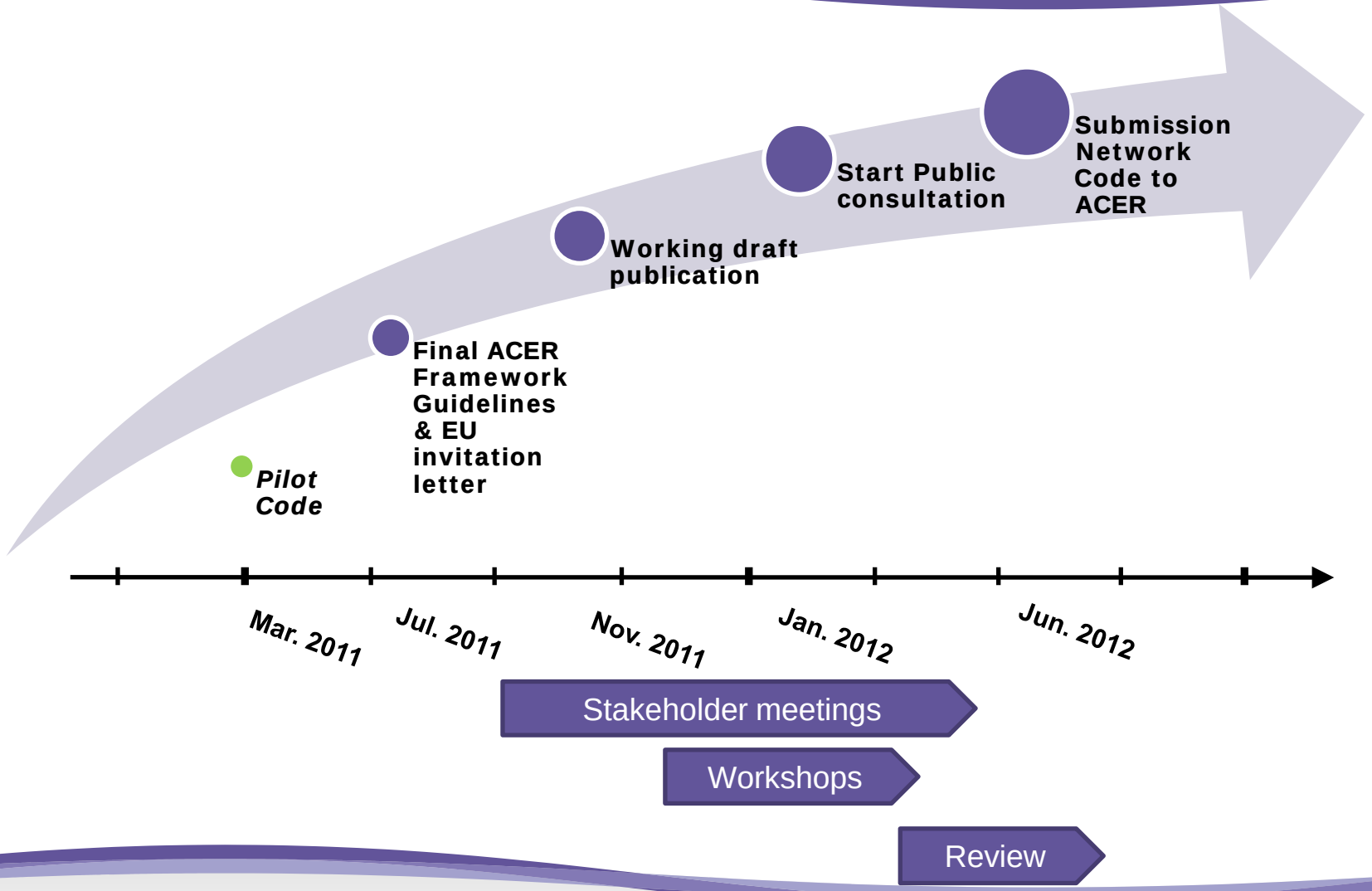
Agenda

- Status and next steps Network Code development
- Most relevant requirements/evolutions in latest working draft publication
- Key comments EUR and discussion

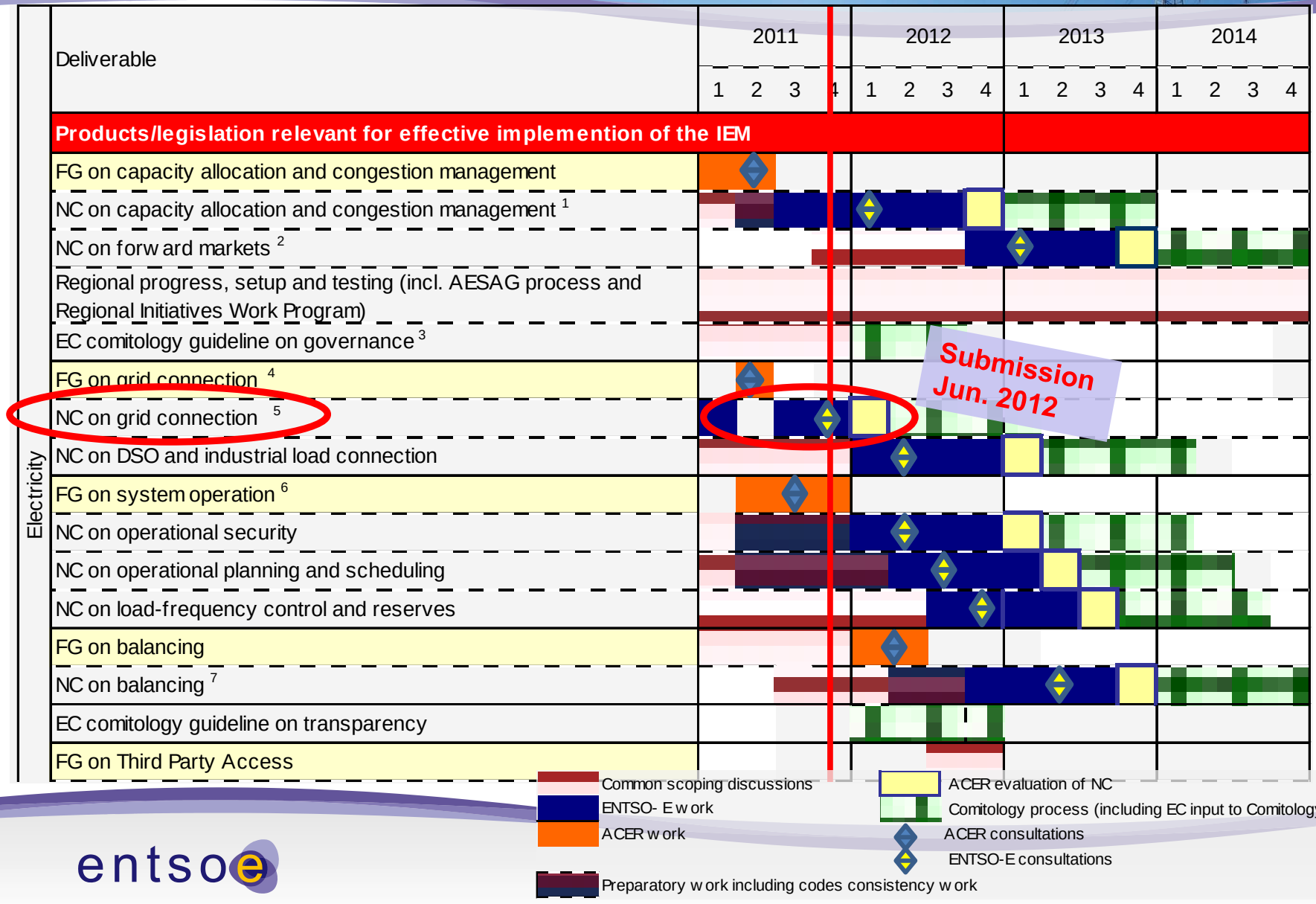
General overview Network Code timeline



Formal Network Code phase



EC/ACER/ENTSO-E program



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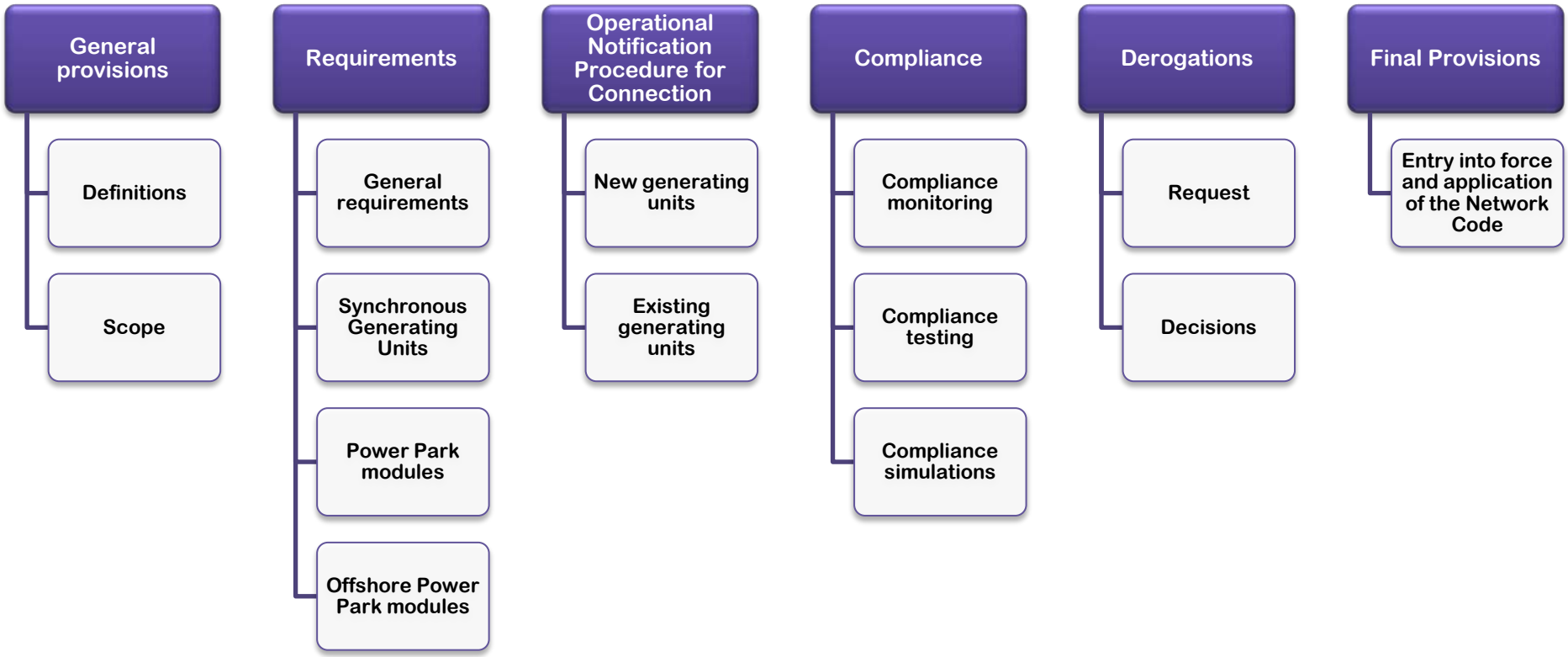
Network Code structure



Most relevant updates in recent working draft (27 Oct. 2011)

- General clauses referring to agreements, outside of the Network Code
- **Definition of Existing Generating Unit (Art. 3)**
- **Categorisation Type A-B-C-D users (Art. 3)**
- **Tripping due to frequency/voltage deviations (Art. 7-10)**
- Rate of change of active power (Art. 9)
- Reactive Power requirements for PPM (Art. 14-16)
- **Retro-active fitting (Art. 28)**
- **Request and decision of derogations (Art. 53-54)**

Cross-border issues

(EC) 714/2009 – Art. 8 (7)

- *"The network codes shall be developed for cross-border network issues and market integration issues and shall be without prejudice to the Member States' right to establish national network codes which do not affect cross-border trade"*

Context 3rd Energy Package

- supporting the completion and functioning of the internal market in electricity and cross-border trade
- facilitating the targets for penetration of renewable generation
- maintaining security of supply

ENTSO-E definition

- All requirements that contribute to maintaining, preserving and restoring system security in order to facilitate proper functioning of the internal electricity market within and between synchronous areas, and to achieving cost efficiencies through technical standardization shall be regarded as "**cross-border network issues and market integration issues**".

Cross-border issues

Why are even small domestic units considered?

- One 5kW PV panel his negligible impact on a synchronous area level.
- What if all units respond similarly to a given stimulus? E.g. disconnection on a sunny day of 200.000 units of 5kW at a frequency rise of 50.2Hz results in a sudden production loss of 1000MW

How can a voltage problem be a cross-border issue?

- A frequency deviation is measured system wide.
- A voltage dip/rise could be a local issue, which can be locally resolved.
- A voltage dip/rise could occur system wide, resulting in a voltage collapse if no **coherent action** is taken. Note: a local measurement cannot identify a starting voltage collapse.

Cross-border issues

Automatic disconnection due to frequency deviations prohibited within the following ranges

Frequency Range	Time period for operation				
	Continental Europe	Nordic	Great Britain	Ireland	Baltic
47.0 Hz – 47.5 Hz			20 seconds		
47.5 Hz – 48.5 Hz	To be determined* by each TSO, but not less than 30 minutes	30 minutes	90 minutes	90 minutes	90 minutes
48.5 Hz – 49.0 Hz	To be determined* by each TSO, but not less than the period for 47.5 Hz – 48.5 Hz	To be determined* by each TSO, but not less than 30 minutes	To be determined* by each TSO, but not less than 90 minutes	To be determined* by each TSO but not less than 90 minutes	To be determined* by each TSO, but not less than 90 minutes
49.0 Hz – 51.0 Hz	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited
51.0 Hz – 51.5 Hz	30 minutes	30 minutes	90 minutes	90 minutes	90 minutes
51.5 Hz – 52.0 Hz			15 minutes		

** under the conditions and within the existing national framework, and respecting the principles of transparency, publicity and non-discrimination*

Categorisation of Users

ACER Framework Guideline on Electricity Grid Connection

- *"The network code(s) developed according to these Framework Guidelines shall define appropriate minimum standards and requirements applicable to all significant grid users."*
- *"The minimum standards and requirements shall be defined for each type of significant grid user and shall take into account the voltage level at the grid user's connection point. The network code(s) shall specify the criteria and methodology for the definition of significant grid users. These shall be based on a predefined set of parameters which measure the degree of their impact on cross-border system performance via influence on control area`s security of supply, including provision of ancillary services ("significance test")…"*

Significant users

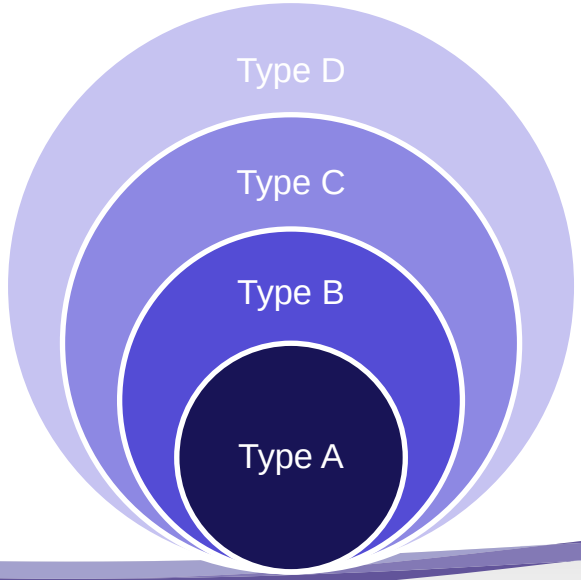
- **Generator capabilities are formulated from a system performance perspective, independent from technology**
- **Need to be able to cope with evolutions in generation mix**
- **Significance is regarded per requirement**

Europe wide balancing services

Refined and controllable dynamic response

Automated response, operator control, information

Common failure mode for all plants (frequency)



Significant users

Network Code gives max. thresholds at synchronous system level

- Criteria based on voltage level (> 110kV → Type D) and MW capacity (table)
- Decision at national level by National Regulatory Authority

Synchronous Area	maximum capacity threshold from which on a Generating Unit is of Type B	maximum capacity threshold from which on a Generating Unit is of Type C
Continental Europe	0.1 MW	10 MW
Nordic	1.5 MW	10 MW
Great Britain	1 MW	10 MW
Ireland	0.1 MW	5 MW
Baltic	0.1 MW	5 MW

Does the Network Code deviate significantly from existing grid codes?

Deviations from existing requirements

The European Network Code will evidently show deviations from existing grid codes

Deviation	Impact
Number of requirements	Modest for most countries
Strictness and range of requirements	Modest for most countries
Units affected by the requirements	Harmonization of requirements to smaller units (also distribution level)
Compliance procedures and tests	Intensity increases

Deviations from existing requirements

ENTSO-E network code is drafted, based on best practices and existing grid codes throughout Europe

Earlier versions of the network code have been challenged in a public consultation (pilot process) and various bilateral discussions

All comments have been thoroughly assessed and if needed integrated in the code

ENTSO-E states that the Network Code does not impose significant variations from existing standards and grid codes

Stakeholders are invited to comment on this if needed in the public consultation (Q1/2012)

New/Existing Generating Units

ACER Framework Guideline on Electricity Grid Connection

"The applicability of the standards and requirements to pre-existing significant grid users shall be decided on a national basis by the NRA, based on a proposal from the relevant TSO, after a public consultation. The TSO proposal shall be made on the basis of a sound and transparent quantitative cost-benefit analysis that shall demonstrate the socio-economic benefit, in particular of retroactive application of the minimum standards and requirements ... The format and methodology or principles of the cost-benefit analysis shall be prescribed by the network code(s)."

Existing Generating Unit

New Generating Units

- The NC applies (unless derogation is granted)

Existing Generating Units

- If NRA decides on retro-active application: The NC applies, superseding other agreements (*process explained in next slides*)
- If not: requirements pursuant to national legislation (even if being repealed) or existing contractual arrangements, remain valid

Quid Existing Generating Units 'under construction'?

- Upon delivery to the Relevant Network Operator
- Within six months period after entry into force of the NC
- Of a final and binding contract for purchase/construction/assembly of main plant
- Which is auditable to verify existence and finality
- → ***considered as Existing Generating Unit***

Retro-active application

ENTSO-E proposes a two-stage approach to assess viability of retro-active application.

If CBA justifies retro-active application for a user or a class of users

Retro-active application

- **If retro-activity for a requirement is not enforced**

  → Existing Generating Unit remains bound by technical requirements pursuant to national legislation or by contractual agreements.

- **If national legislation is repealed**

  → Existing Generating Unit (in case of no retrofitting) remains bound by technical requirements pursuant to national legislation such as it was the day before it ceased to be in force.

- **National legislation**

  → may remain in force, in case it refers to requirements not covered by the Network Code

- **Former derogations to national legislation**

  → are not valid as derogation for the European Network Code, but provide evidently useful information

Retro-active application

A full quantitive CBA is a resource intensive process

➲ A <u>filtering</u> (CBA stage 1) is performed based on engineering review

Cost of modification
Insignificant
Significant

Benefit in reduced demand loss / balancing costs
No/low impact
Significant impact

COST	BENEFIT	ACTION
		1
		2
		2
		3

- 1: Analyse retrofit via Stage 2 CBA
- 2: Make further judgment; check against ENTSO-E library
- No further action

Retro-active application

Green light: reasonable prospect of justifying retro-active fitting

⇨ quantitative CBA (stage 2)

CBA techniques

- Net Present Value / Return On Investment / Rate of Return / Time to Break Even.
- Discount rate at TSO's discretion

Cost components

- Costs for implementing the requirement
- Any attributable loss of opportunity
- Change in maintenance costs

Societal Benefits

- Improvement of security of supply (black out probability)
- Improvement to the internal market in electricity and cross-border trade (reactive power provision, freq. response, reserves, …)

Procedure for derogations

Application to the Relevant Network Operator

Assessment of the request and submission to the NRA

Decision by the NRA

Assessment of the decision by ACER and recommendations to the NRA

Register of derogations maintained by the NRA

Reactive Power Requirements

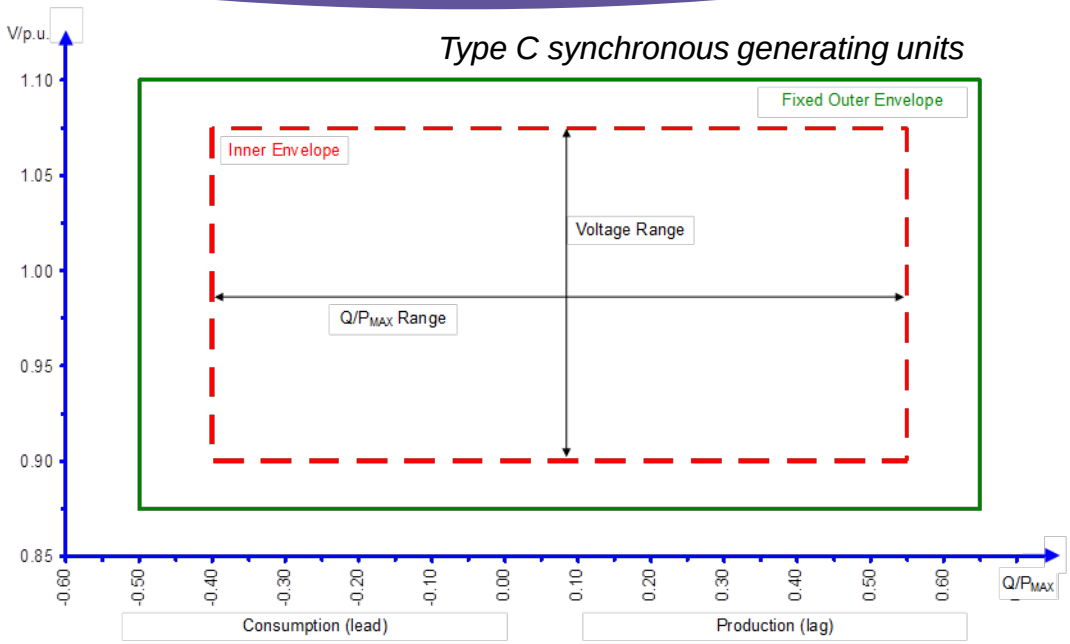
Reactive power capability

Need for reactive power depends strongly on the type of network (length, cable/overhead, loading, …)

- Network Operator defines U-Q/Pmax shape within red envelope
- Red envelope can be moved within boundaries
- Dimensions red envelope depend on synchronous area
- Green outer boundary is based on all relevant grid codes in Europe. Note: the green boundary is not the requested range.

Provides a basis for efficient voltage regulation in constantly evolving networks

Type C synchronous generating units



Synchronous Area	Range of Q/P_{max}	Range of steady state voltage level in PU
Continental Europe	0.95	0.225
Nordic	0.95	0.150
Great Britain	0.95	0.100
Ireland	1.08	0.218
Baltic States	1.0	0.220

Questions?

- **Working draft of the Network Code**
  - http://www.entsoe.eu
- **Documents to be published during public consultation**
  - Frequently Asked Questions (update)
  - Position paper on the Network Code approach