Network Codes Workshop Agenda

Topic	Presenter	Time
Introduction & Welcome	**Rodney Doyle**	**10:00**
Framework Guideline Update	Philip Newsome	10:10
Overview of the Network Code concept	Mark Lane	10:20
Overview of the Consultation process – How to get involved	Mark Lane	10:25
Update on the status of each of the following Network Codes: Outline of key milestones and projected consultation dates where appropriate		
Market Codes		
Capacity Allocation and Congestion Management (CACM)	Mark Lane	10:30
Forwards	Mark Lane	10:40
Balancing	Mark Lane	10:50
Q & A on Market Codes	All	11:00
Coffee Break (Coffee will be served at 11:15)		11:15
System Operation Codes		
Operational Security	Donal Connolly	11:20
Operational Planning & Scheduling	Glen Flanagan	11:40
Load Frequency Control and Reserves	Donal Connolly	12:00
Q & A on System Operations Codes		12:10
System Development Codes		
Requirements for Generators	Mark Norton	12:20
Demand Connection	Mark Norton	12:30
HVDC	Mark Norton	12:40
Q & A on System Development Codes		12:50
AOB – Open discussion		13:00

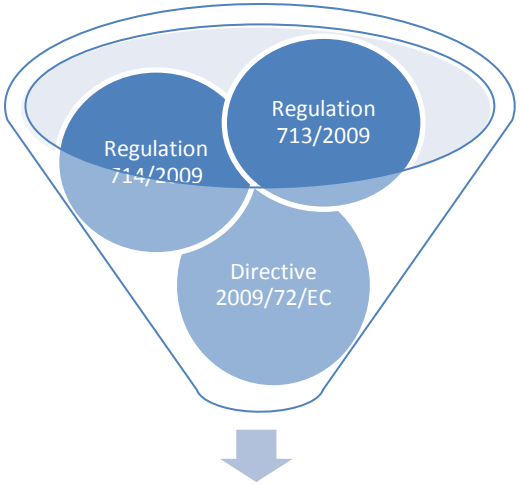
Network Codes

Mark Lane

24 October 2012

Third Package & Network Codes

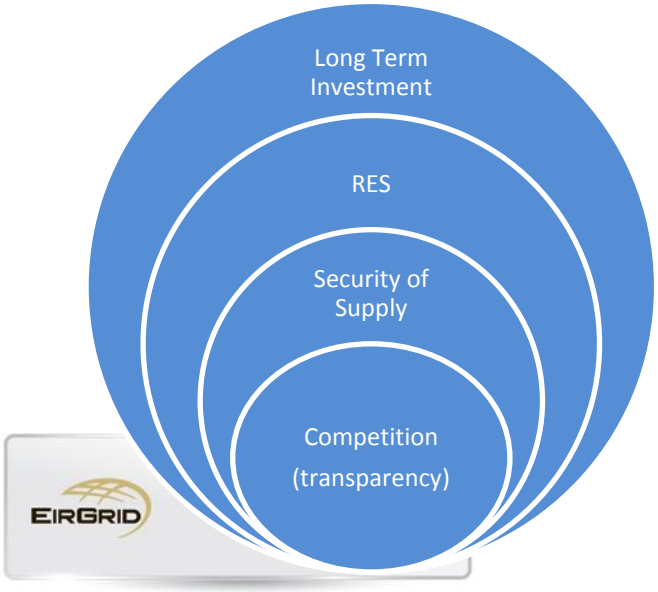
Achieving the Internal Electricity Market



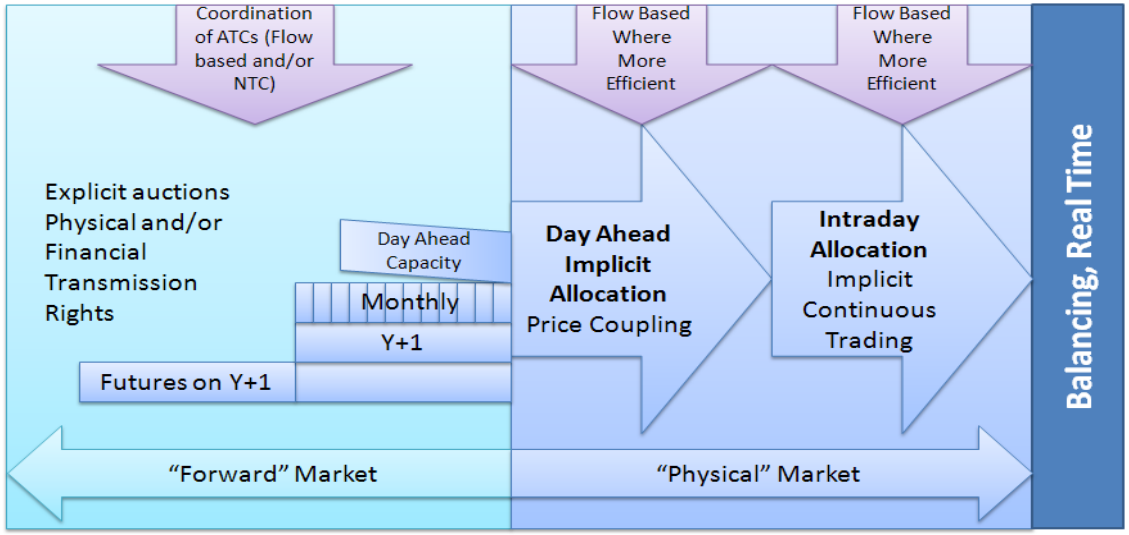
Third Energy Package

Article 8(6): Network Codes (in twelve areas)

- Network connection rules
- Balancing rules including network-related reserve power rules
- Network security and reliability
- Operational procedures in an emergency
- Capacity-allocation and congestion management
- Third-party access rules
- Data exchange and setlement rules
- Interoperability rules
- Rules for trading
- Transparency rules
- Rules regarding harmonized transmission tariff structures
- Energy efficiency regarding electricity networks



EU Target Model



Network Codes - Legal Status

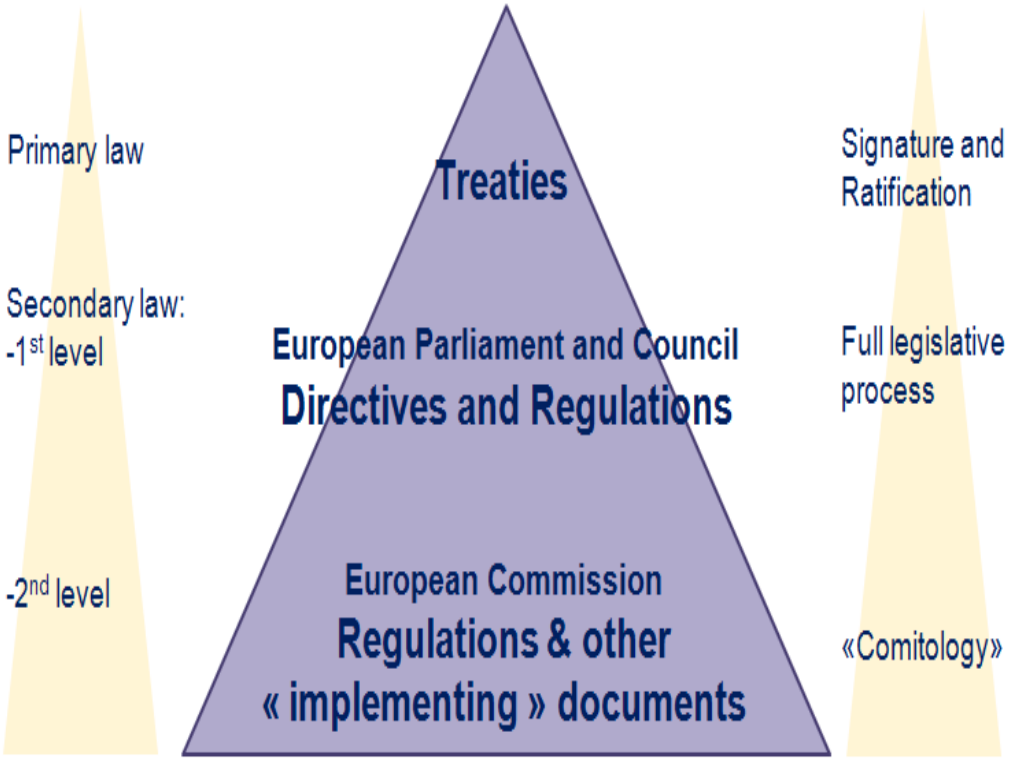
What impact will the Network Codes have?

•Network Codes will most probably be in the format of an EU Regulation

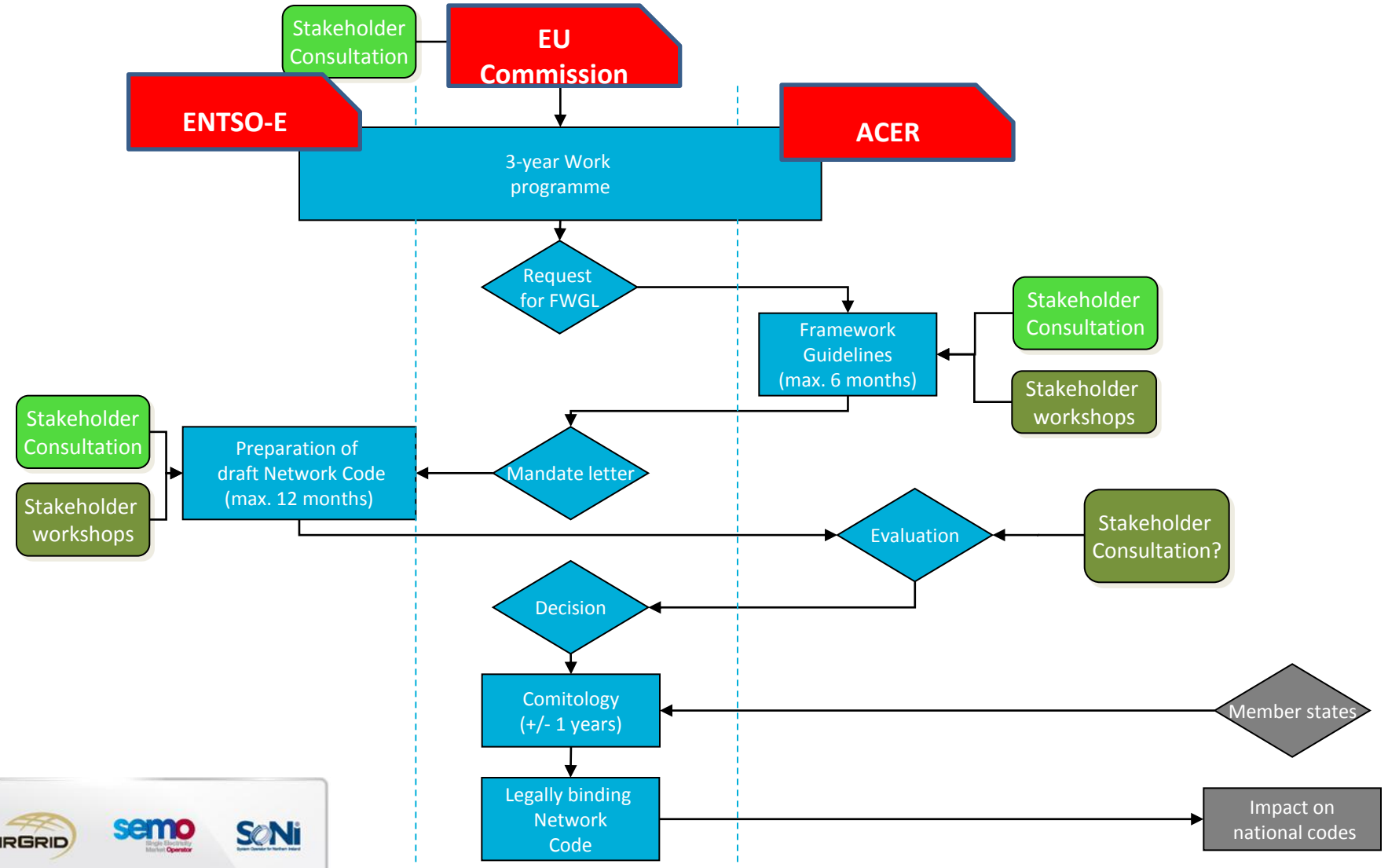
•Network Codes will be directly applicable in each country, there is no need to implement them with a national piece of legislation

•Network Codes will be directly applicable for all the entities mentioned in the rules of the code

•Lengthy amendment procedure, difficult to change



How are the Network Codes Developed?



714/09: ENTSO-E Consultation Requirements

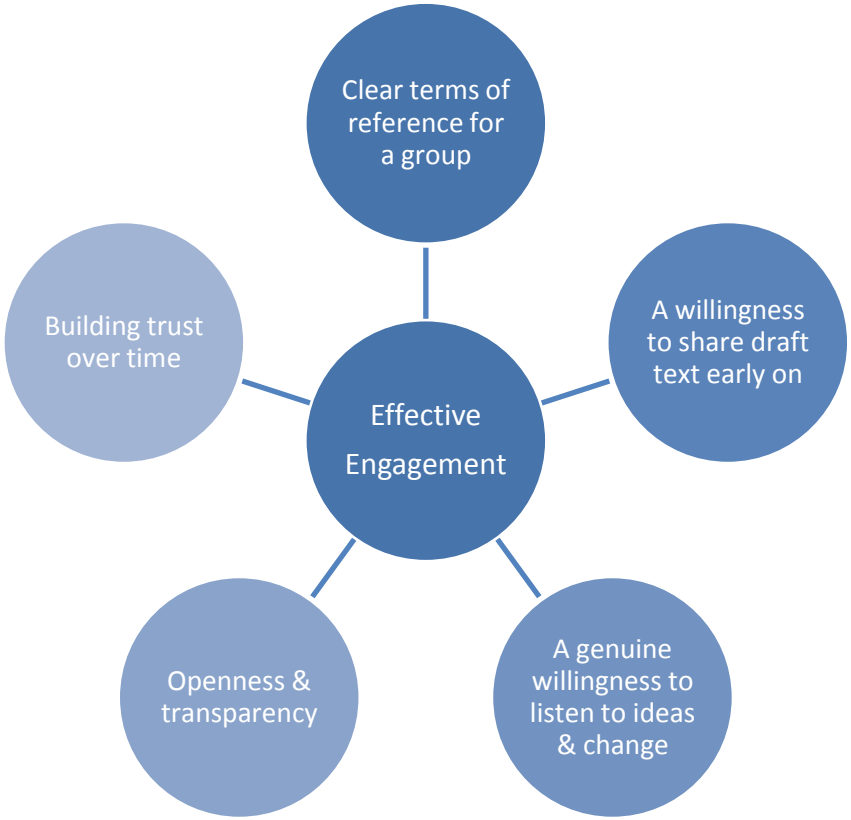
- **Article 10(1):** the ENTSO for Electricity shall conduct an extensive consultation process, at an early stage and in an open and transparent manner, involving all relevant market participants, and, in particular, the organisations representing all stakeholders, in accordance with the rules of procedure referred to in Article 5(1). That consultation shall also involve national regulatory authorities and other national authorities, supply and generation undertakings, system users including customers, distribution system operators, including relevant industry associations, technical bodies and stakeholder platforms. It shall aim at identifying the views and proposals of all relevant parties during the decision-making process.

- **Article 10(2):** All documents and minutes of meetings related to the consultations referred to in paragraph 1 shall be made public.

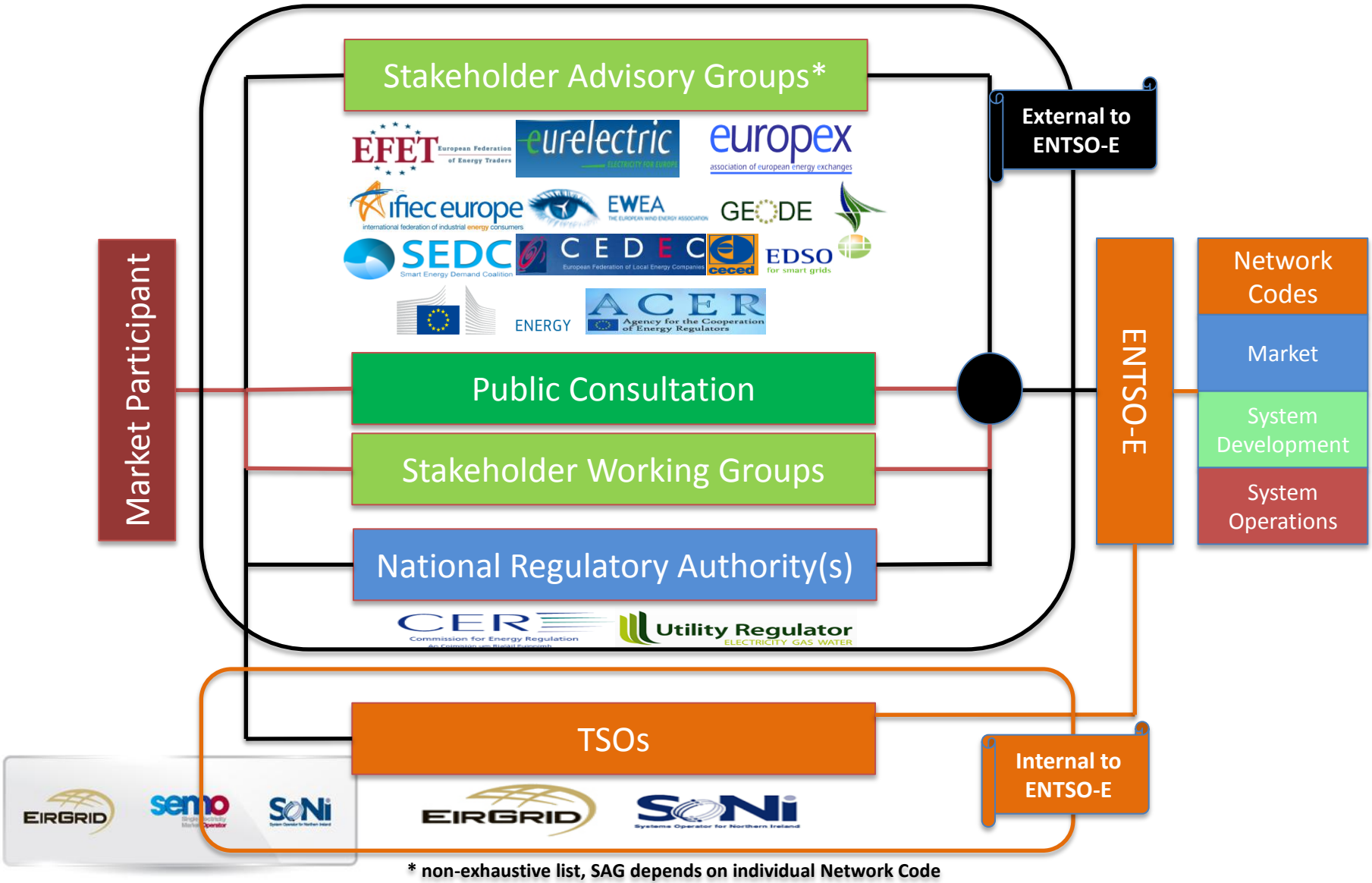
- **Article 10(3):** Before adopting the annual work programme and the network codes referred to in Article 8(1), (2) and (3), the ENTSO for Electricity shall indicate how the observations received during the consultation have been taken into consideration. It shall provide reasons where observations have not been taken into account.

Approach to Drafting & Stakeholder engagement

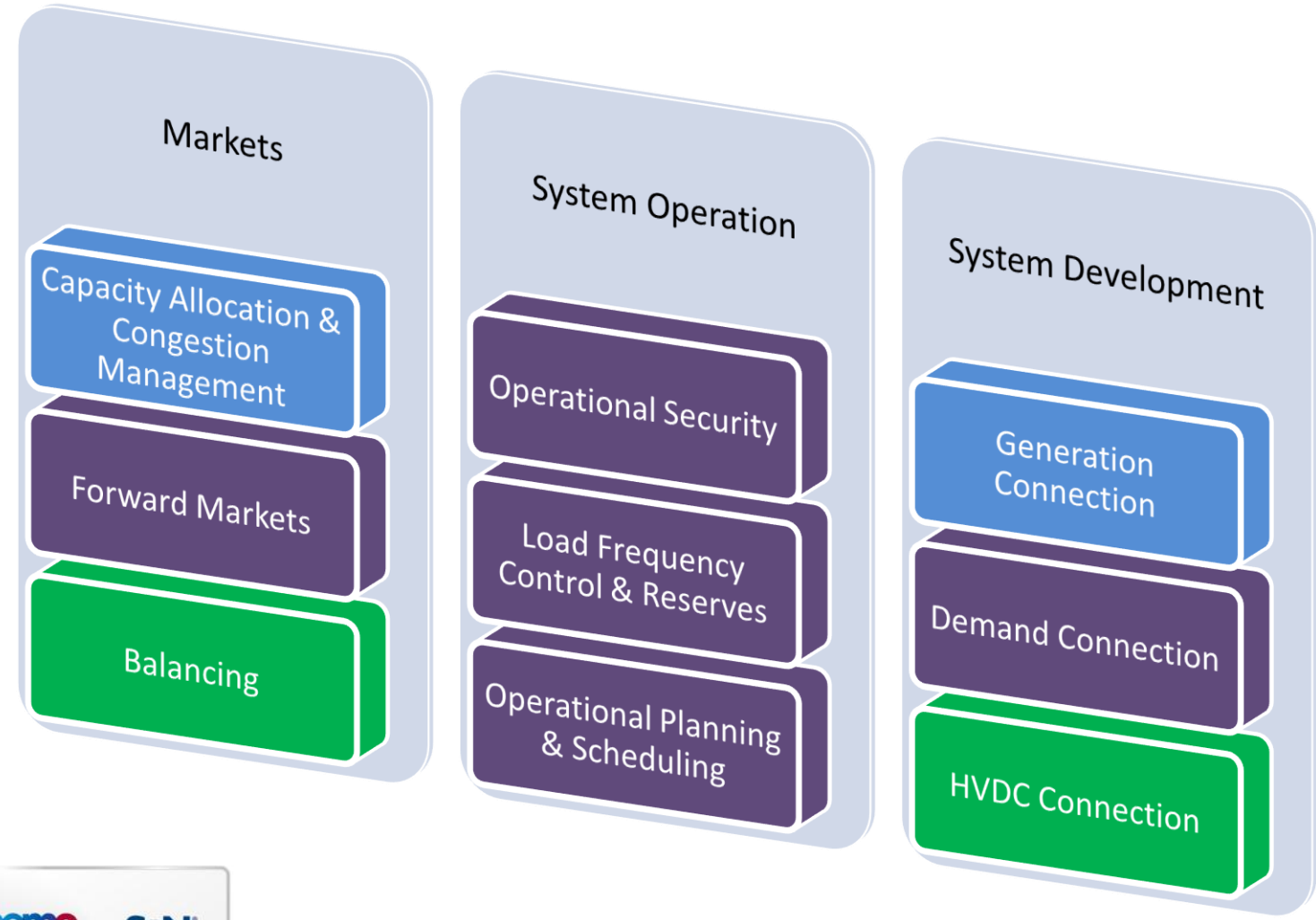
- **Transparency** -> look to publish all relevant material, e.g. early drafts and important issues for feedback;
- **Open engagement** -> listen to all viewpoints from all interested parties;
- **Explanation** -> clearly explain the rationale for the choices made in the development of the network codes;
- **Consistency** -> each network code should be an additional cog towards achieving the overall objective; consistency is key



How to get involved in the Network Codes



Network Codes – progress to date



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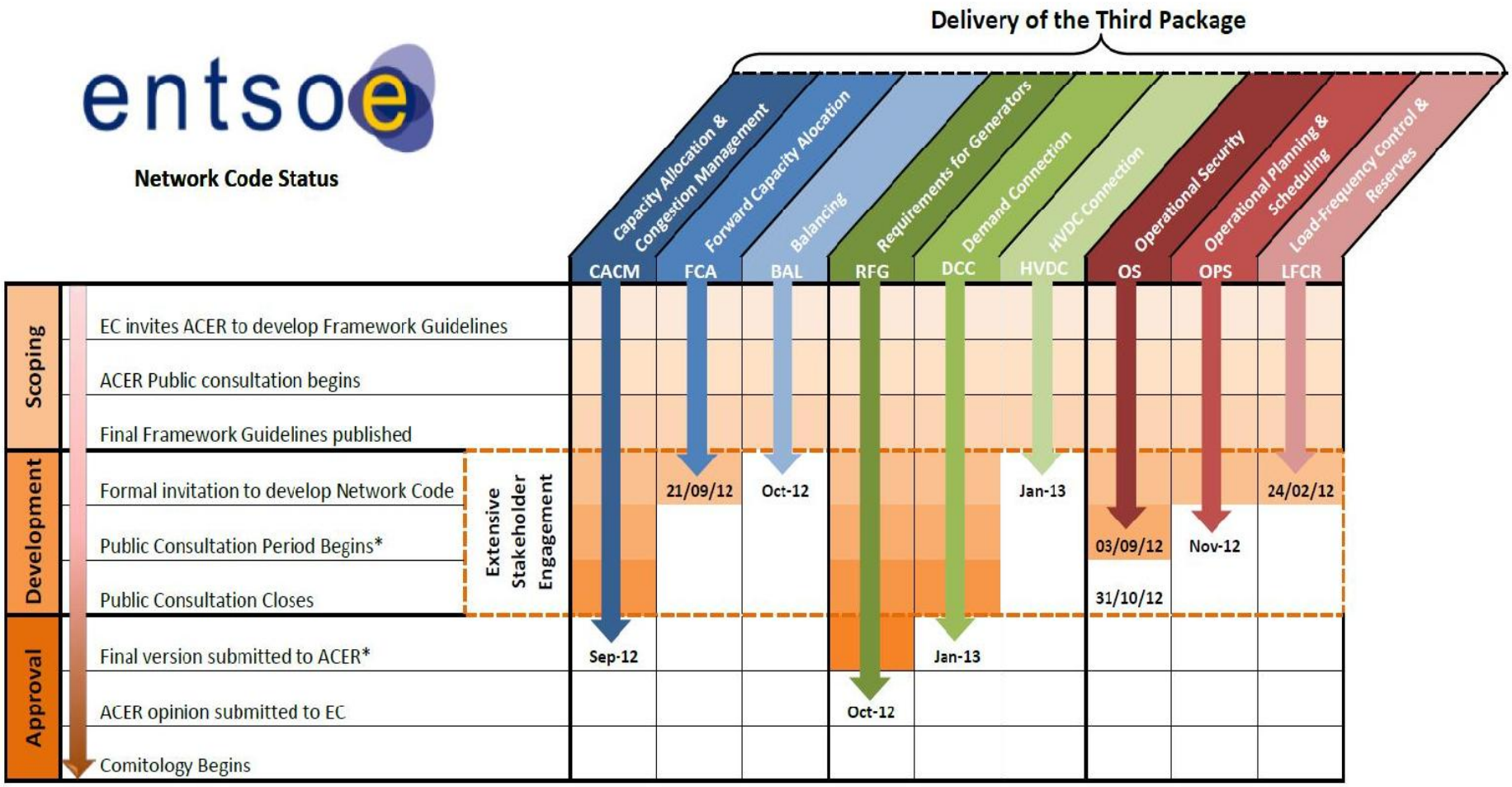
Network Code Status



Disclaimer: The purpose of this chart is to provide overall transparency of ENTSO-E's network code development. All forward-looking dates are provisional until confirmed. Stakeholders will be informed and invited to all confirmed events by means of official communication

* In accordance with ENTSO-E's Network Code Development Process, an Internal re/drafting and approval is done before the launch of the formal public consultation and submission of the code to ACER.

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EirGrid/SONI – our role in Network Codes

	Network Codes	DT Member	DT Role
Market	CACM	Mark Lane	Full Member
Market	Capacity Calculation	-	-
Market	Day-ahead	-	-
Market	Intraday	-	-
Market	Forward Capacity Allocation (FCA)	Mark Lane	Convenor & SPOC
Market	Balancing	Conor Kavanagh	Full Member
SDC	Requirements for Generators	Mark Norton	Full Member
SDC	Demand Connection Code	Mark Norton	Convenor
SDC	HVDC	Salim Temtem	Full Member
SOC	Operational Security	Donal Connolly	Full Member
SOC	Operational Planning & Scheduling	Glen Flanagan	Full Member
SOC	Load Frequency Control & Reserves	Donal Connolly	Full Member

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EirGrid/SONI – NC Convenors & SPOCs

	Convenor	Country/Market	SPOC	Country/Market
CACM				
Capacity Calculation	FINGRID	Finland	RTE Réseau de transport d'électricité	France
Day-ahead	amprion	Germany	TenneT / nationalgrid	NL/ GB
Intraday	elia	Belgium	elia / nationalgrid	Belgium/GB
FCA	EIRGRID	SEM	EIRGRID	SEM
Balancing	APG Austrian Power Grid	Austria	TRANSNET BW	Germany
Requirements for Generators	amprion	Germany		
Demand Connection Code	EIRGRID	SEM	Terna	Italy
HVDC	TenneT Taking power further	Netherlands	amprion	Germany
Operational Security	APG Austrian Power Grid	Austria	Polskie Sieci Elektroenergetyczne Operator S.A.	Poland
Operational Planning & Scheduling	RTE Réseau de transport d'électricité	France	RTE	France
Load Frequency Control & Reserves	amprion	Germany	swissgrid	Switzerland

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Market Network Codes - Drafting Teams

FCA

CACM

Balancing

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Stages of Network Code Development (I)

Step 1- Scoping

- Identify a structure.
- Discuss key issues.
- Ensure a common understanding

Step 2 - Drafting

- Draft text to meet the structure
- Discuss & refine
- Share with stakeholders & listen to views
- Develop supporting material

Step 3 - Internal Approvals

- Get comments (avoid detail) from Committees & WGs
- Update code before committee approval
- Seek Assembly approval to consult

Step 4 - Public Consultation

- 2 month consultation
- Listen to views (national and at EU level)
- Get ready for next steps (don't stop work)

Engage with stakeholders, EC & ACER throughout

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Stages of Network Code Development (II)

Step 5 - Analysis of responses

- Review comments & listen to views
- Develop reasons to change or not to change things
- Identify key issues

Step 6 - Updated Drafting

- Update the text to reflect comments (be open)
- Develop supporting material
- Resolve contentious issues
- Manage member states

Step 7 - Internal Approvals

- Get comments (avoid detail) from Committees & WGs
- Update code before committee approval
- Seek Assembly approval

Step 8 - Final Submission

- Submit supporting documents and code to Assembly
- Submit approved code to ACER

Engage with stakeholders, EC & ACER throughout

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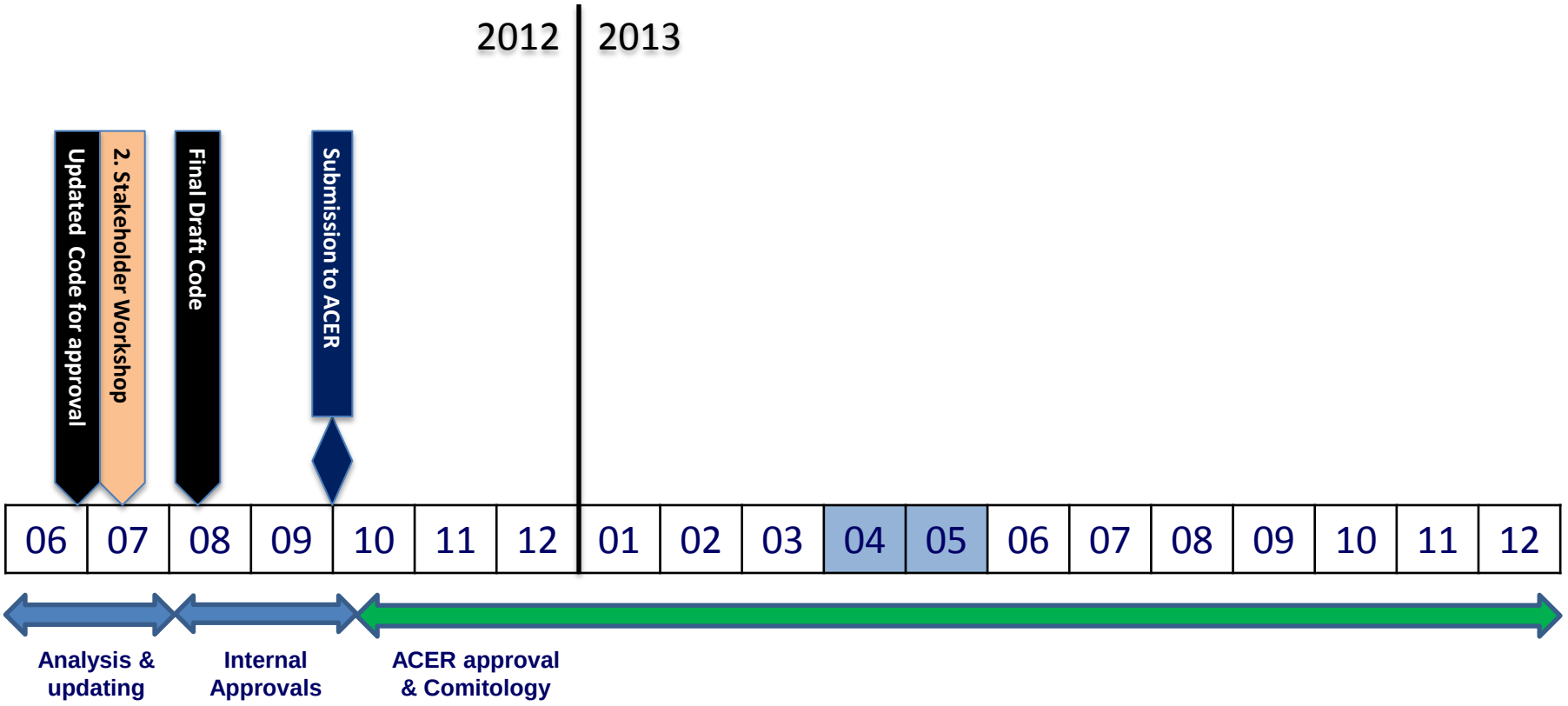
Network Code Development – CACM



Step 5/6 **Step 7** **Step 8**

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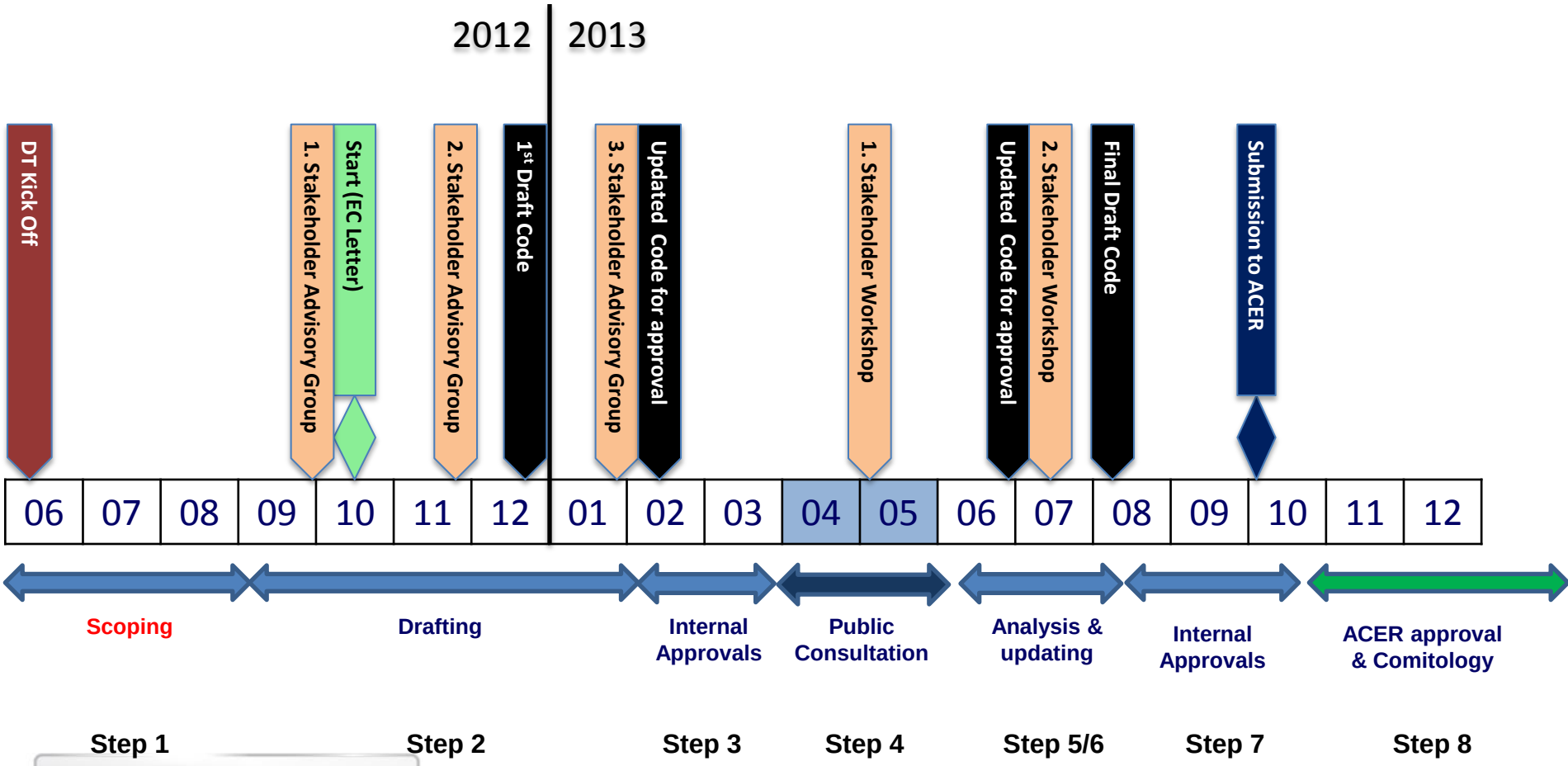
CACM Network Code Contents (final)

1. General Provisions:	Subject Matter & Scope, Definitions, Confidentiality obligations, CACM objectives, Consultation, Publication CACM methods, Transparency, Regulatory approvals	*Articles 1-8*
2. Governance:	Roles & Responsibilities	*Articles 9-12*
2. Requirements	Capacity Calculation	*Articles 13-36*
	Bidding Zones	*Articles 37-40*
	Redispatching & Countertrading	*Articles 41*
	Algorithm Development / Amendment	*Articles 42-44*
	Day Ahead Market	*Articles 45-58*
	Intraday Electricity Market	*Articles 59-71*
	Clearing & Settlement	*Articles 72-75*
	Firmness	*Articles 76-80*
	Congestion Income Distribution	*Articles 81-82*
	XB Redispatching or Countertrading Cost Sharing Methodology	*Articles 83-84*
	CACM Costs	*Articles 85-90*
4. Transitional Arrangements	Intraday arrangements	*Articles 91-93*
	Objectives & Provisions of intraday arrangement	*Articles 94-95*
	Island Systems with Central Dispatch	*Article 96*
5. Final Provisions		*Article 97*

Network Code Development – FCA



FCA Network Code Draft Contents (1/10/12)

1. General Provisions:	Subject Matter & Scope, Definitions, Confidentiality obligations, CACM objectives, Consultation, Publication CACM methods, Transparency, Regulatory approvals	*Articles 1-8*		
2. Governance:	Roles & Responsibilities	*Articles 9-11*	Committees	*Articles 12-14*
2. Requirements	Capacity Calculation	*Articles 15-41*	Allocation Rules	*Articles 73-81*
	Bidding Zones	*Articles 42-45*	Firmness	*Articles 82-91*
	Forward Capacity Market	*Articles 46-68*	Congestion Income Distribution	*Articles 92-93*
	Auction Platform & Secondary Trading	*Articles 69-72*	Cost Recovery	*Articles 94-98*
4. Transitional Arrangements	General Provisions	*Article 99*	Regional Auction Platforms	*Articles 100-101*
5. Final Provisions	*Articles 102-103*			

Update: Network Code - FCA

- 01 October – 1st Stakeholder Advisory Group meeting held

- 28 October - ACER Public consultation on Forward Risk Hedging Products & Harmonisation of Long Term Capacity Allocation Rules
  - Cross-regional roadmap on long term transmission rights :
    - Harmonisation of long term allocation rules
    - Harmonisation of platforms for allocation
    - Harmonisation of the nomination process
    - Analysis of the design and implementation of TRs


ACER

Forward Risk-Hedging Products and Harmonisation of Long-Term Capacity Allocation Rules

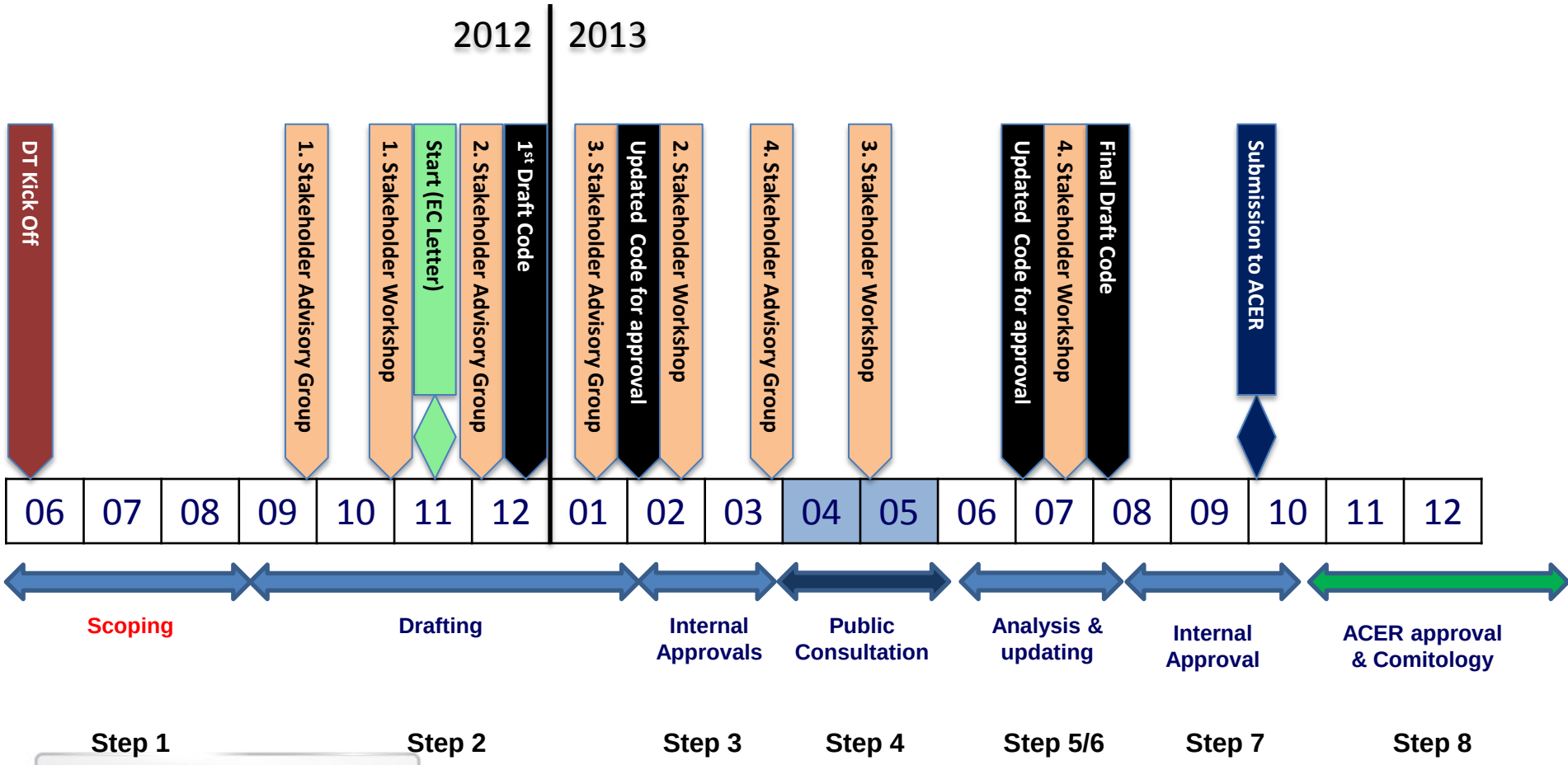
Consultation Document

PC_2012_E_13
29 August 2012

Agency for the Cooperation of Energy Regulators
Trg Republike 3
1000 Ljubljana, Slovenia

- 29 October – ENTSO-E delegation meeting with EC on MiFID

Network Code Development – Balancing



Update: Network Code - Balancing

- 18 September – Final Framework Guideline on Balancing published
- 11 October – 1st Stakeholder Advisory Group meeting held (EBSAG)

- 22 October - ENTSO-E Survey on Ancillary Services Procurement and Electricity Balancing Market Design
  - Note: EirGrid was responsible for conducting this work

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Key Takeaways

- EirGrid/SONI are at the centre of developments on designing the market rules for the Internal Energy Market & are heavily involved in the development of Network Codes (incl. leading the work on a number of Network Codes).

- We are readily available to discuss any aspect of the Network Codes either in a group or bilaterally.

- Market Participants can get involved:
  - Directly via public consultations and stakeholder workshops and also via TSOs who are heavily involved in the drafting of Network Codes
  - Indirectly via Stakeholder Advisory Groups, NRAs

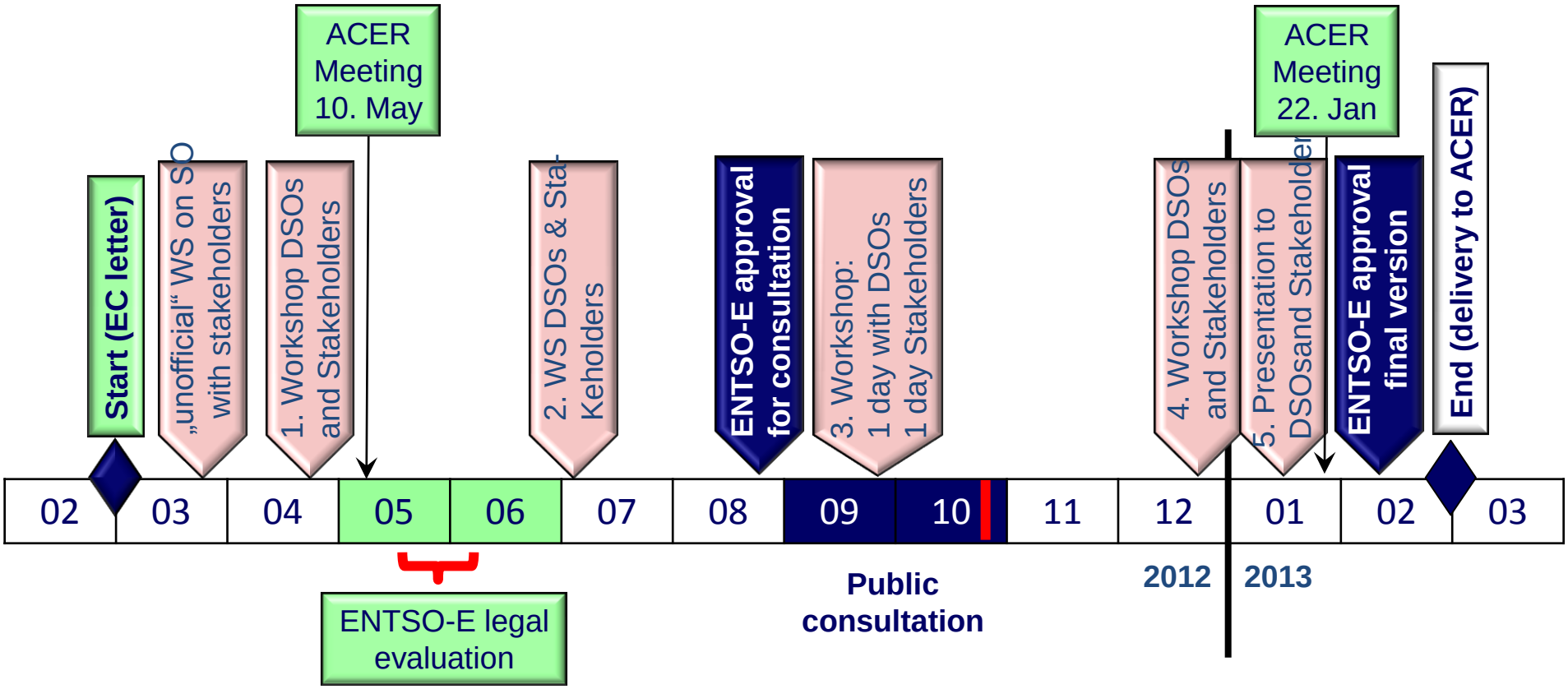
- Question for Market Participants: How can EirGrid/SONI best meet your needs in terms of providing a platform to input into the Network Code process and make your voice heard?

Thanks for your attention

Operational Security Network Code

Donal Connolly

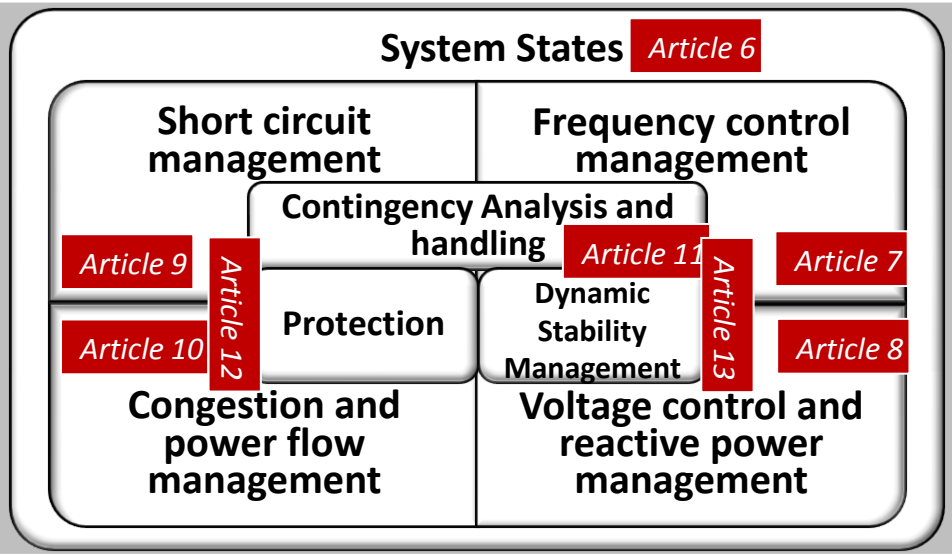
Network Code Development



Contents

1. General Provisions: Subject Matter and Scope, Definitions, Regulatory aspects, Recovery of costs, Confidentiality obligations — *Articles 1-5*

2. Requirements



3. Testing and investigation — Operational testing and investigation — *Article 14*

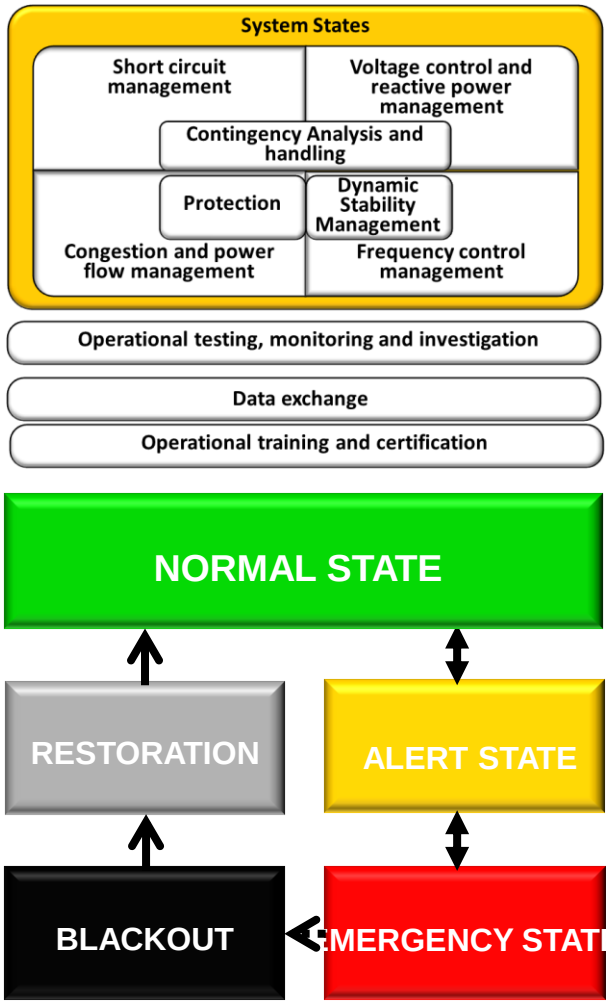
4. Data exchange — Data exchange — *Articles 15-28*

5. Training — Operational training and certification — *Article 29*

6. Compliance — *Articles 30-31*

7. Final Provisions — *Article 32-33*

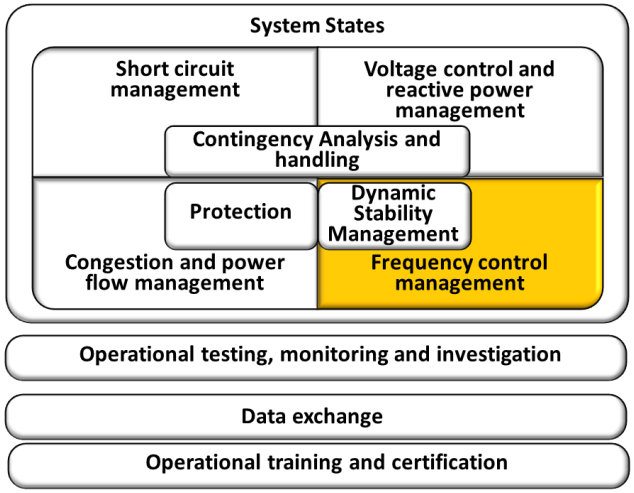
System States

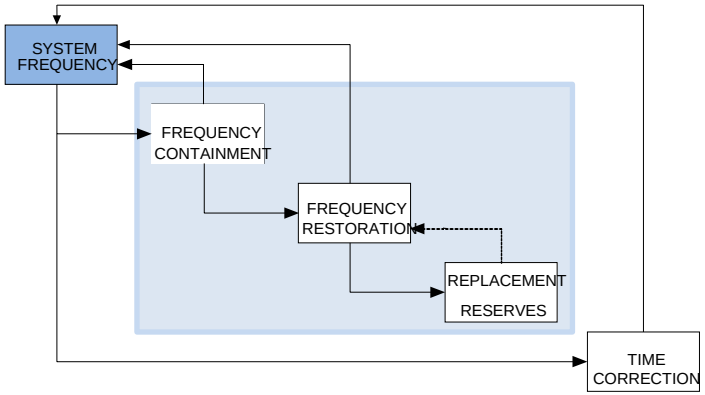


Monitoring operational parameters in order to assess the operational state of the system and facilitate a return to a Normal State through improved communication and coordination.

- Five system states are described.
- Determining the system state:
  - Real-time monitoring of parameters;
  - Set limits for each element of the transmission system.
- Returning the system to a Normal State:
  - *Remedial actions*;
  - Communication and coordination.
- Availability of critical tools & facilities and emergency / security plans.
- *Threshold for Significant Grid User.*

Frequency Control Management

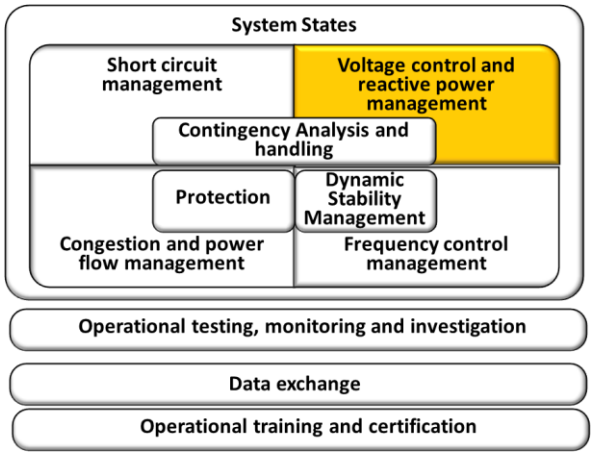


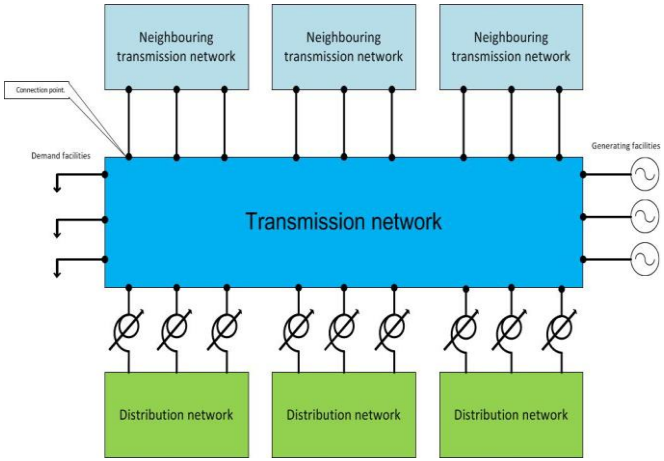


The aim of Frequency control management is to ensure the global generation / demand balance of all interconnected Transmission Systems within a Synchronous Area.

- Maintain the frequency within the frequency quality targets of the synchronous area (LFC&R NC).
- Operate with sufficient reserves.
- Analysis to be carried out prior to exchange or sharing of reserves.
- *Generation facilities remain connected within frequency and time ranges specified in RfG NC;*
- *Generation facilities and demand facilities if required disconnect at specified frequencies.*

Voltage Control and Reactive Power Management

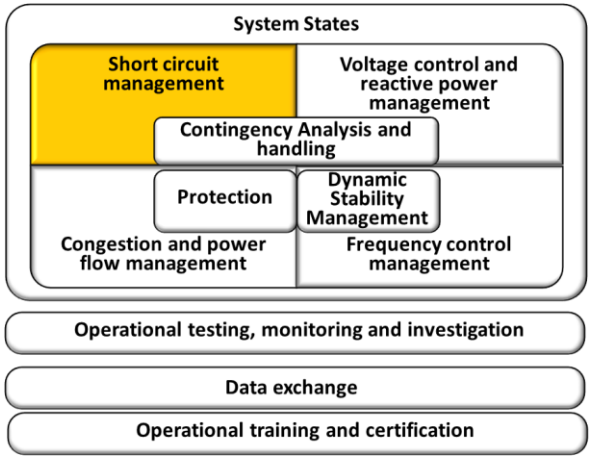




The aim of Voltage Control and Reactive Power Management is to keep voltages within the operational Limits.

- Ensure voltage is maintained within operational limits.
- Operate with sufficient reactive power reserves.
- Coordinate with other TSO.
- Prepare remedial actions to cope with potential or identified voltage deviations.
- Monitoring, control and coordination of reactive power resources
  - *Maintain reactive power limits and following voltage control instructions;*
  - *Blocking tap changers;*
  - *Low voltage disconnection.*
- *Generation facilities remain connected within voltage and time ranges specified in RfG NC;*
- *Generation facilities and demand facilities if required disconnect at specified voltage.*

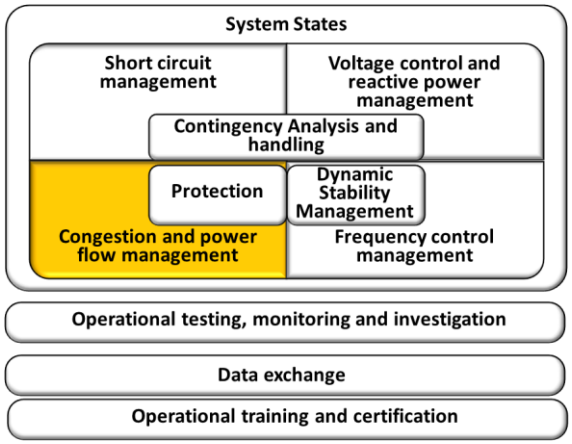
Short Circuit Current Management

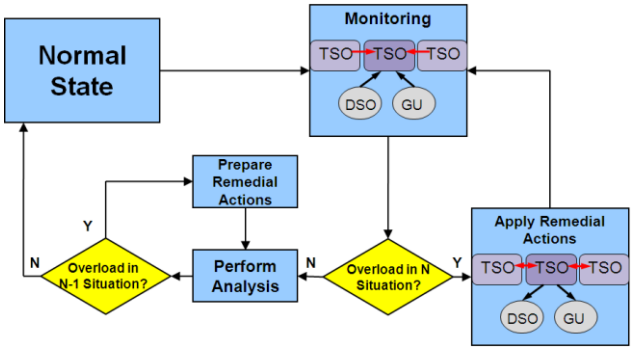


The aim of Short Circuit Management is to ensure that short circuit currents remain within required limits.

- Not exceed short circuit current capabilities and not lower than required for correct operation of protection equipment.
- Requiring accurate short-circuit current calculation by TSOs.
- Consider the effect of other Transmission and Distribution systems.
- Monitoring the short-circuit currents, applying remedial actions in case of violation of OS Limits.

Congestion and Power Flow Management

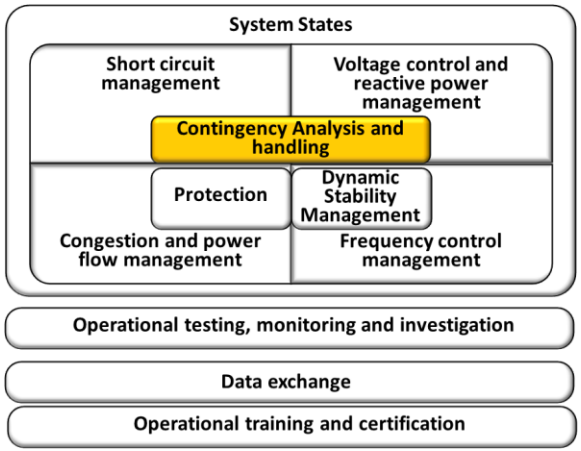




The aim of Congestion and Power Flow Management is to maintain power flows within operational power flow limits on every element of the transmission grid.

- Monitor and maintain power flows within operational limits.
- Perform power flow analysis in real-time coordinated with all affected TSOs.
- Prepare and if required implement remedial actions to avoid violations limits.
- *Redispatch generation and demand facilities, in coordination with other affected TSOs and DSOs.*

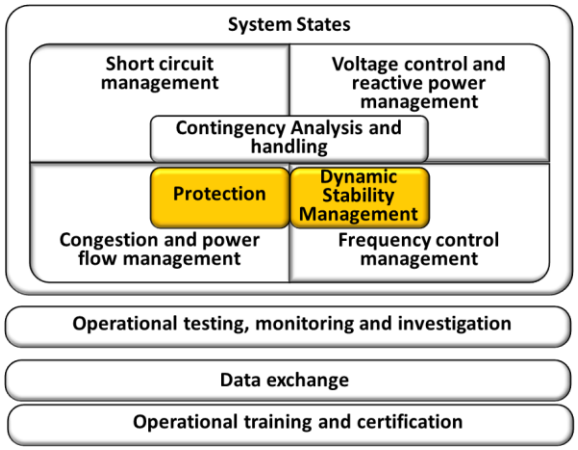
Contingency Analysis and Handling



The aim of Contingency Analysis and Handling is to identify those contingencies which would endanger the operational security of the transmission system and to prepare the appropriate remedial actions.

- Perform contingency analysis in real-time and in the operational planning time frame.
- Prepare pre-fault or post-fault remedial actions to prevent or remedy of the effects of contingencies.
- Coordinate analysis to ensure operational security of its own and the interconnected Transmission System (Common Grid Model).
- *Relies on adequate data and information exchange (between TSOs and from Significant Grid Users and DSOs).*

Protection and Dynamic Stability Management



The aim of the Protection section (Short Circuit Management) is to ensure the coordination of protection philosophies and correct functioning of devices, required in order to cope with faults and disturbances on the transmission system.

The aim of Dynamic Stability Management is to identify potential stability problems.

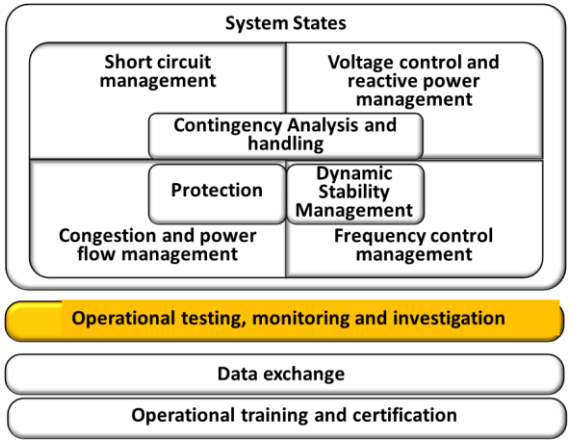
Protection

- Ensure correct, selective and redundant functioning of protection relays and systems.
- Coordinate protection concepts and Set-Points for the interconnections with affected TSOs (including System Protection Schemes).
- *Ensure that Low Frequency Demand Disconnection Scheme are implemented in each TSO's area in a secure manner and coordinated with DSOs other TSOs.*

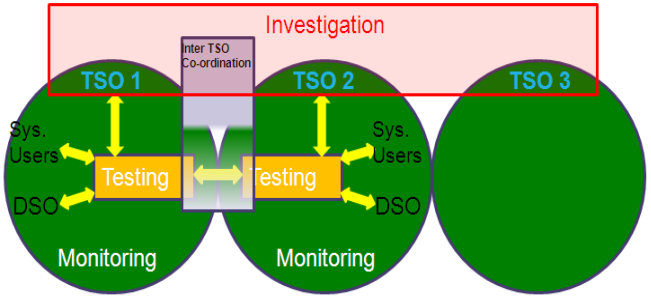
Dynamic Stability Management

- TSOs shall perform dynamic stability assessment (can be offline).
- Coordinated approach to dynamic stability assessment and remedial actions.
- Preparation of Remedial actions to cope with identified violations of Power System Stability.
- *Coordination on methodology to establish the number of synchronous generators required for stability.*

Testing and Investigation

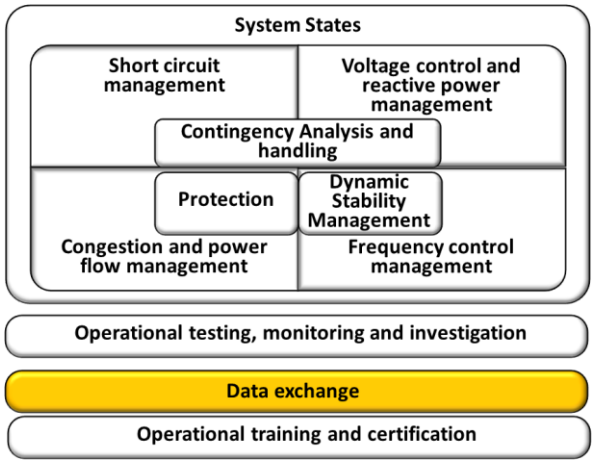


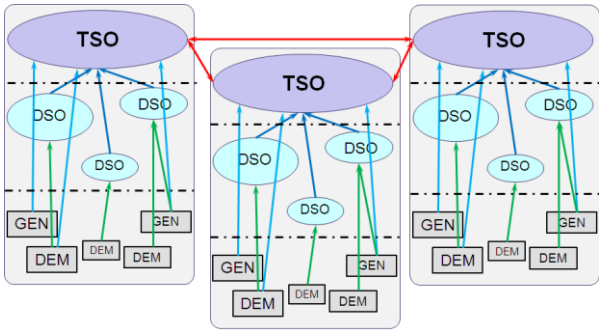
The aim of Operational Testing and Investigation is to ensure correct functioning of transmission system elements, processes and significant grid user facilities connected to the Transmission Grid and that testing is planned and coordinated.



- *Ensure correct functioning of system elements.*
- *Continuing compliance of Significant Grid Users with connection requirements and with declared ancillary services.*
- *Planning and coordination of operational tests.*
- *Investigation of power system disturbances.*

Data Exchange

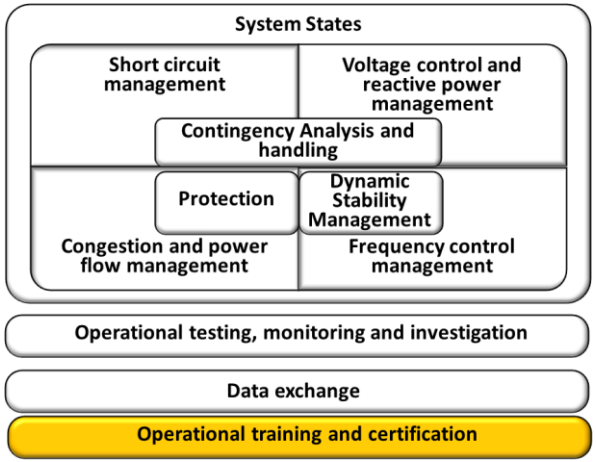




The aim of Data Exchange is to ensure accurate, timely and adequate data and information for operational security.

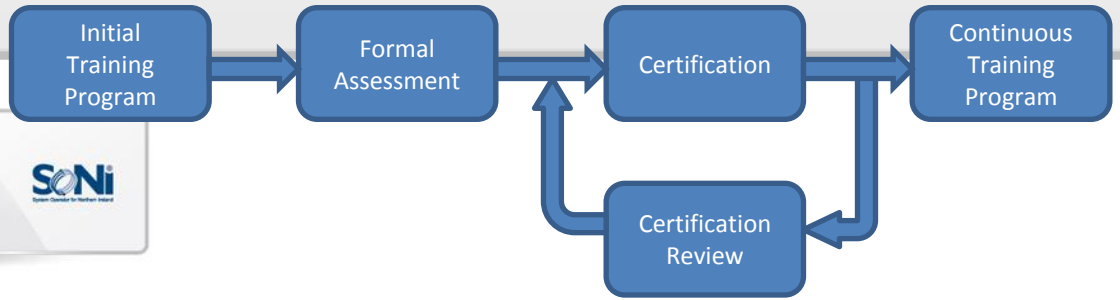
- Structural, Forecast, Real-Time Data between TSOs
- *Structural, Real-Time Data between TSOs & DSOs*
- *Structural, Scheduled, Real-Time Data between TSOs, Interconnection Owners and Generators connected to TSO*
- *Structural, Scheduled, Real-Time Data between DSOs and Generators connected to the Distribution System*
- *Data between TSOs and Generators Connected to DSO*
- *Data between TSOs and directly connected Demand*
- *Data between TSOs and Demand connected to DSO*

Operational Training and Certification



The aim of OT&C is to ensure education, on the job training and certification of TSOs' staff responsible for System Operation in general and Operational Security in particular and provides for coordinated and coherent training and certification approach by all European TSOs.

- Documented training schemes (initial and continuous development) for the TSO control room System Operators.
- Training programmes:
  - dealing with normal and emergency conditions, along with inter TSO influences.
  - reflect new technologies and changing environments.
  - realistic training systems
- Formal certification process .
- *Coordinated training between TSOs and with input from DSOs, Generating Facilities and Demand Facilities.*



Compliance

Responsibility of the Significant Grid User

- *Ensure its facilities are compliant with the network code requirements.*
- *Notification of any modification or operational disturbance with compliance implications.*
- *Notification of test scheduled to verify compliance (TSO or DSO participation).*

Responsibility of TSO and DSO

- *TSO has sole responsibility for the operational security of its transmission system.*
- *TSO or DSO shall assess the compliance of a Significant Grid User's facility with the network code (particularly after any fault, modification or equipment replacement)*
- *TSO or DSO to make available information and documentation to be provided and requirements to be fulfilled.*

Final Provisions

Amendment of Contracts and General Terms and Conditions

Entry into Force

Operational Security Network Code

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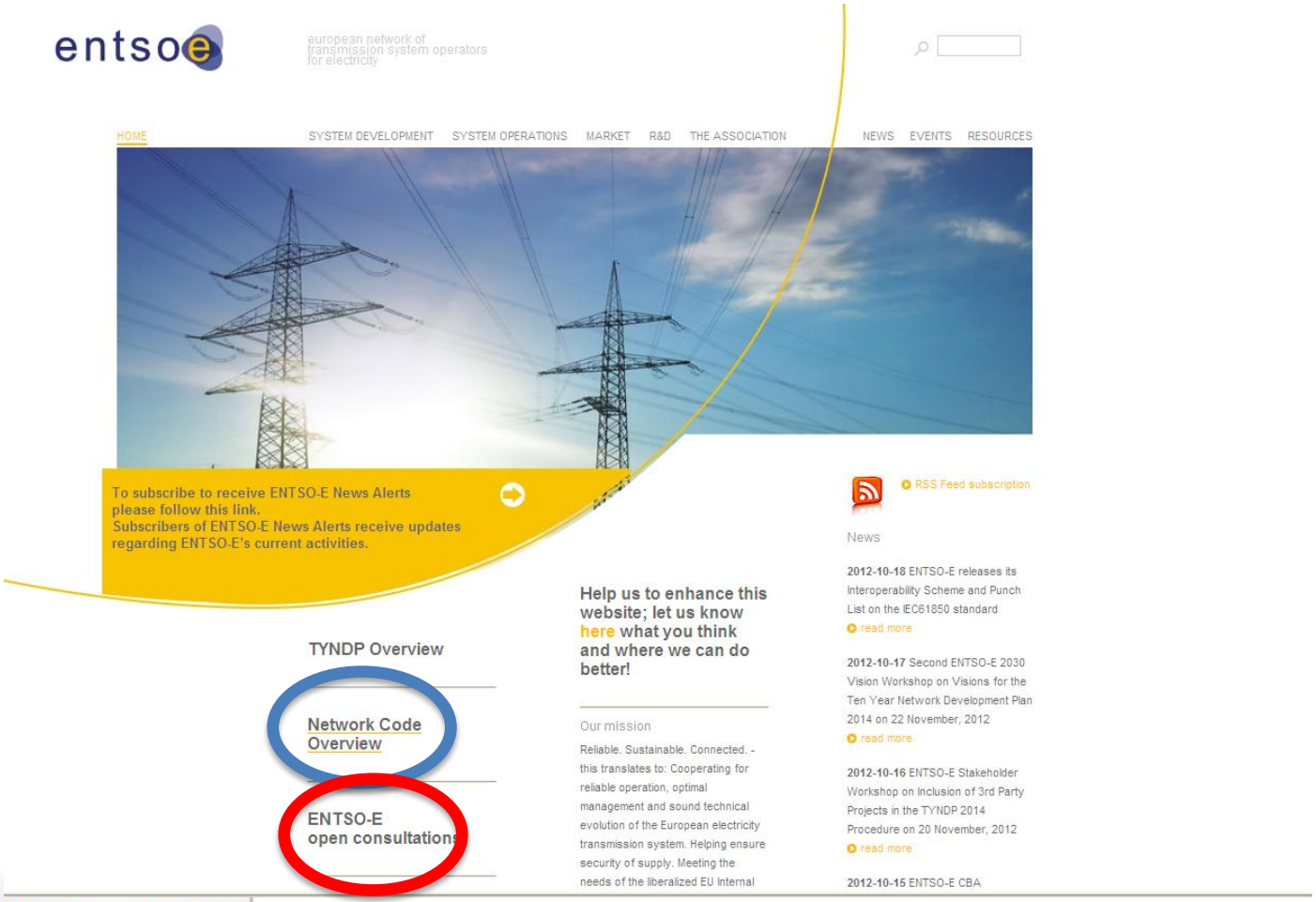

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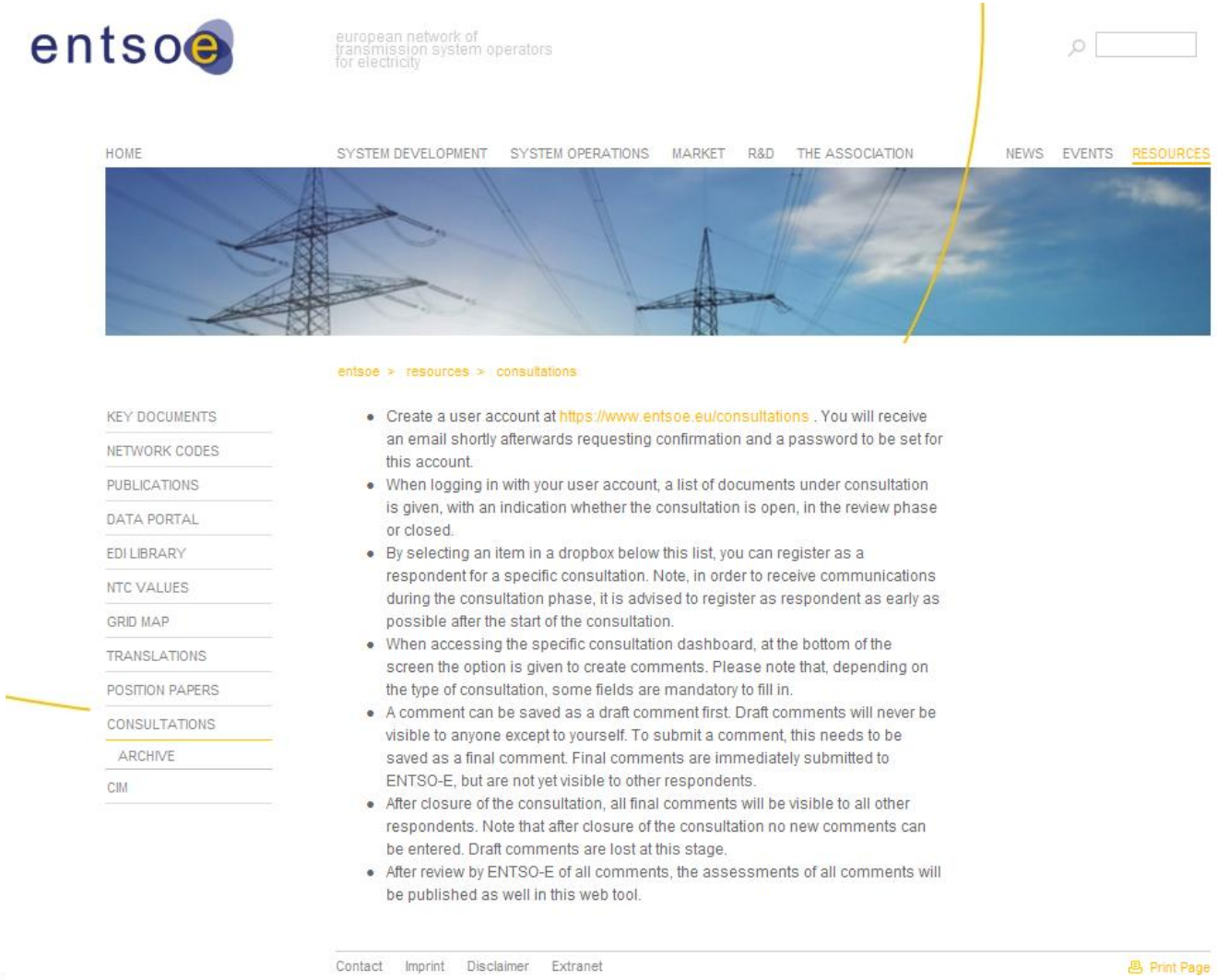
Commenting on the Code



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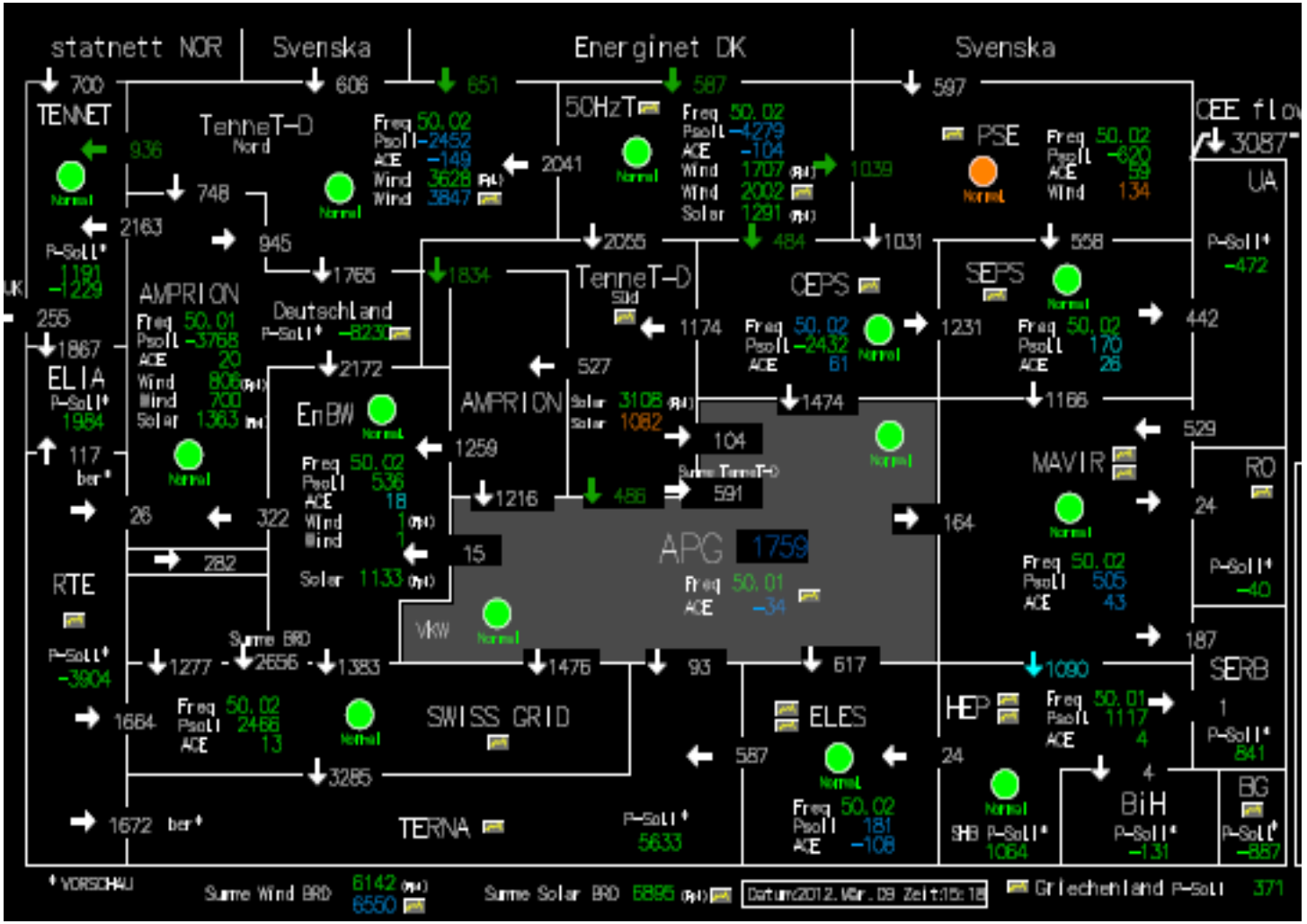
Thanks for your attention

Awareness System



Operational Planning and Scheduling Network Code (OP&S NC)

Glen Flanagan

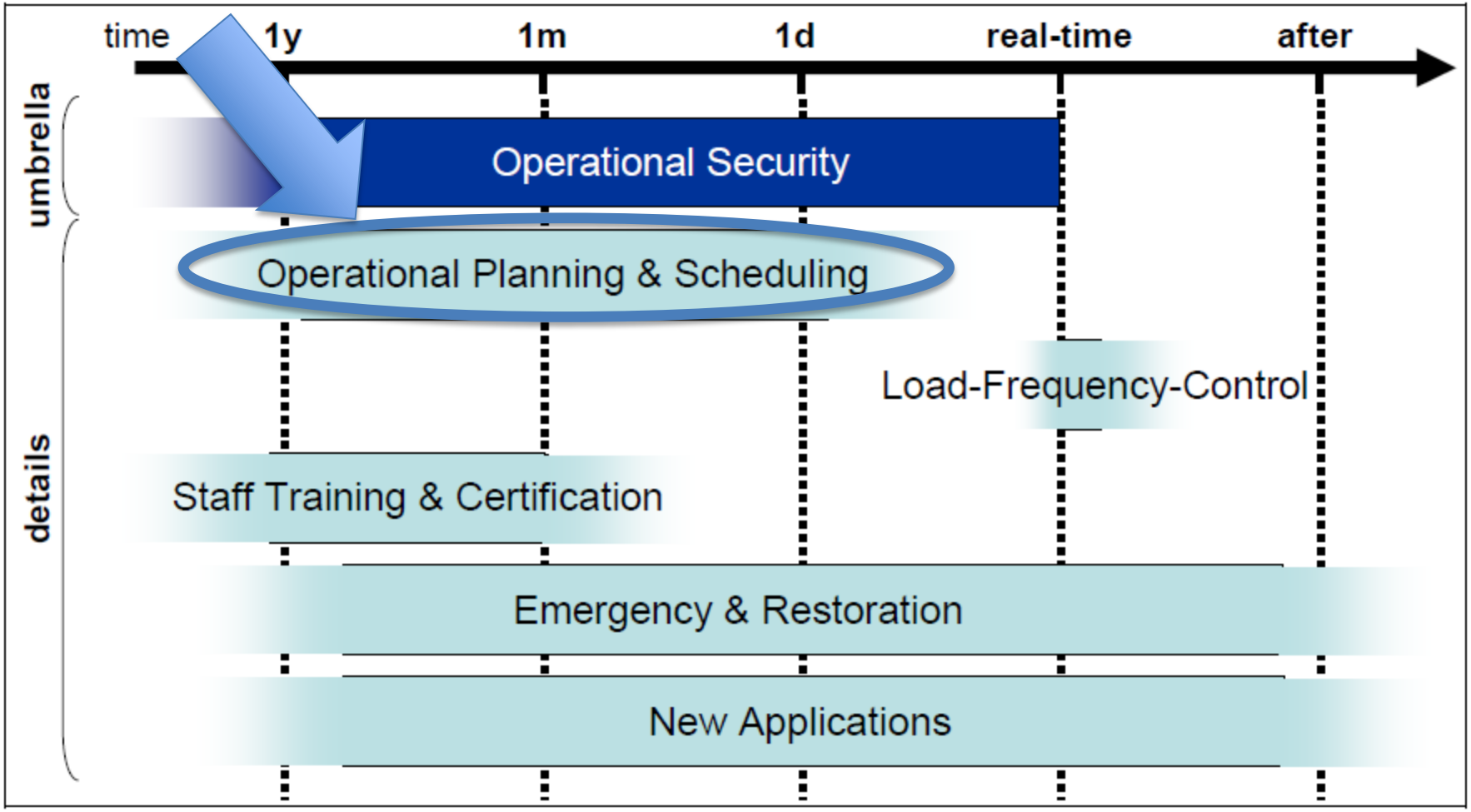
(Grid Operation, Near Time, SONI)

Scope & Objectives for OP&S from Acer Framework Guidelines

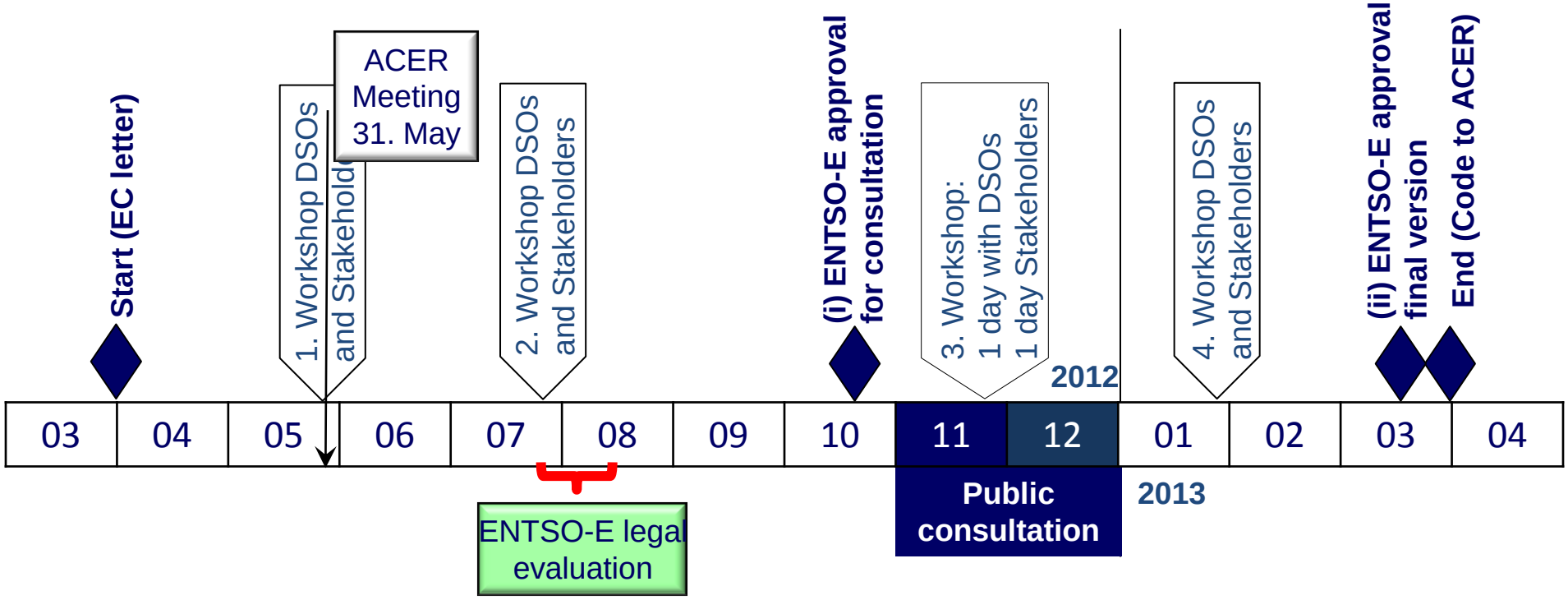
- *Ensuring coherent and coordinated behaviour of transmission networks and power systems in preparation of real-time operation.*

- *Achieving and maintaining a satisfactory level of **operational security** and efficient utilisation of the power system and resources.*

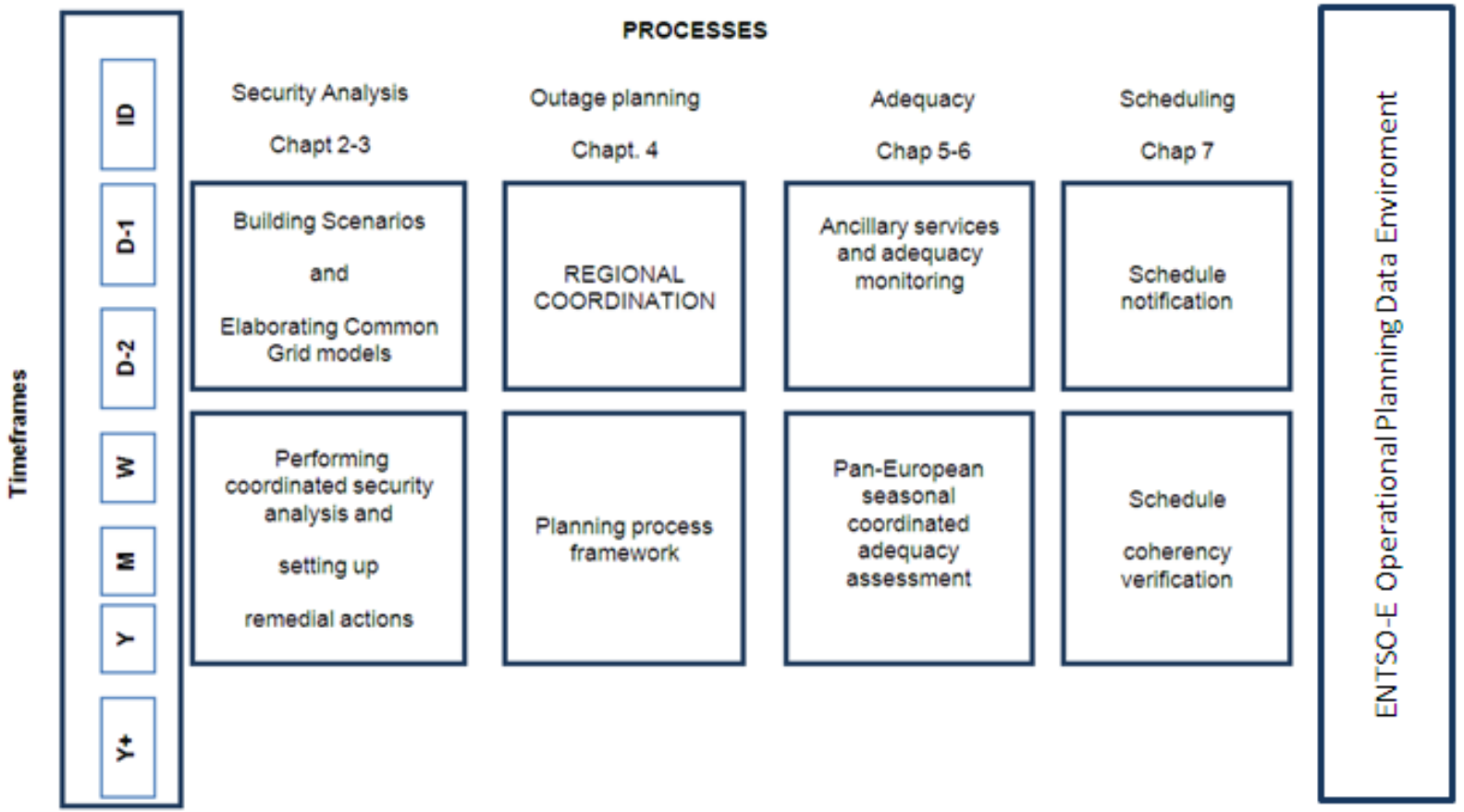
OP&S code in relation to other Operational Codes



Development Timeline of OP&S Network Code



Contents of OP&S Network Code



How individual TSOs carry out Security Analysis at present? ('Planning' to keep the lights on)

- **Planning ahead for Real Time Operations requires;**
  - Load Forecasts
  - Generation Availability / Running patterns
  - Technical characteristics equipment connected
  - Details of new Generation or Network Infrastructure
  - Interconnector Availability

- **Studies to establish System Security;**
  - Steady State
  - Dynamic
  - Outage Margin

How can we carry out Security Analysis on Pan-European level? (Chapter 2-3 OP&S NC Security Analysis)

- **Data required;**
  - Technical characteristics of Relevant Grid Elements
  - Availability and capacity of Relevant Grid Elements
  - Load Forecasts

- **Method for merging information to Common Grid Model**

- **Study Tools for Common Grid Model (TBA)**
  - Load flow studies
  - Dynamic studies (future)

How can we carry out carry out Pan European Outage Planning? (Chapter 4 Outage Planning)

- **Outage Planning Regions**
  - Neighbouring TSOs to coordinate in groups (more formal arrangements than exist at present)
- **Year-ahead outage plan**
  - For network elements that have cross border impact
- **Updates to the year-ahead outage planning**
  - Change requests and how they are dealt with

Adequacy
(Chapter 5 & 6)

- **What is Adequacy?**
  - Generation on system = Load requirements
    - MW's Generated = MW's Demand/Load
  - Adequate amounts/location of Reactive Power
    - MVar's produced = MVar's required by system

Requirements for Scheduling (Chapter 7)

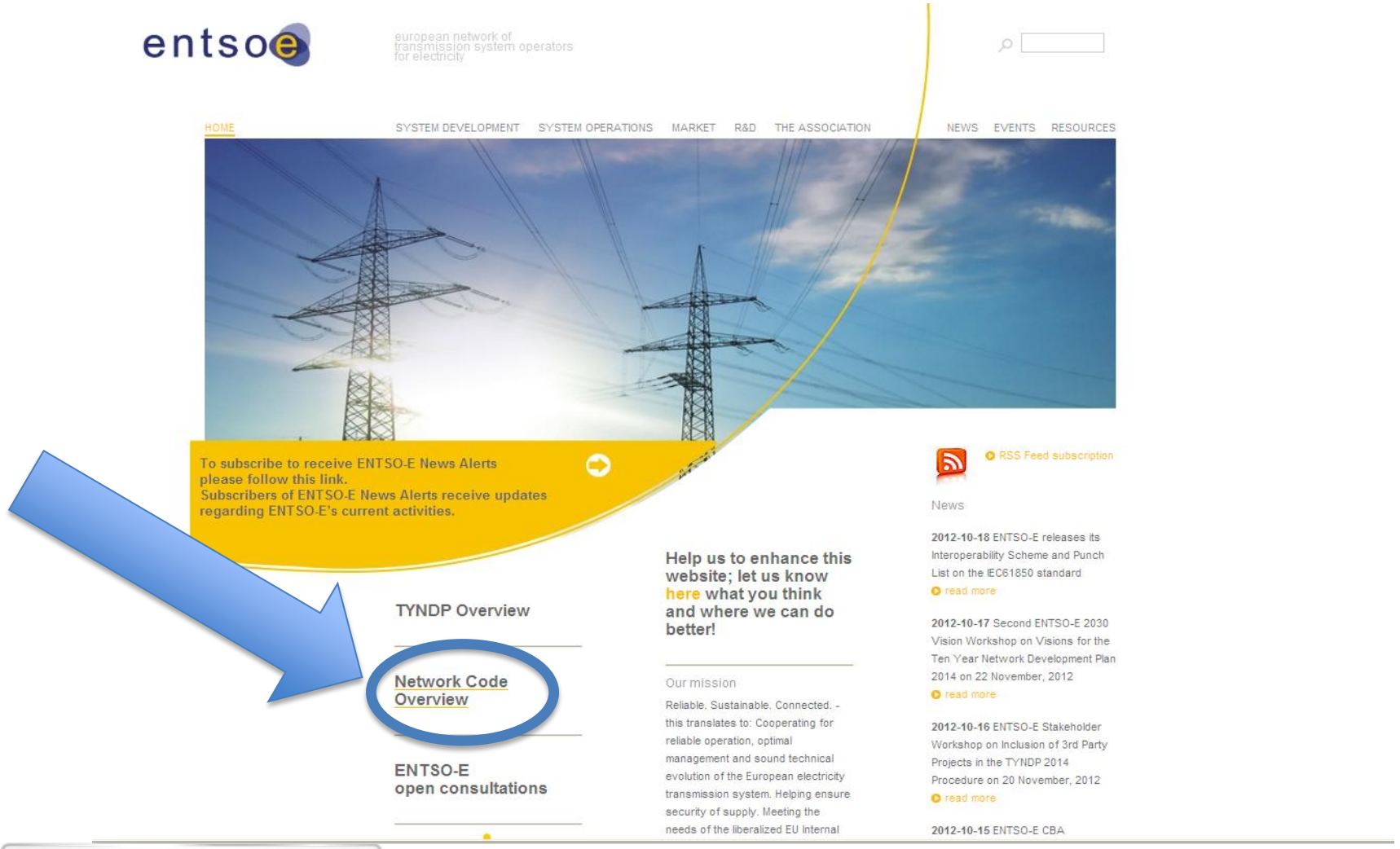
- **Scheduling of;**
  - Generation / Production
  - Load / Demand
- **Scheduling across AC and DC interconnectors**
  - AC line scheduling more difficult than DC on mainland Europe

What's next?

- Public Consultation Nov – Dec 2012
- OP&S supporting paper to be released at public consultation stage (paper helps explain Network Code in detail)
- Please let us know your views at Public Consultation stage

Where to find OPS Network Code and Supporting Document

www.entsoe.eu



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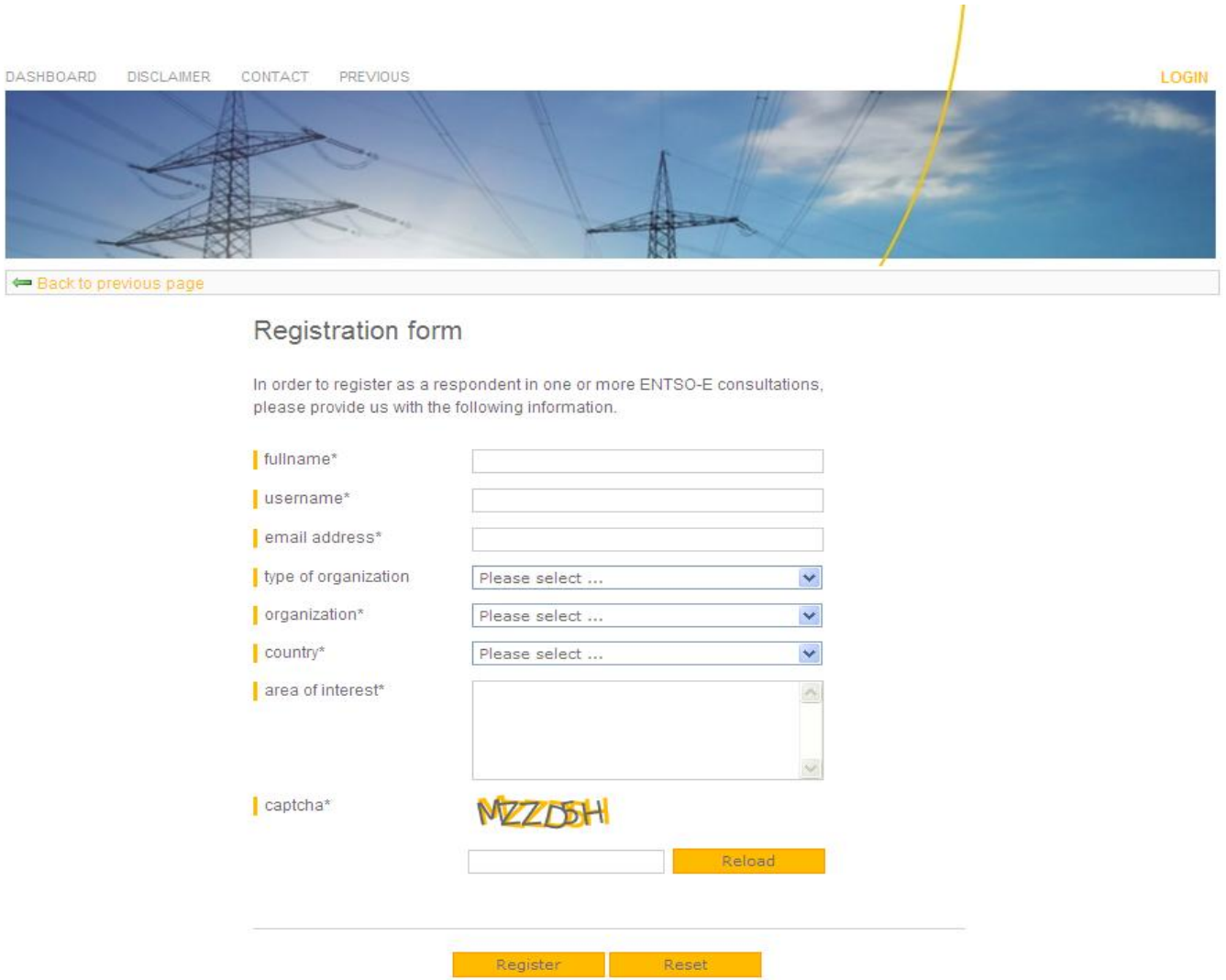
Where to find OPS Network Code and Supporting Document

How to raise questions during public consultation?



Thank you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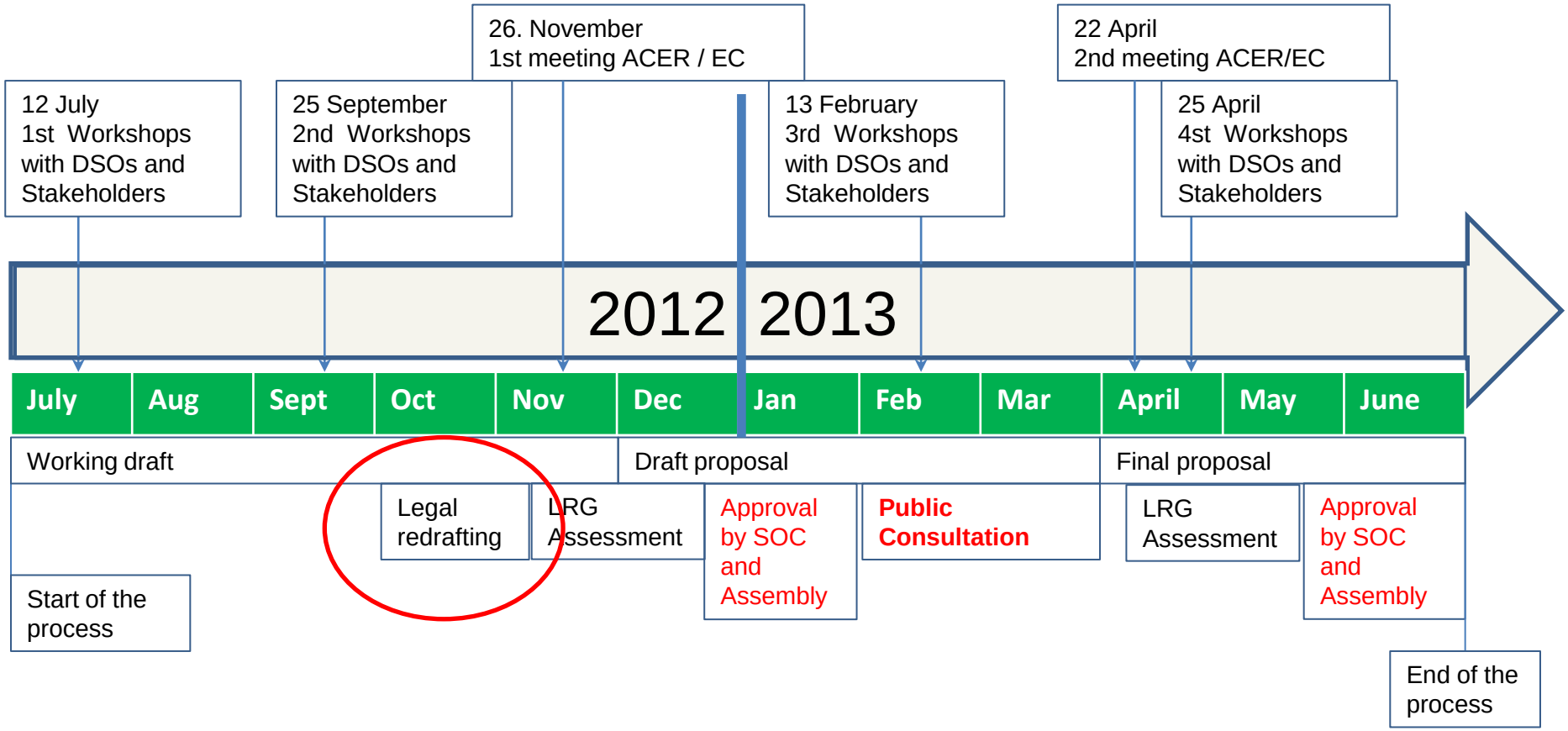
Single Electricity
Market Operator
SONI
System Operator for Northern Ireland

Load – Frequency Control & Reserves Network Code

Donal Connolly

Code Development Schedule



Contents of the Code

- Frequency Quality
- Load – Frequency Control Structure
- Frequency Containment Reserves
- Frequency Restoration Reserves
- Replacement Reserves
- Cross Border Reserves
- Synchronous Time Control
- Cooperation with DSO

Main Aims of the Code (1)

- Frequency Quality
  - Set frequency quality targets
  - Data collection
  - Data analysis
  - Publication process

- Load Frequency Control Structure

Process Activation Structure

Control and implementation requirements

- FCR
- FRR (manual and automatic)
- RR
- Cross Border Reserves

Process Responsibility Structure

Areas and area related obligations for TSOs

Main Aims of the Code (2)

- FCR, FRR and RR
  - Determination of volume (total and share)
  - Determination of required properties
  - Characteristics of activation (linear and piecewise linear)
  - Reserve providing units (amount and location)
  - Availability
  - Monitoring

  - Inertia
  - Risk levels
    - e.g.Synchronous Area risk level as a function of Frequency
      - Normal, elevated and high

Main Aims (3)

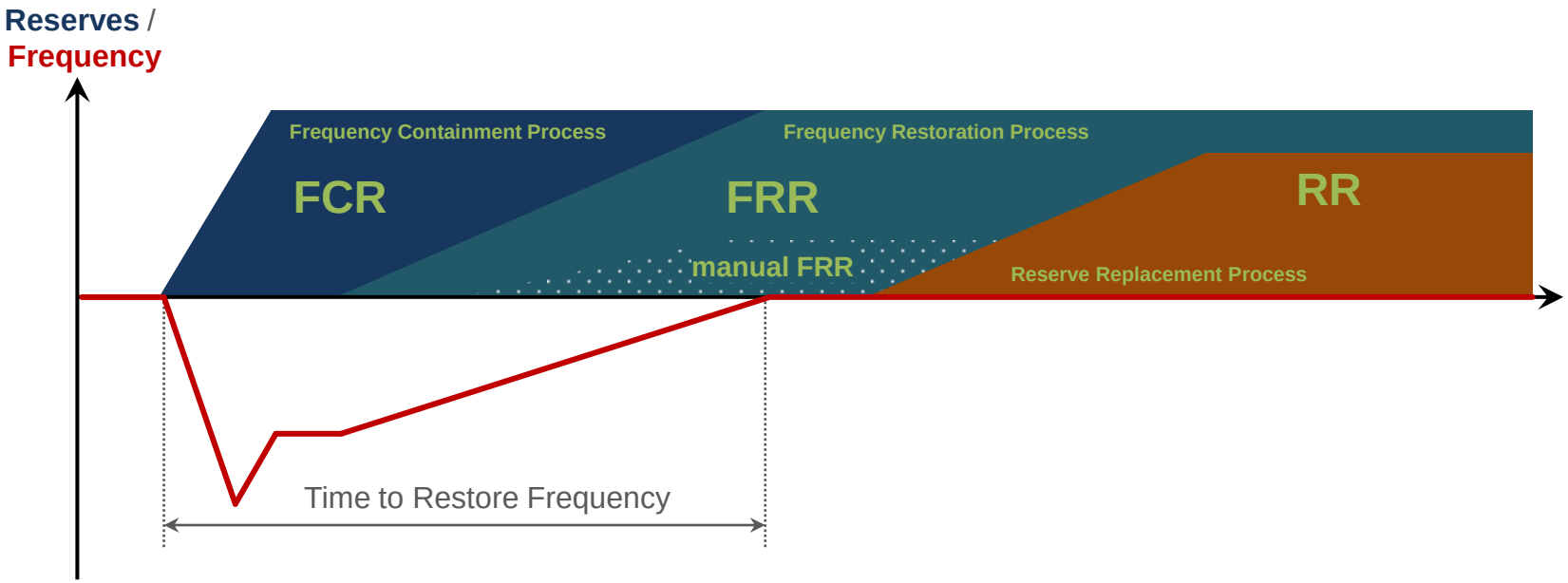
- Exchange of Reserves
  - Within synchronous areas and between synchronous areas
  - Set limits
  - Roles and responsibilities
- Synchronous Time Control
- Cooperation with DSO
  - Reserve providing unit to provide information to DSO
  - DSO can set limits on the delivery of reserves based on seurity analysis

Load – Frequency Control & Reserves Network Code

www.entsoe.eu

Thanks for your attention

Process Activation Structure

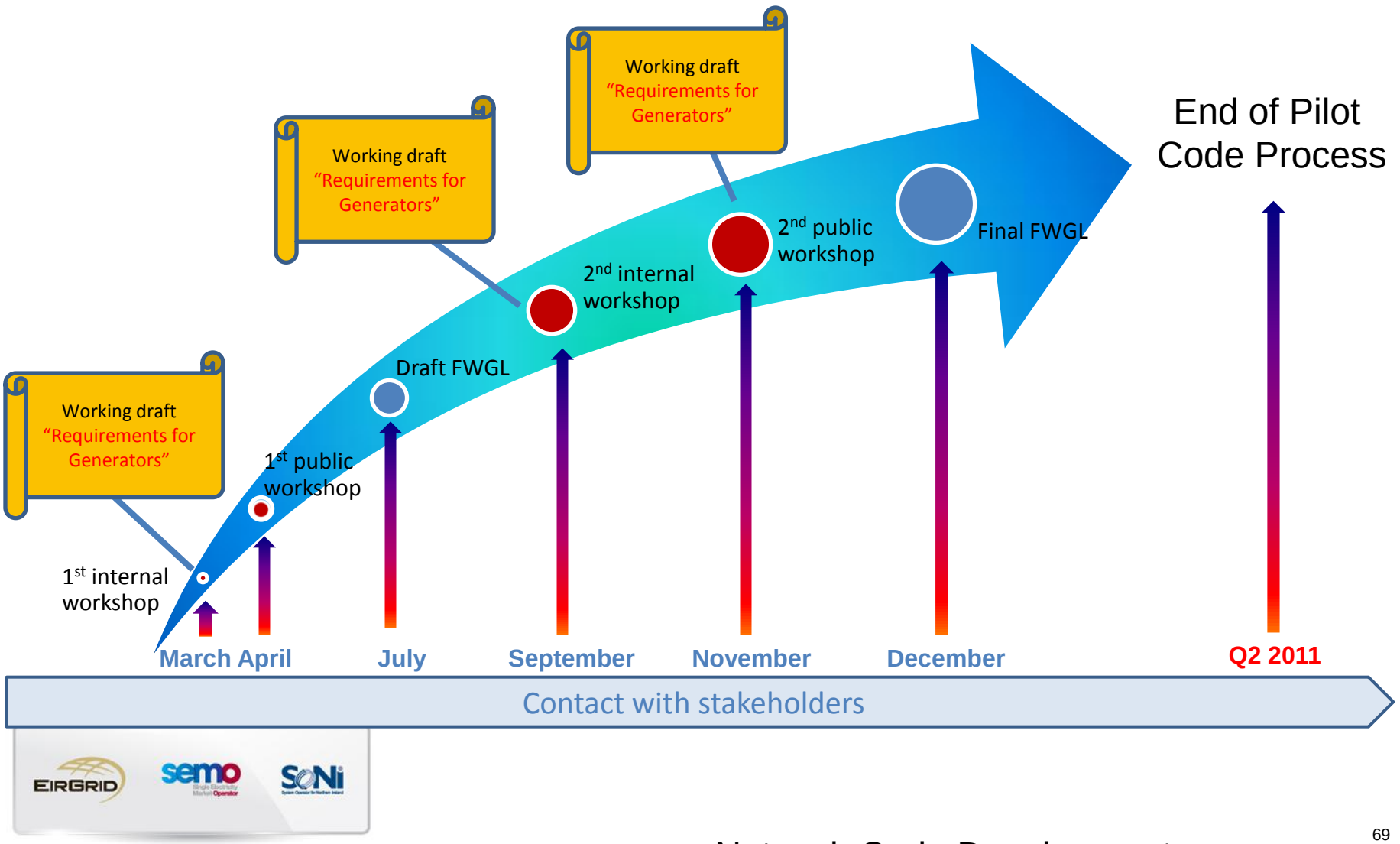


- Frequency Containment Process
- Frequency Restoration Process
- Reserve Replacement Process

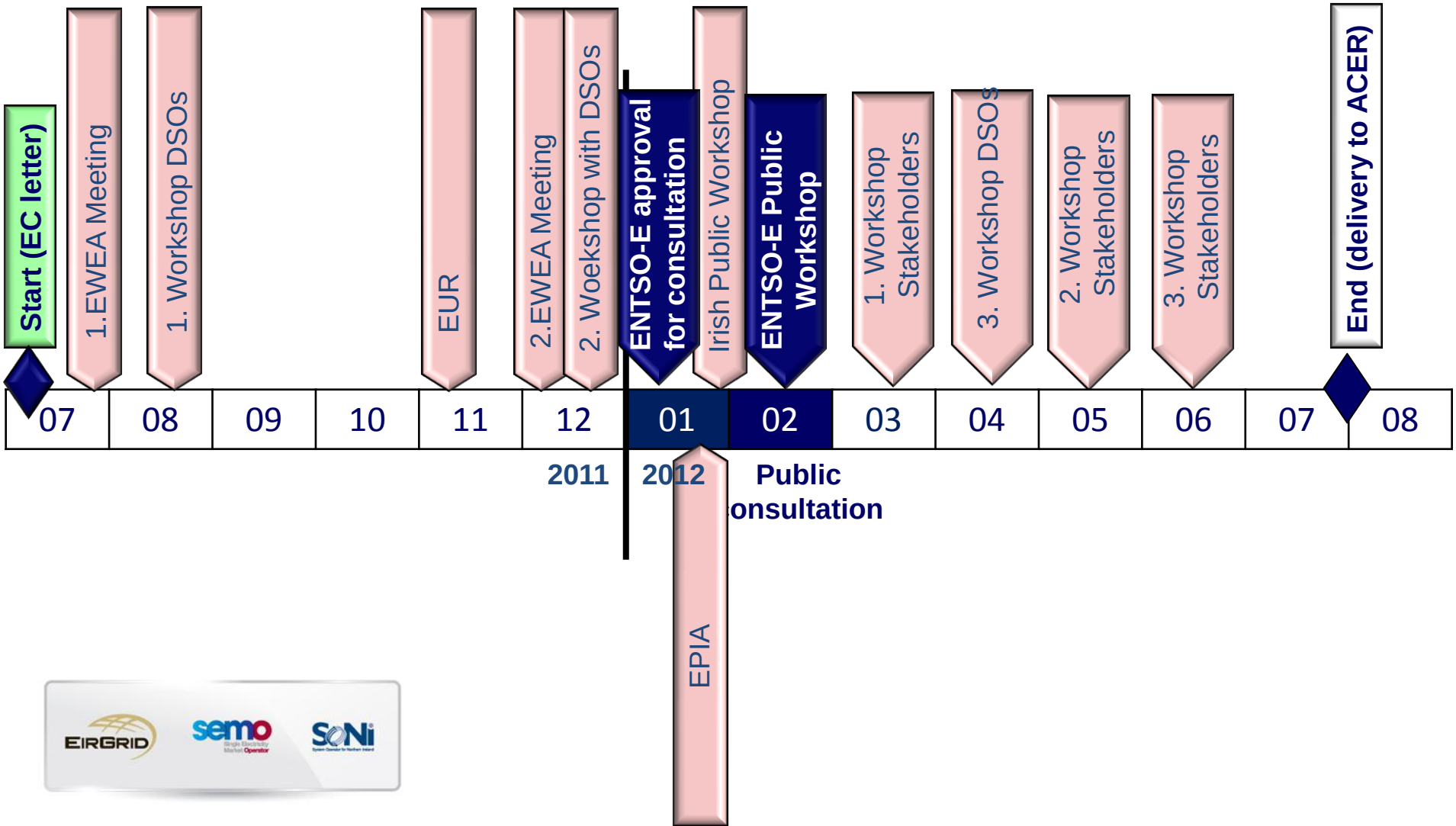
Requirements for Generators Network Code

Mark Norton
Manager Technology and Standards
24th Oct 2012

Pilot process



Network Code Development



What is a Significant Grid User?

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

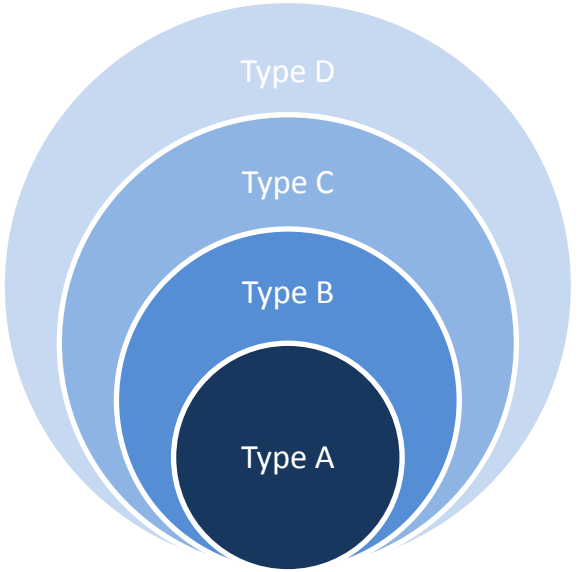
- Generator capabilities are formulated from a system performance perspective, independent from technology
- Need to be able to cope with evolutions in generation mix
- Significance is regarded per requirement

Wide-scale network operation and stability including European-wide balancing services

Stable and controllable dynamic response capabilities covering all operational network states

Automated dynamic response and resilience to operational events including system operator control

Basic capabilities to withstand wide-scale critical events; limited automated response/operator control



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

Contents of Code

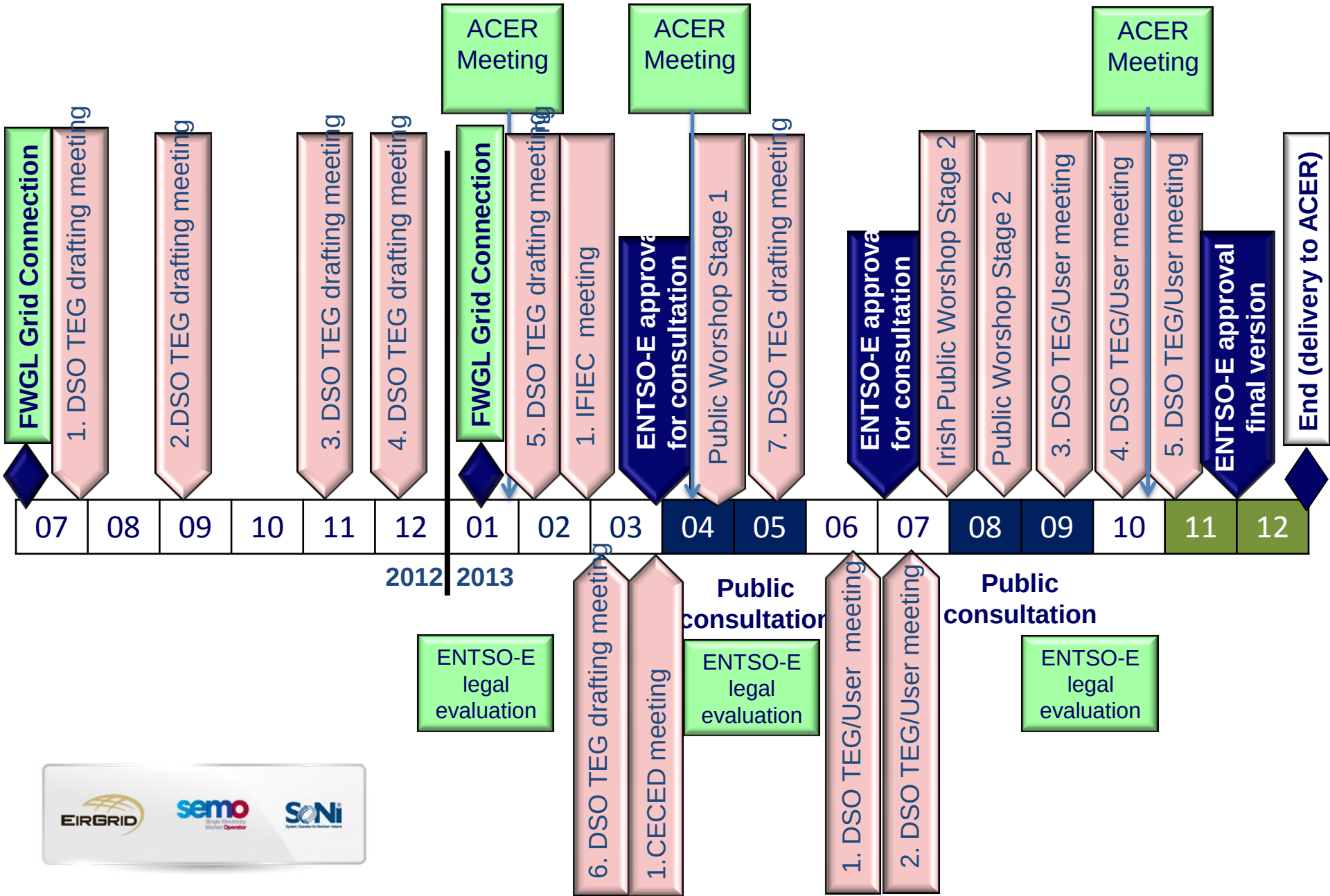
- General provisions
  - Definitions
  - Scope
- Requirements
  - General requirements
  - Synchronous Generating Units
  - Power Park modules
  - Offshore Power Park modules
- Operational Notification Procedure for Connection
  - New generating units
  - Existing generating units
- Compliance
  - Compliance monitoring
  - Compliance testing
  - Compliance simulations
- Derogations
  - Request
  - Decisions
- Final Provisions
  - Entry into force and application of the Network Code

Thanks for your attention

Demand Connection Network Code

Mark Norton
Manager Technology and Standards
24th Oct 2012

Network Code Development



Significant Users

Transmission Connected Demand Facility

Transmission Connected Distribution Network

- DSO networks
- Closed Distribution Networks

Demand facility with DSR

- Any size from Domestic
- APC/RPC/TCM Remote Controlled
- SFC Autonomous

Contents of Code

- General provisions
  - Definitions
  - Scope
- Requirements
  - Transmission Connected Demand Facilities
  - Transmission Connected Distribution Networks
  - Demand with DSR APC/RPC/TCM
  - DSR SFC
- Operational Notification Procedure for Connection
  - New Demand Facilities and Distribution Networks
  - Existing Demand Facilities and Distribution Networks
- Compliance
  - Compliance monitoring
  - Compliance testing
  - Compliance simulations
- Derogations
  - Request
  - Decisions
- Final Provisions
  - Entry into force and application of the Network Code

Code Requirements

Framework Guidelines	
Frequency and voltage parameters	Section 2.1
Requirements for reactive power	Section 2.1
Load-frequency control related issues	Section 2.1
Short-circuit current	Section 2.1
Requirements for protection devices	Section 2.1
Balancing capabilities and provision of ancillary services	Section 2.1, 2.1.1,and 2.1.2
Equipment requirements at connection point	Section 2.1.1 and 2.1.2
Disconnection/Islanding/Reconnection	Section 2.1.3
Instructions provide by TSO/DSO to user	Section 2.1.2 and 3.2
Information/Data exchange	Section 3
Compliance	Section 2.4
Derogation	Section 2.2
Enforcement period	Section 2.3

New European Requirements

The new requirements identified by ENTSO-E cover the following:

1. Demand Side Response delivering Reserve Services
2. Demand Side Response delivering System Frequency Control
3. Reactive power exchange capabilities
4. Voltage withstand capabilities
5. Frequency withstand capabilities

Thanks for your attention

HVDC Code

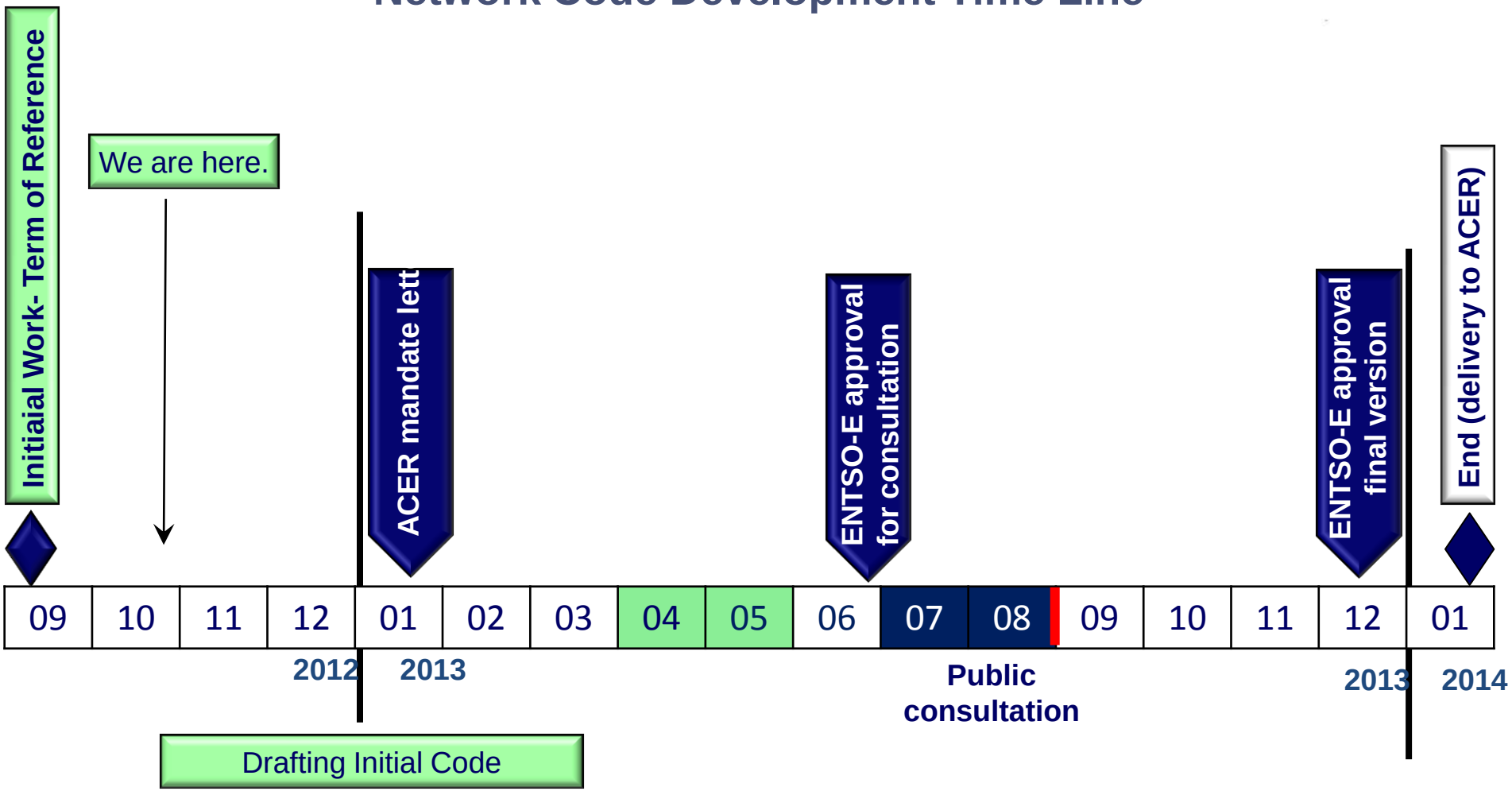
HVDC Connection and DC connected Offshore Power Park Module Requirements

Topics

- HVDC Network Code Development Status
- Objective/Scope of the Code
- Types of HVDC and DC offshore Power Park Module
- Example of Requirements

HVDC Network Code Development Status

Network Code Development Time Line



Call for interest to join the user group is coming shortly on the ENTSO-E website.

Objective/Scope of the Code

To define "Significant Grid User" consistent with the FWGL and other network codes and to develop functional specifications that are applicable to different HVDC and DC connected offshore PPM configurations. The requirements should be non-discriminatory, and utilise the inherent capabilities of HVDC systems and DC connected offshore PPMs to ensure or improve power system security and enhance market integration and wind energy penetration.

Cross-border issues and signifiant Grid User

(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"*
- *The network code(s) developed according to these Framework Guidelines shall define appropriate minimum standards and requirements applicable to all significant grid users."*

Context 3rd Energy Package

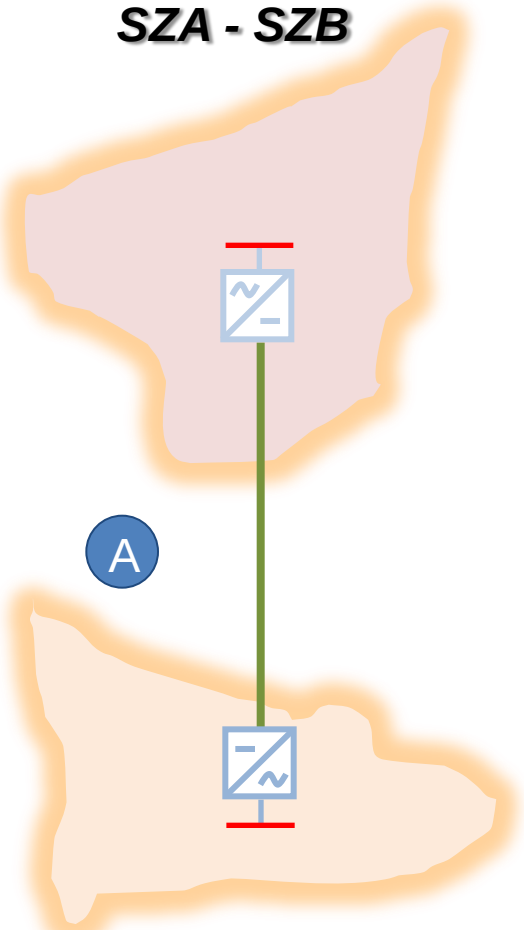
- supporting the completion and functioning of the internal market in electricity and cross-border trade
- facilitating the targets for penetration of renewable generation
- maintaining security of supply

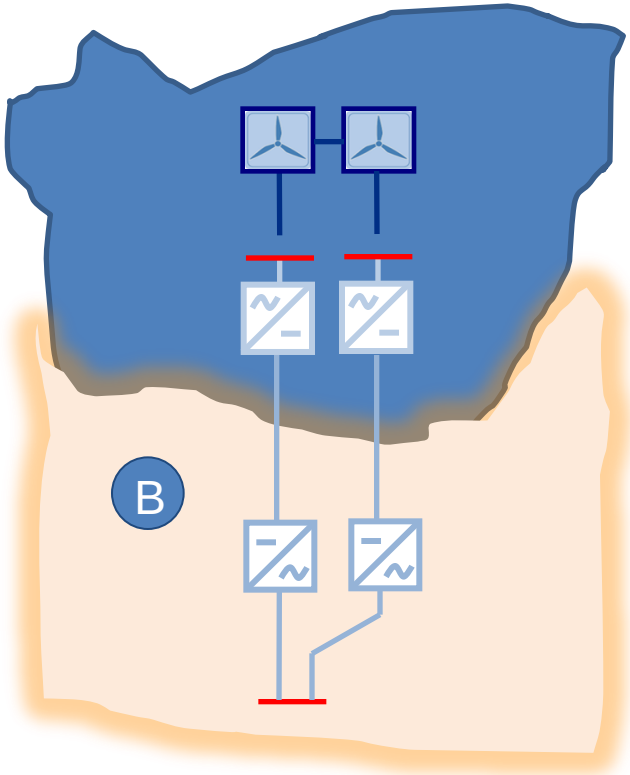
Rfg definition

- 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**".

Types of HVDC and DC offshore Power Park Module

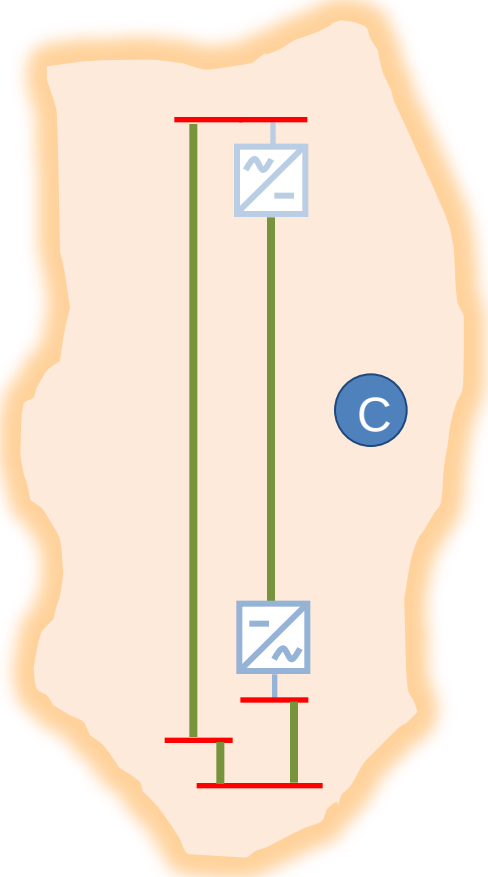
DC Connection SZA - SZB



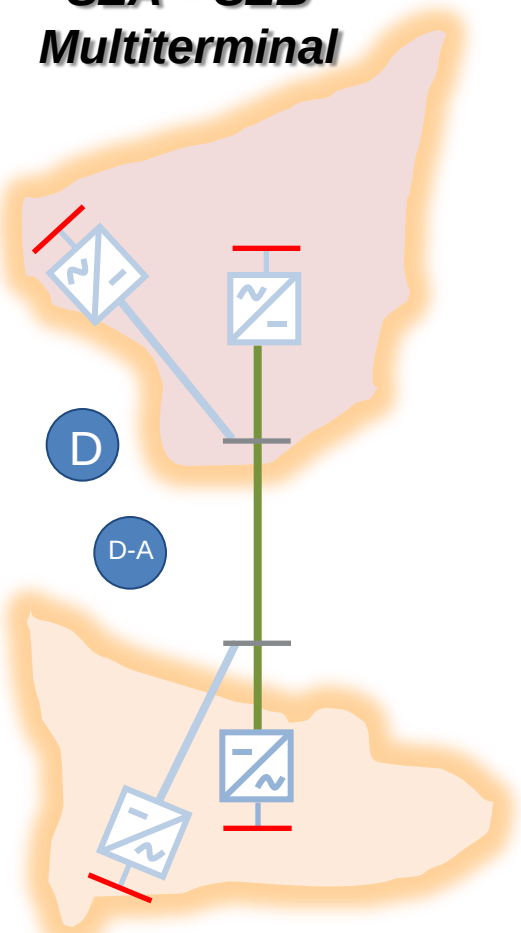


DC-Connection OS-SZ

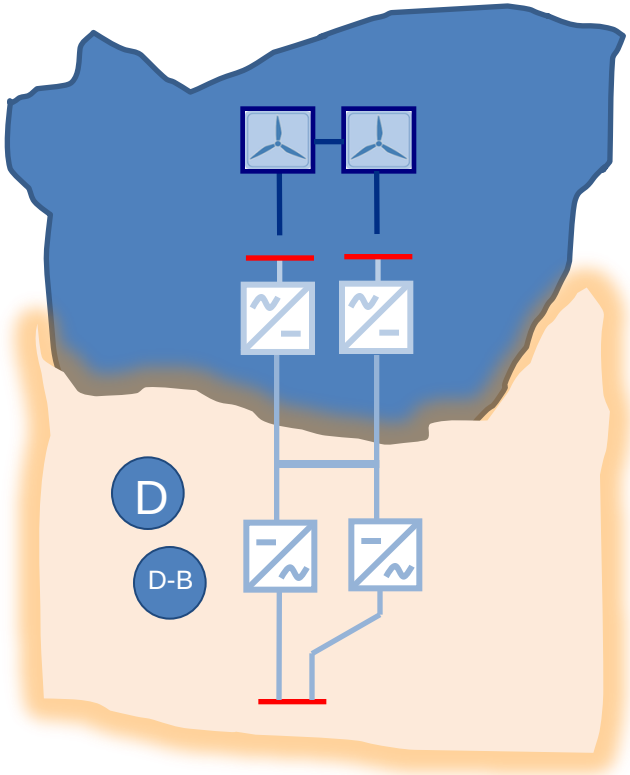
Embedded DC within one SZ



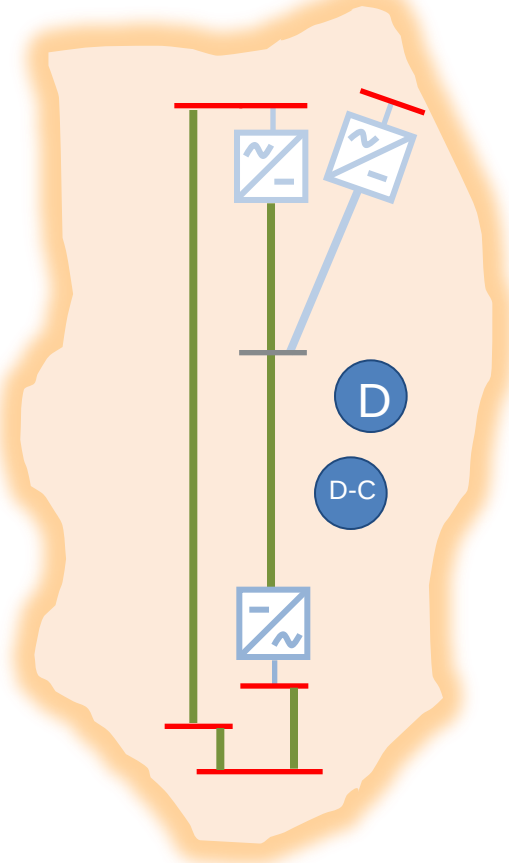
DC Connection SZA – SZB Multiterminal

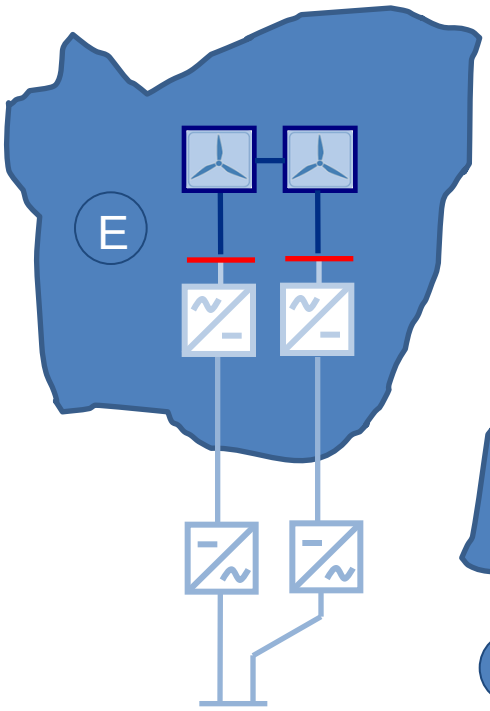


DC-Multiterminal Connection OS-SZ



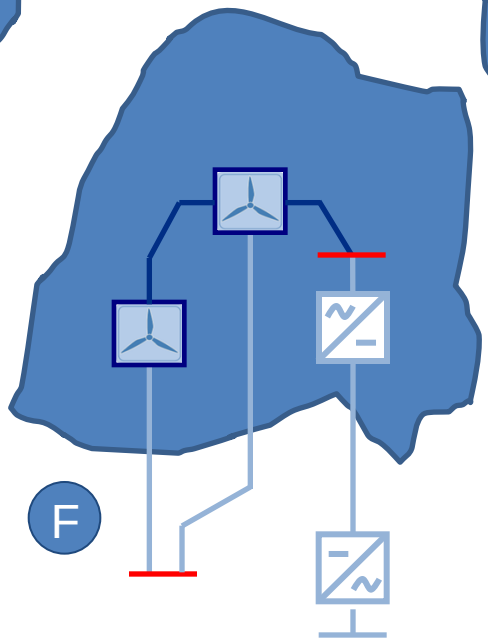
Embedded Multiterminal DC within one SZ

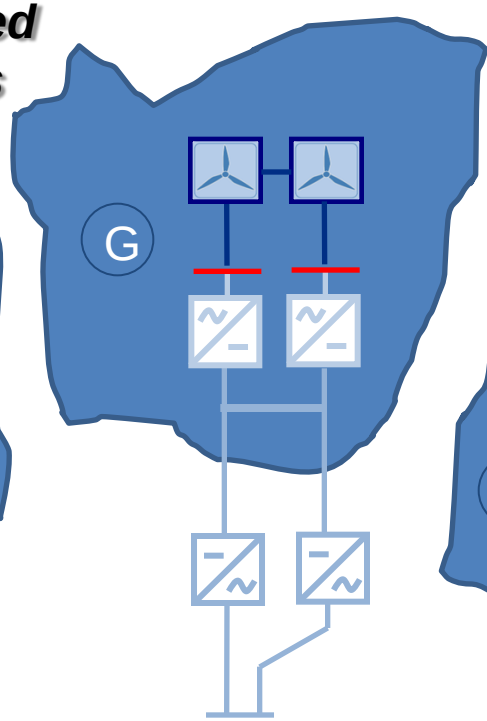




DC connected OS (AC) PPMs

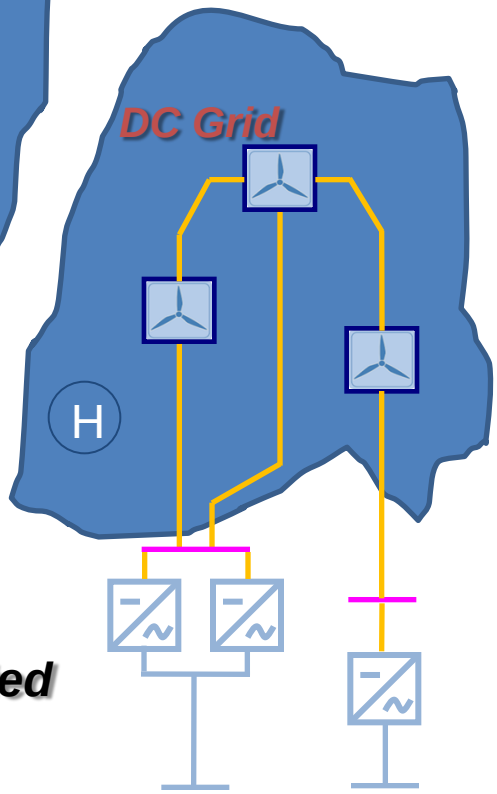
Hybrid connected OS (AC) PPMs





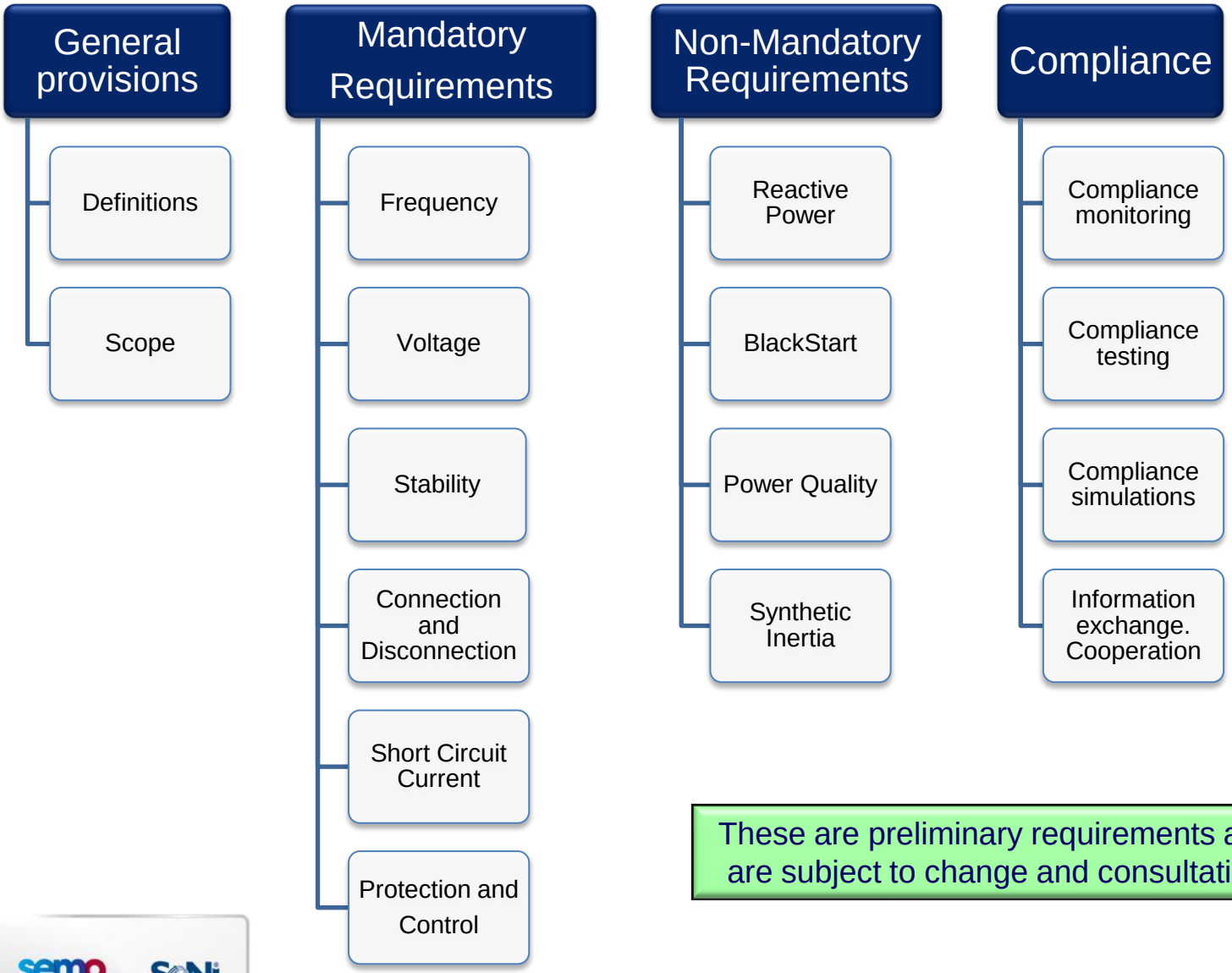
DC GRID connected OS (AC) PPMs

DC GRID connected OS (DC) PPMs



Example of Requirements

Example of requirement



These are preliminary requirements and are subject to change and consultation

Network Code requirements

Exhaustive requirements (Prescriptive)

- The Network Code lays down requirements and specific parameters
- ***E.g. Frequency per area***

Non-Exhaustive requirements (Framework)

- The Network Code gives a coherent approach to formulate requirements
- Avoids divergence of requirements throughout Europe
- Specific setting of parameters based on a given legal framework, e.g. NRA approval, consultation, in mutual agreement, other Network Codes, …
- ***E.g. reactive power provision***

Principle requirements (Process)

- High level requirement on functionality
- Specific implementation prescribed by other agreements, national legislation, Network Codes, …
- ***E.g. information exchange or cooperation***

What is the expectation of the audience for this Code?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