ENTSO-E's Workshop with Stakeholders on the Connection Network Codes national implementation

Date: 23 September 2015
Time: 10:00 -16:30
Place: Radisson Blu Royal Hotel, Rue du Fossé-aux-loups 47, B-1000 Brussels, Belgium

FINAL AGENDA

No	Subject	Duration	Time	Lead
1.	Welcome and introduction	10 min	10:00-10:10	**Sébastien Lepy** ENTSO-E System Development Committee Chairperson
2.	Legal framework for the Connection Network Codes Discussion	30 min	10:10-10:40	**Ines Barreda Ruiz de Assin** ENTSO-E Legal and Regulatory Group All
3.	Connection Codes national implementation processes – part 1: - French case - UK case	1h 20 min	10:40-12:00	**Sabine Corcos** French Ministry **Jérémy Vincent** CRE **Stéphanie Bieth** RTE **Rupika Madhura** ACER Chair for Grid Connection Codes **Rob Wilson** National Grid
4.	Lunch	1h	12:00-13:00	
5.	Connection National Codes national implementation processes – part 2: - German case	1h 20 min	13:00-14:20	**Jan Suckow** VDE FNN

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	- Norwegian case			**Astrid Ånestad** Norway NVE **Stian Boye Skaatan** Statnett SF
6.	Panel discussion	1h 30 min	14:20-15:50	**Sébastien Lepy** ENTSO-E System Development Committee Chairperson **Uros Gabrijel** ACER **Rupika Madhura** ACER Chair for Grid Connection Codes **Joris Soens** Representative of all DSOs associations **Jan Suckow** VDE FNN **Astrid Ånestad** Norway NVE **All the participants**
7.	Next steps	20 min	15:50-16:10	**Ralph Pfeiffer** ENTSO-E Connection Codes Team Convenor **Uros Gabrijel** ACER
8.	Conclusions	20 min	16:10-16:30	**Sébastien Lepy** ENTSO-E System Development Committee Chairperson

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ENTSO-E'S WORKSHOP WITH STAKEHOLDERS ON THE CONNECTION NETWORK CODES NATIONAL IMPLEMENTATION

Radisson Royal Blu Hotel

Rue du Fossé-aux-loups 47, BE-1000 Brussels, Belgium

Brussels, 23 September 2015

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LEGAL FRAMEWORK CONNECTION NETWORK CODES

Inés de la Barreda

Workshop “Implementing the European Connection Network Codes – challenges and solutions”

23 September 2015

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1 Legal Framework – Third package

2 Inside the codes – Developement of the requirements

3 Scope of application

4 Regulatory aspects

4 Role of EU entities

5 Derogation process

LEGAL FRAMEWORK – THIRD PACKAGE:

1. All CNC are integral part of Regulation (EC) 714/2009;

- All provisions in Regulation apply to all Connection Codes
- References to Regulation includes reference to Connection codes.

2. EU regulations – approved as Network Codes or Guidelines:

- Based on articles 6 and 8 of Regulation EC nº 714/2009;
- Labelling as NC (vs Guidelines) does not make a difference to their legal value (content or enforceability);
- Connection codes are labelled as Network Codes

Reminder: EU regulations prevail over national legislation.

INSIDE THE CODES: DEVELOPEMENT OF NC REQUIREMENTS

Connection Network Codes define different layers of requirements:

1. **Requirements of direct application / "*exhaustive requirements*":**
   - **Defined in the code;**
   - **Applicability different for EU and non EU members:**
     - **EU Members**: replace national regulation (art. 288 TFEU) – should not be incorporated into national law.
     - **Non EU Members:** EEA (once inserted in the Annex of the Treaty); EnC (once inserted in the list of acts of energy acquis), other countries not bound by EU law (when incorporated in their national legal order).

INSIDE THE CODES: DEVELOPEMENT OF NC REQUIREMENTS

2. Requirements in need of national implementation: "*non exhaustive requirements*":

- **Requirements of general application:**
  - Proposed by the TSO or relevant system operator;
  - Approval granted by the NRA unless MS assigns it to other entity.

- **Site specific requirements:**
  - TSO or relevant sytem operator;
  - Member State might require approval by a designated entity.

INSIDE THE CODES: DEVELOPEMENT OF NC REQUIREMENTS

3. More detailed (*stringent*) provisions defined at national level (art. 21 Electricity Regulation):

- Requirements out of the scope of the codes;
- Based on EU / MS shared competence in energy;
- This allows for non contradictory measures at national level;
- For NCs, detailed provisions should not affect cross-border trade (art . 8 (7) Electricity Regulation)

SCOPE OF APPLICATION

Subjective scope of application: Entities affected by the requirements:

- **NC RFG**: Power generation modules (NEW);

- **NC DCC**
  - tranmission-connected demand and distribution facilities (NEW)
  - distribution systems, including closed dsitribution systems (NEW)
  - demand units (NEW) within a demand facililty providing DSR services;

SCOPE OF APPLICATION

Subjective scope of application: Entities affected by the requirements:

- **NC HVDC**
  - HVDC systems (NEW) connecting synchronous areas/ control areas
  - HVDC systems (NEW) within a control area at transmission level or at distribution level with cross-border impact
  - DC-connected power park modules (NEW).

SCOPE OF APPLICATION

Subjective scope of application: Entities affected by the requirements:

- **Geographical scope of application**
  - Not applicable to connections in islands of MS of which the systems are not synchronnously operated with a synchronous área

REGULATORY ASPECTS

Entities granted powers in NCs (arts 7 RfG, 5 DCC, 9 HVDC):

- **System operators:**
  - Define certain requirements for devices connected to their network upon approval of the entities below. Site specific might not require approval, depending on each MS.
  - Draft proposals of requirements of general application for approval of the entities mentioned below.
- **National Regulatory Authorities:**
  - Approve requirements; scope of application, derogations…
  - In general terms are assigned powers in the NCs based in article 37 of Directive 72/2009.
- **Member States:**
  - In some cases MS can appoint a different entity to provide for these approvals based on article 5 of Directive 72/2009.
  - Can provide that TSOs define certain requirements instead of the relevant system operator.

ROLE OF EU ENTITIES

- **ACER:**
  - Stakeholder involvement;
  - Monitoring of implementation and effects on market integration and efficiency;
  - Derogations (monitoring).

- **ENTSO-E:**
  - Stakeholder involvement (in close cooperation with the Agency);
  - Non-binding guidance on NCs;
  - Monitoring of implementation;
  - Provide information to the Agency

- **European Commission:**
  - Derogations: providing a harmonized approach, monitoring the derogation process and granting a reasoned opinion to provide or revoke a derogation.

DEROGATION PROCESS

Addressees of the code could request a derogation not to apply some specific requirements:

- **Initiative to request a derogation:**
  - Affected entities – file the derogation request with the relevant system operator;
  - Relevant system operator or relevant TSO – for classes of users connected to their network.
- **Entity granting a derogation:**
  - Regulatory authorities – based on published derogation criteria;
  - Other entities.
- **All the process is monitored by ACER and the EC.**

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Implementation of Connection Network Codes

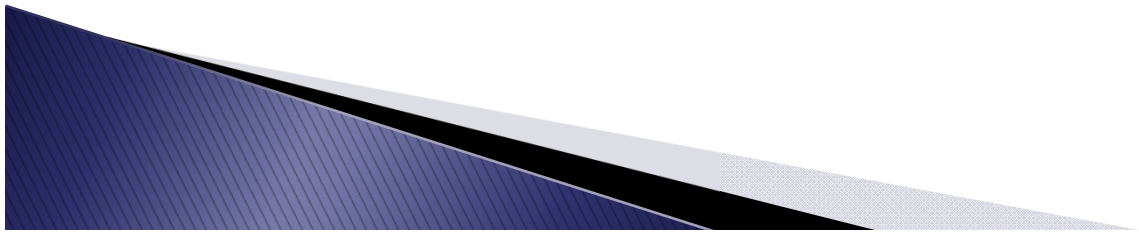
The French process

ENTSOE external Workshop – Brussels 23.09.15

Sabine Corcos – Climat and Energy Ministry
Jérémy Vincent - French Regulator
Stéphanie Bieth – French TSO

Topics

- Organisation and schedule
- Impact on the national documents
- Roles of the involved parties



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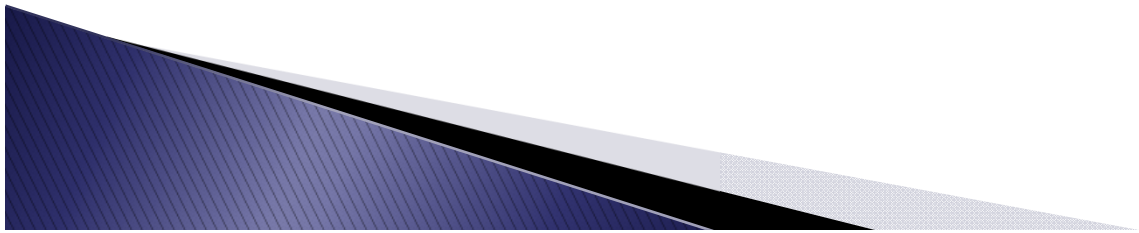


Launch of the national implementation of connection Network Codes

A « pilot working group » was put in place in October 2014 by the Ministry, in cooperation with the French Regulator (CRE), in order :

- **To assess the impact** of RfG on existing texts governing the connection of generators to the grid
- **To list the subjects** that have to be discussed with stakeholders and identify their degree of importance
- **To define** in which framework the **consultation** should take place.

A report was presented to the Ministry and the Regulator in March 2015.

A specific committee for discussion and proposals

The report concludes that **a specific committee** should be put in place to discuss and make proposals on the implementation of RfG on a national level.

This committee will **only** address the implementation of **RfG**.

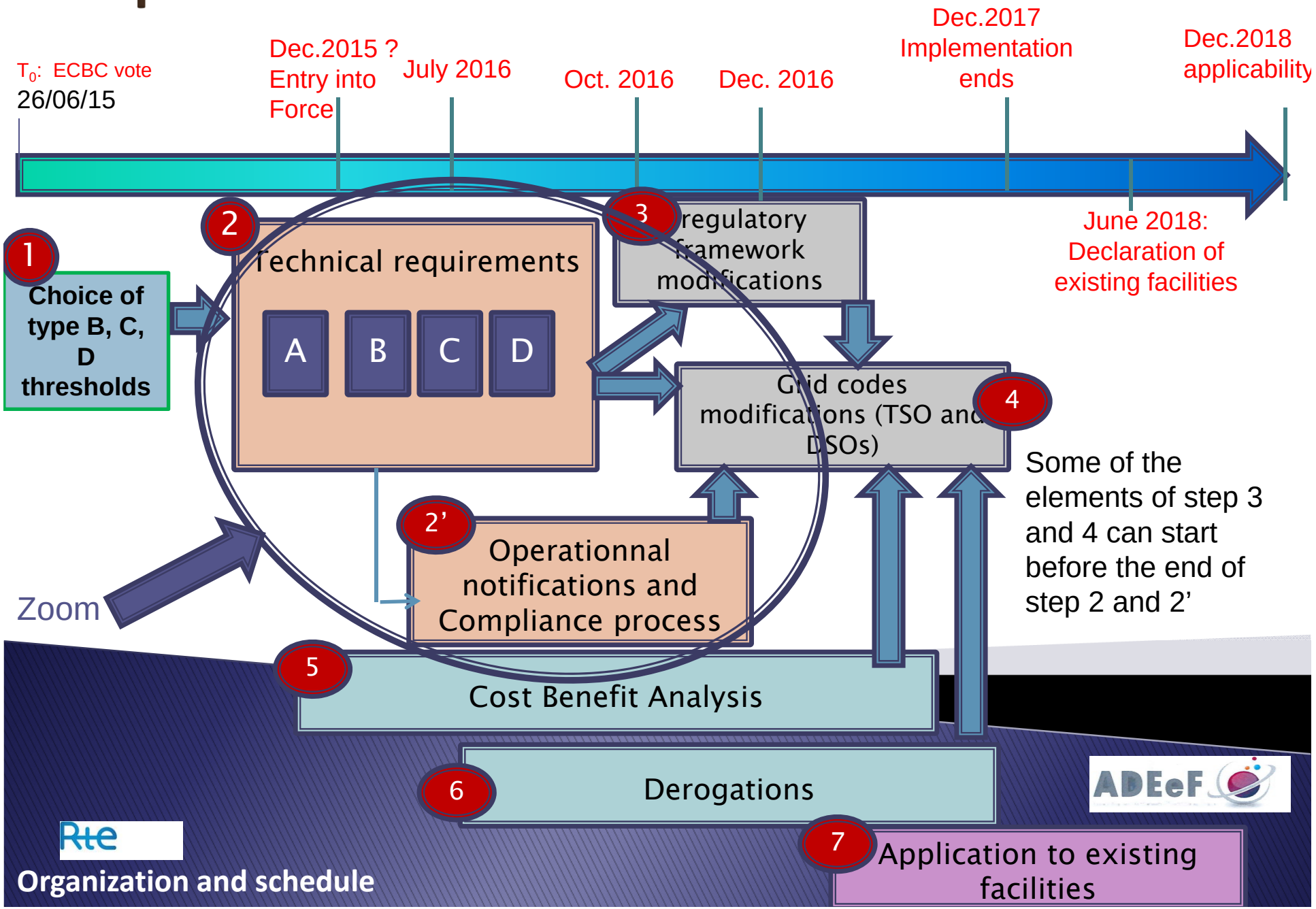
Feedback on this experience should enable us to decide on the process for following codes. These principles should be consistent.

Key principles

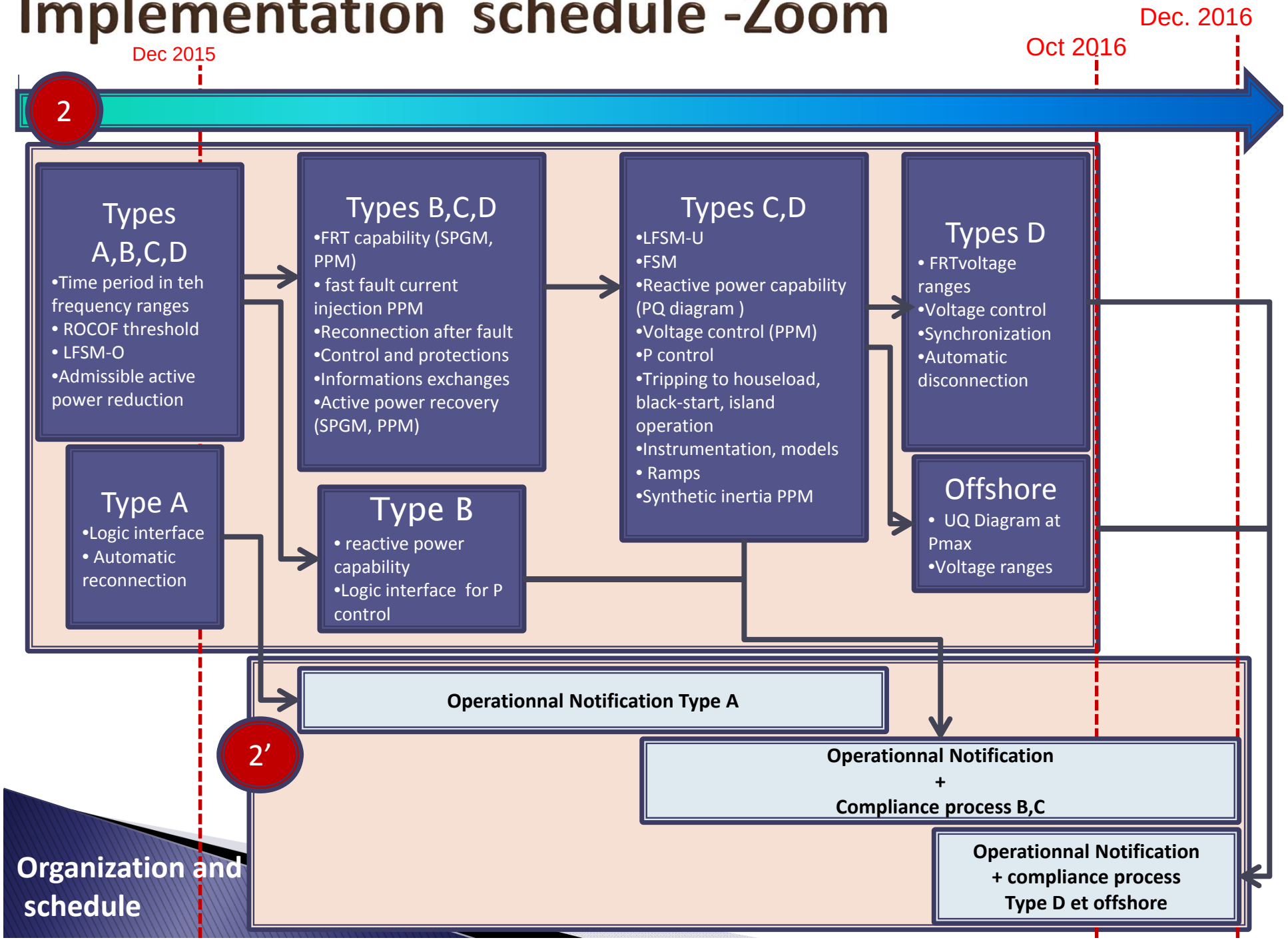
The committee will make proposals on **non-exhaustive and non mandatory requirements** as well as proposals on **methodologies** identified by the « pilot working group ».

Based on these proposals, it will then be up to the **Ministry and/or the Regulator** to decide on these requirements and methodologies**.**

Implementation schedule



Implementation schedule -Zoom



Topics

- Organisation and schedule
- Impact on the national documents
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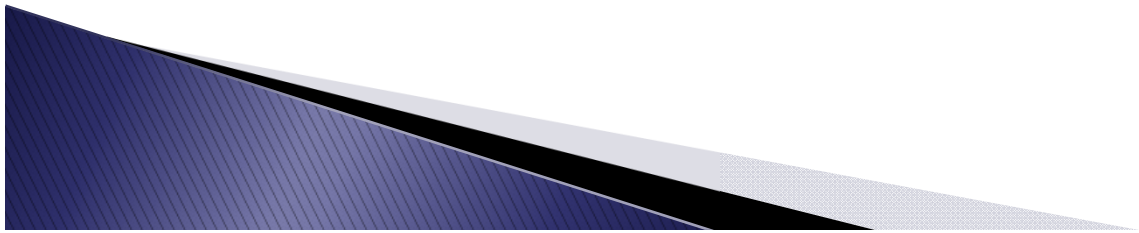
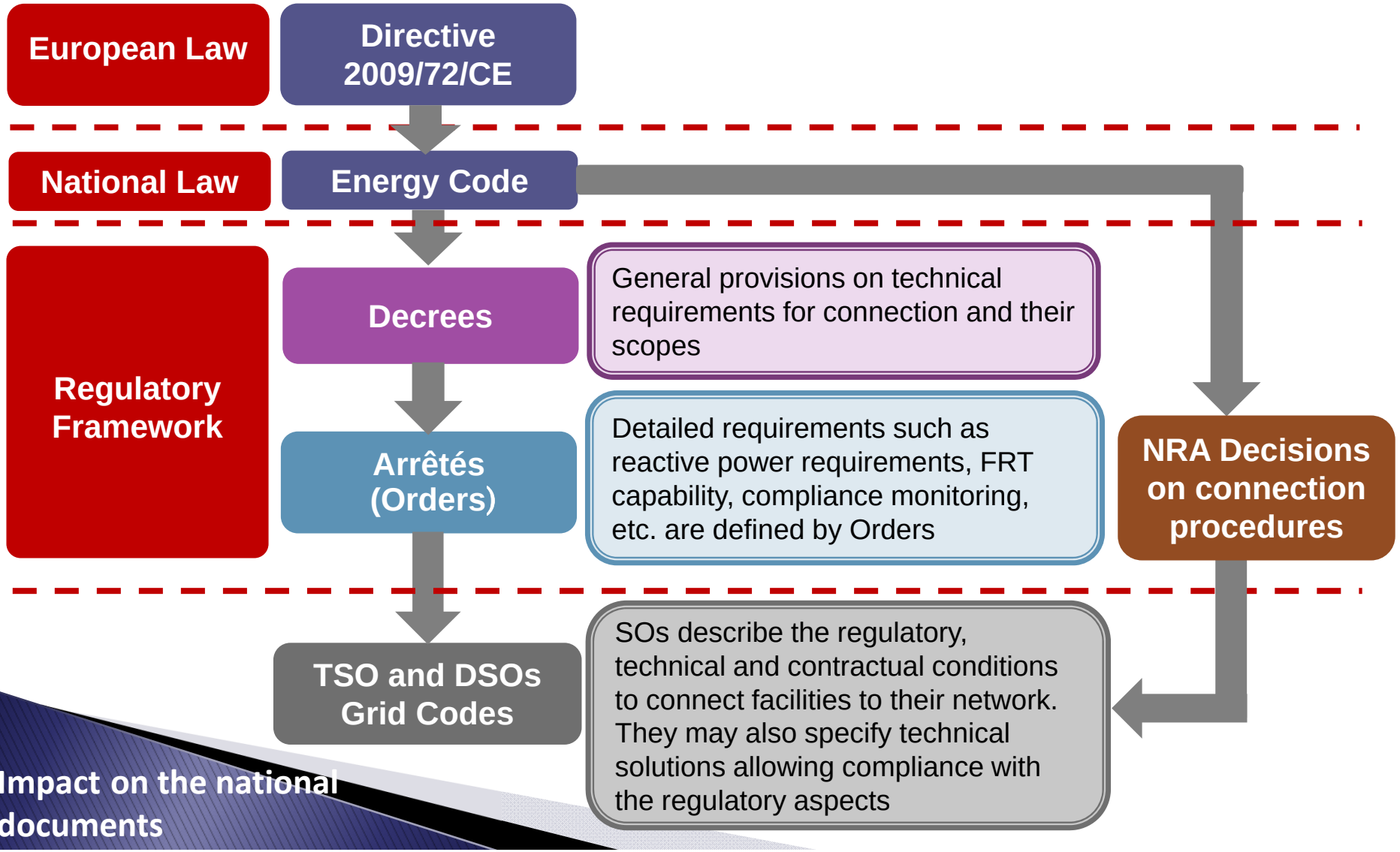


Existing framework concerning technical requirements for connection



Impact of the RfG NC on Decree

Decree

- Today, France has one Decree related to the connection of generators.
- This decree must be revised. For the sake of clarity, an option under discussion is to keep one “all-encompassing Decree”.

Option under discussion → A “all-encompassing Decree” which could :

- Include the existing provisions still applicable and take into account new provisions from the RfG Network Code.
- Define which national authority is competent to approve, when needed, requirements from the RfG NC and create the link between provisions which will be defined in Orders, NRA Decisions and Grid Codes.

Impact of the RfG NC on Orders and Grid Codes

Arrêtés (Orders)

- Today, France has Orders defining the technical requirements and compliance monitoring measures **per voltage level**
- A deep revision will be needed in order to take into account the new provisions from the RfG Network Code (Yet to be determined during Implementation Committee)

TSO and DSOs Grid Codes

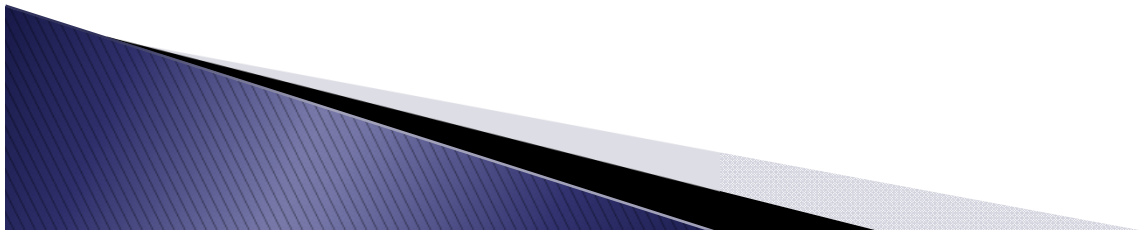
- System Operators Grid Codes bringing together a large number of regulatory, technical and contract conditions will be strongly impacted
- A deep revision should be conducted by each System Operator

The Grid Codes should gather RfG NC and national regulations provisions in order to inform customers of all applicable provisions.

Impact on the national documents

Topics

- Organisation and schedule
- Impact on the national documents
- Roles of the involved parties



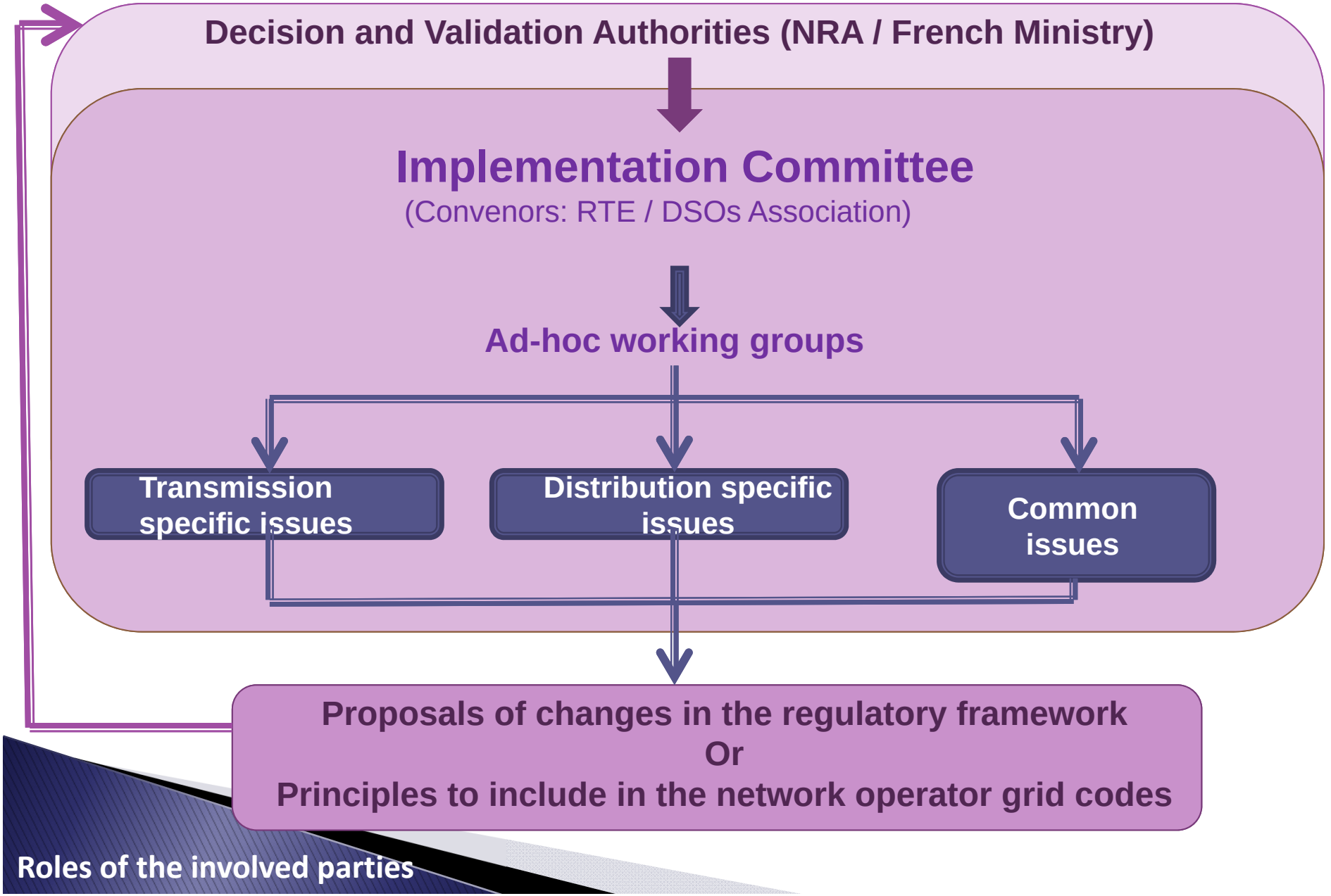
The Involved Parties

- **Stakeholders** : generators, associations of generators, manufacturers
- **Network operators**: the DSOs association, RTE

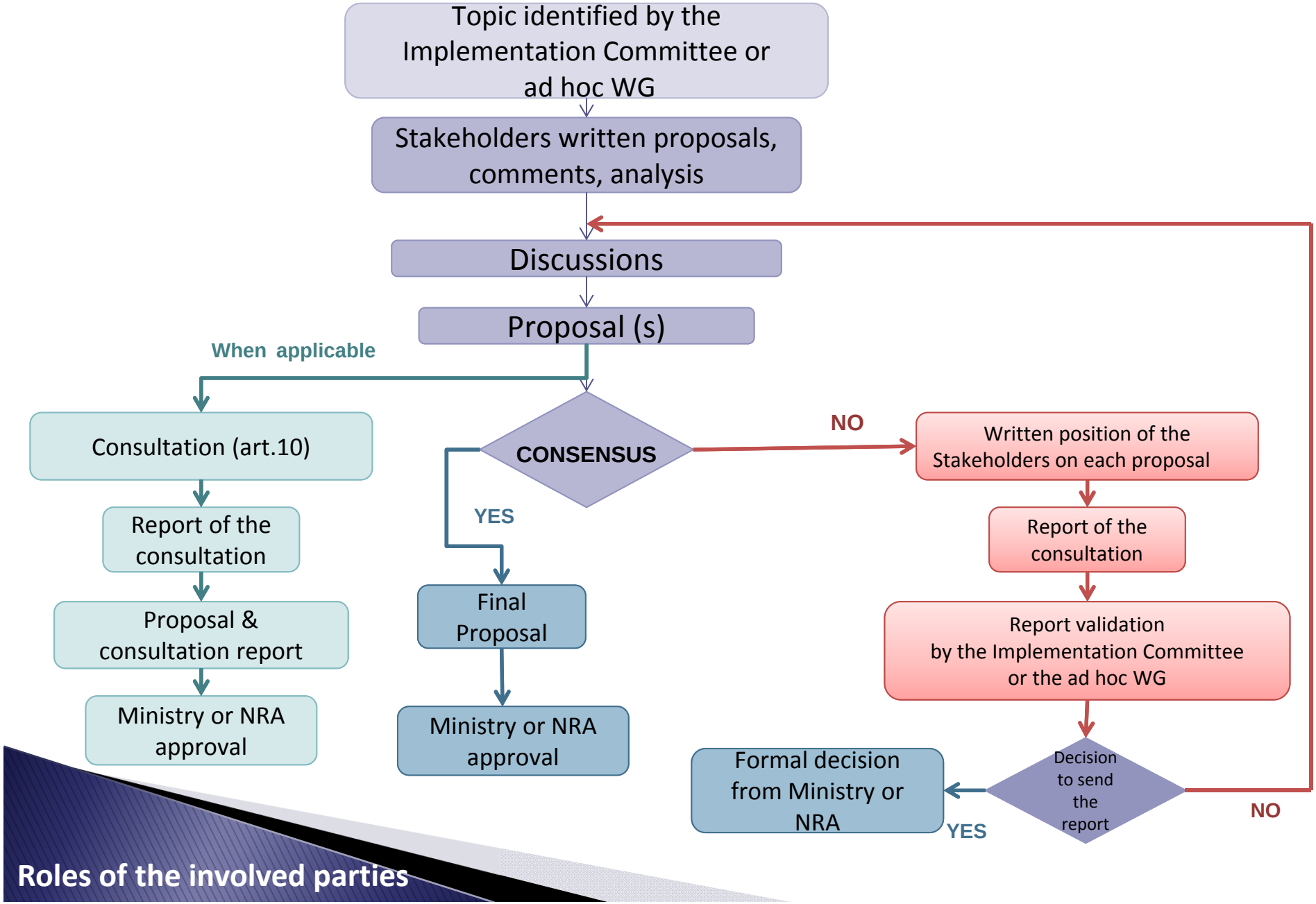
- **the French Energy Ministry and the Regulator.**

All are involved through the specific Implementation Committee

The Implementation Committee



How does the commitee work?



Roles of the involved parties

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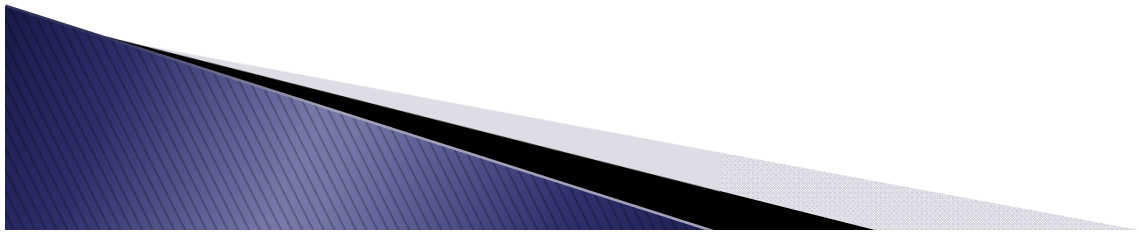


European Connection Codes
Great Britain Implementation

ofgem/ national**grid**



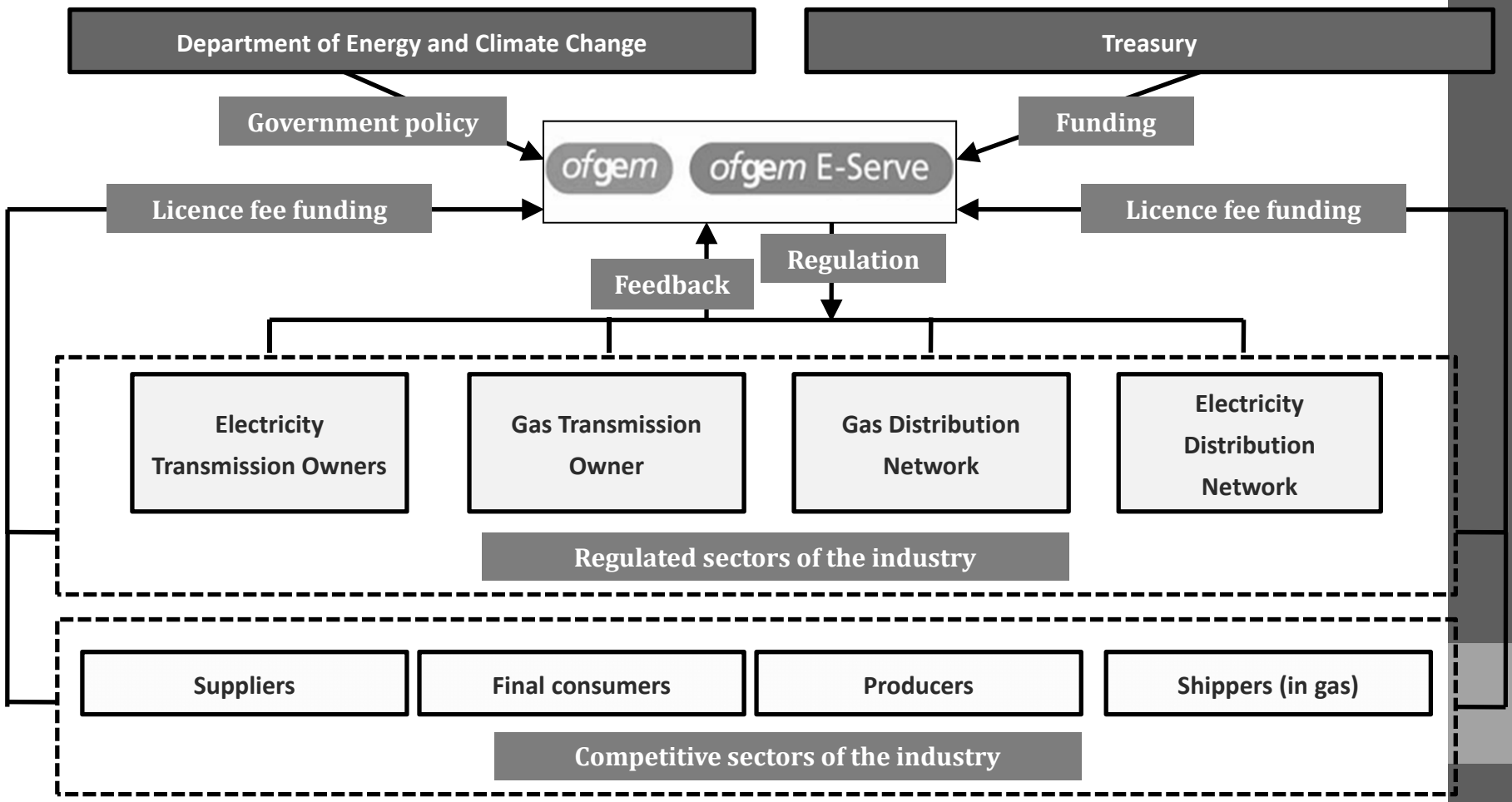
ENTSO-E Stakeholder Workshop
23rd Sept 2015

What will we cover?

- Framework of energy industry in Great Britain (GB)
- GB approach to implemention of European Grid Connection Codes
- Case Study – Requirement for Generators (Rfg)
- Opportunities and Challenges

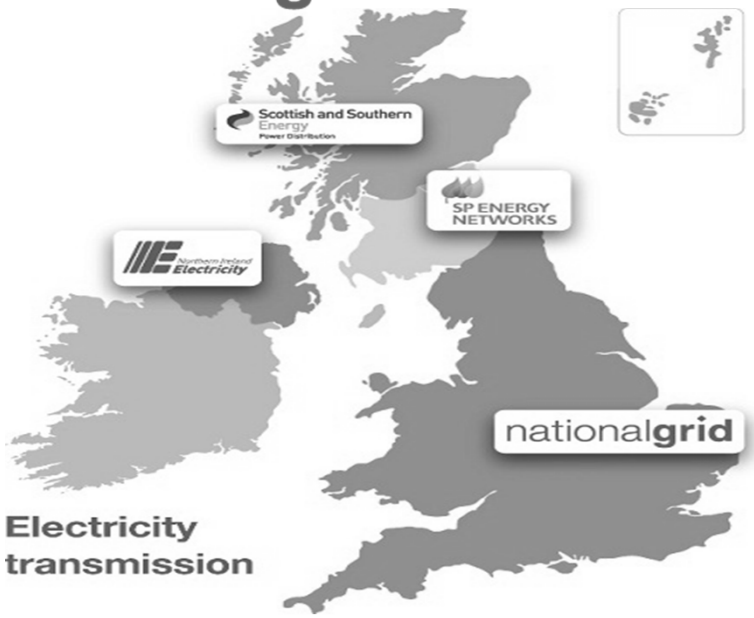
ofgem/ nationalgrid

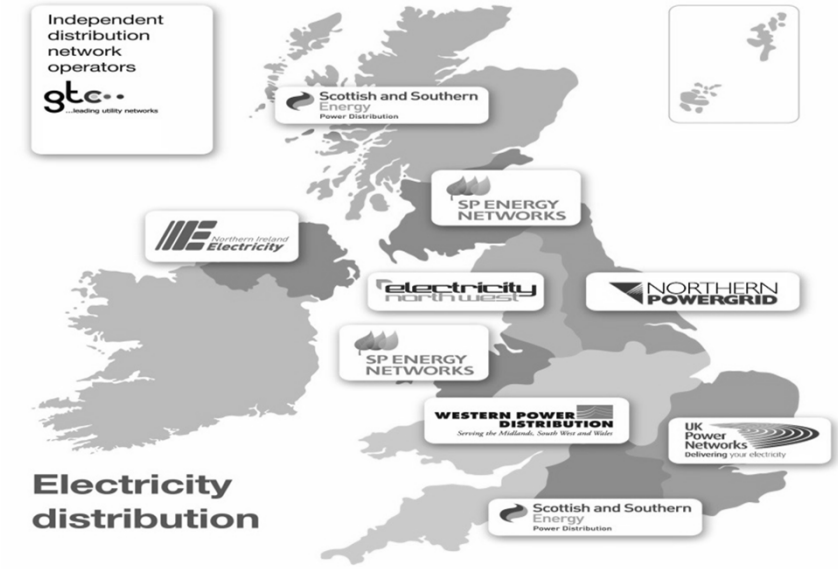
Energy GB Institutions



ofgem/ nationalgrid

Electricity Network Companies





1 System 0perator (SO)

4 Transmission System Operators (TSO)

14 Distribution Network operators (owned by 6 groups) (DNOs)

ofgem/ nationalgrid

GB Industry Licence and Code regime

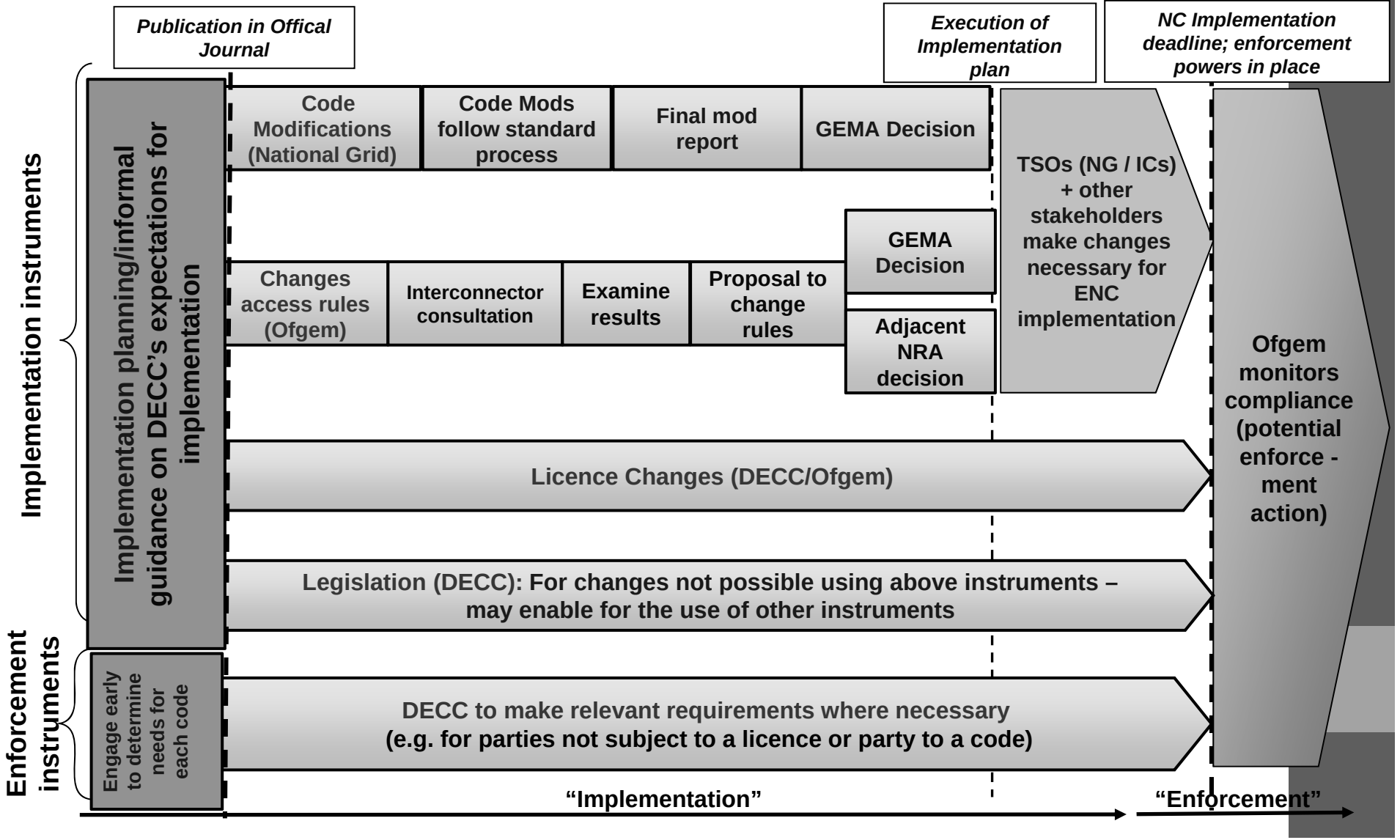
- the Electricity Act 1989, certain activities electricity may only be carried out with a licence (or under a relevant exemption or exception).
- Ofgem (energy regulator) determines the content of the licence.

- There certain conditions that licence holders must comply with including GB industry codes and standards.

- The GB codes and standards establish rules that govern market operation and the terms for connection and access to energy networks.

Implementation Instruments

ofgem/ nationalgrid



Key benefits of using the " code modification"

- easily recognised by all parties as similar to existing processes and with established routes for governance.
- Closer structures and processes for existing and new GB Users.
- Will work across the full range of Users and confers no clear advantage to any group.
- Most likely to achieve timely solution

- …..therefore ultimately most least cost to GB consumers

Key Challenges

- Stakeholder engagement (type and timely)
- Timetable on compliance
- Ensuring that changes across the codes are considered in a holistic manner

Role and Responsibilities

- GB Industry
- Ofgem (Regulator)
- DECC (Member State)

Implementation Progress

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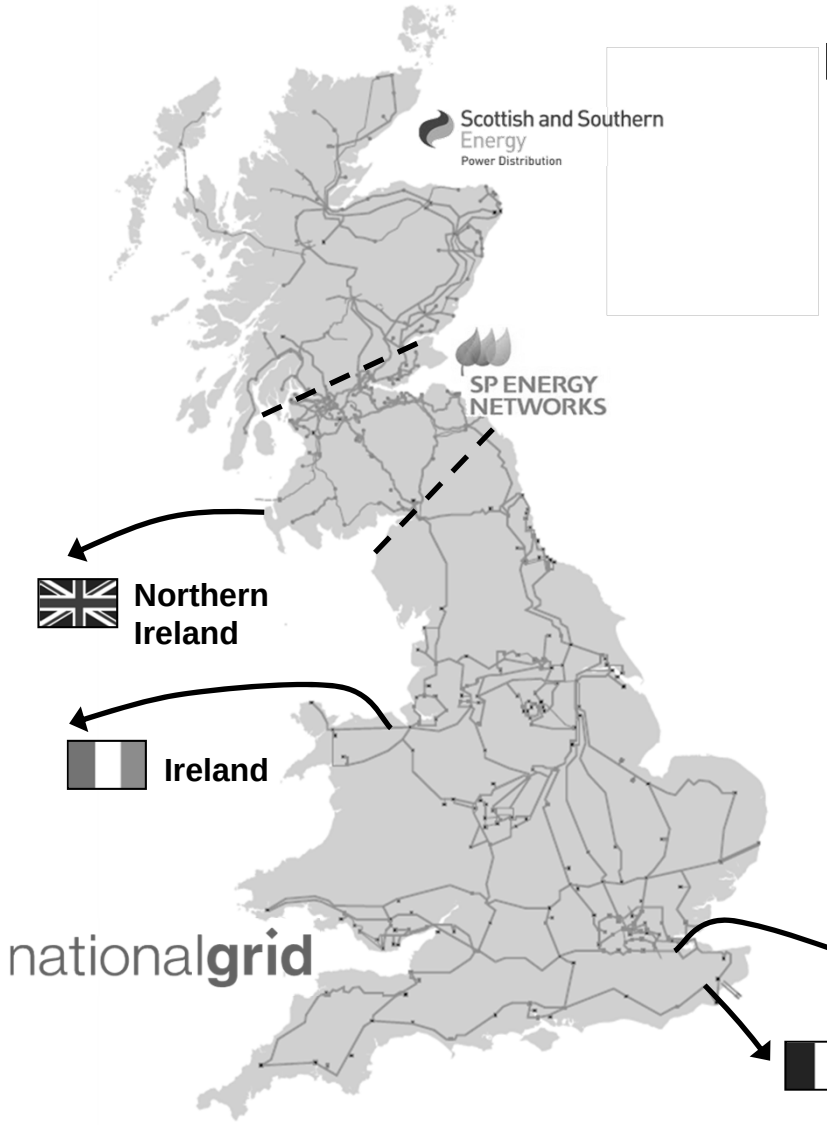
23rd Sept 2015

Electricity Transmission in GB



Multiple TOs

SHET

SPT

NGET

OFTOs

(offshore networks & interconnectors)

Netherlands

France

(several more planned)

One NETSO

National Electricity Transmission System Operator

National Grid Electricity Transmission

GB Grid Code Overview

- The Grid Code is designed to permit the development, maintenance and operation of an efficient, economical and coordinated electricity transmission system.
- It facilitates competition in the generation and supply of electricity
- It promotes the security and efficiency of the system as a whole
- National Grid and users of the National Electricity Transmission System are required to comply with the Grid Code.
- Places technical requirements upon equipment connected to the transmission system

Industry Workgroups – set up under Grid Code Review Panel

- Terms of reference for workgroups circulated to GB code panels
  - RfG approved by Grid and Distribution Code Review Panels in late 2013
  - DCC and HVDC approved summer 2015
- Facilitated by National Grid; open to all industry stakeholders
- RfG workgroup formed in Jan 2014; 12 meetings since then
  - Has filled a vital role in coordinating GB stakeholder engagement on RfG
  - Good outline progress on code implementation
  - Have built a genuinely collaborative approach to finding the best GB solution for all parties
- DCC and HVDC workgroups also just formed (Sept 2015)

RfG Industry Workgroup Progress

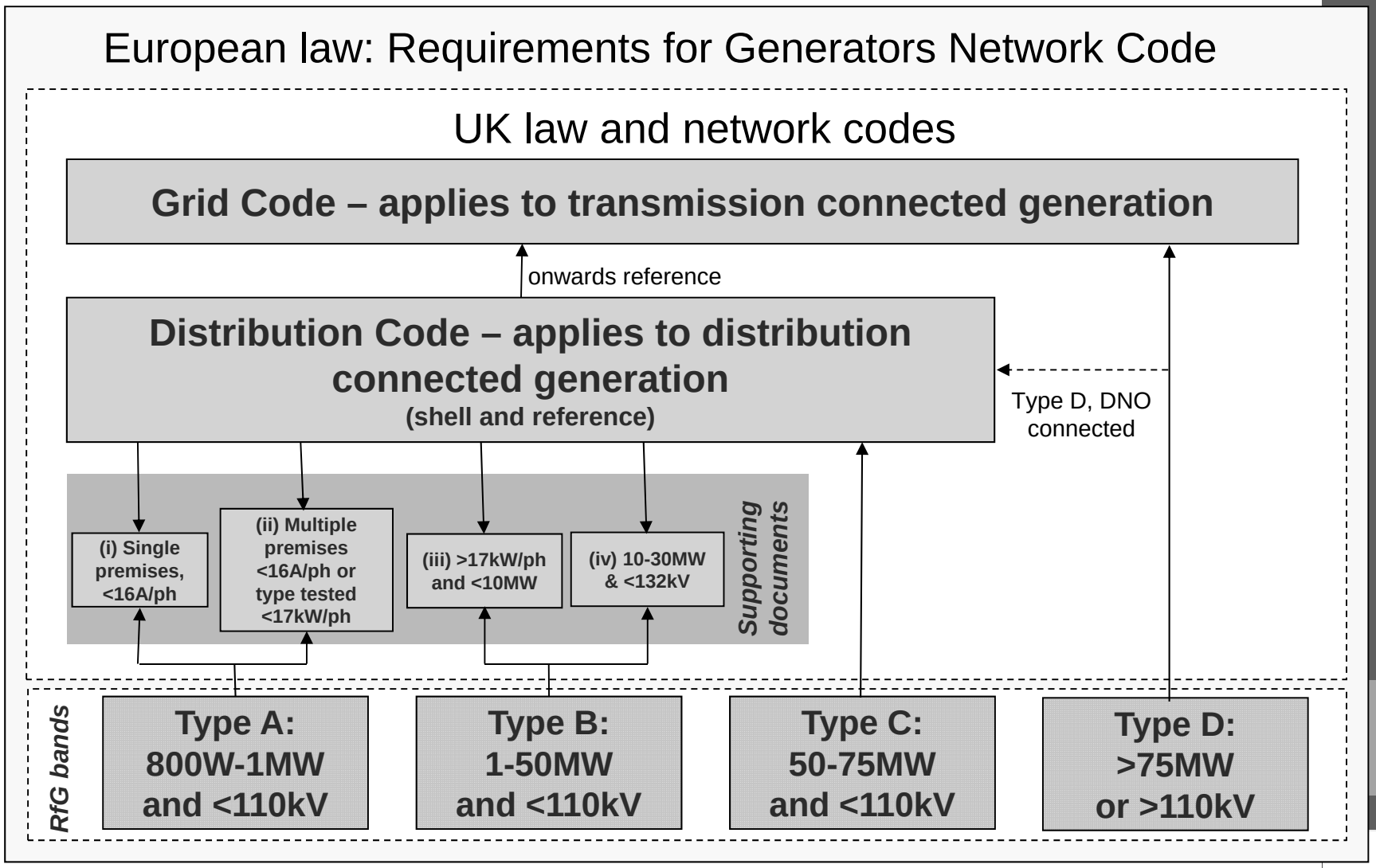
- Considered structural alternatives and agreed solution
- Determined initial view of GB parameter setting
- Clarified key GB issues such as retrospectivity, new/existing scope, timescales etc
- Fed back agreed GB comments to Commission, ACER and ENTSO-E
- Mapped RfG to existing GB code provisions
- Defined detailed implementation plan including packaging of code modifications
- Developing banding threshold industry consultation

JESG – Joint European Stakeholder Group

- Formed in summer 2012
- Pan-industry GB Stakeholder forum covering the development, Comitology process and implementation of European Network Codes, and other areas of European electricity policy such as infrastructure policy
- Provides a single group for GB stakeholders to engage on all aspects of European Policy
- Considered implementation approaches

RfG - GB Code Implementation Structure

Place all requirements in Grid Code.
Distribution Code refers on to supporting documents



NB Thresholds shown are maximums for GB synchronous area, subject to agreement

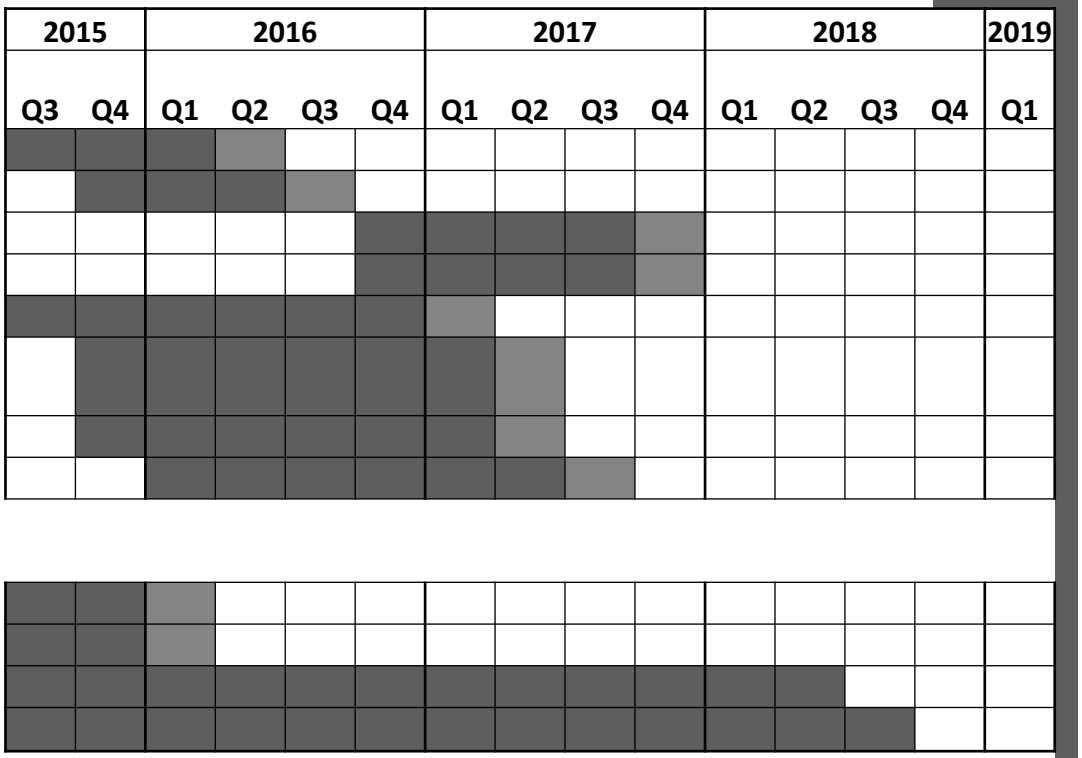
Plan Overview:

7 work packages identified through code mapping

	Implementation Mods	Dependencies	On-going related GC Mods
1	Banding	X	
2A	Compliance	1	
2B	Compliance	1;4-7	
3	General	1	
4	Fault Ride Through	1	GC0062
5	Voltage + Reactive Power	1	
6	Frequency	1	GC0079; GC0087
7	System Management	1;6	

Enabling/Related workstreams

X	Ofgem/DECC Member States Decisions
	GC0086 - Open Governance
	HVDC
	DCC



Key

Workgroup Output
NRA Decision

Key Challenges – RfG workgroup

- Industry engagement – particularly from smaller parties
- Setting banding thresholds:
  - Generator costs vs operational costs
  - …but increased generator capabilities facilitate connection of increased volumes of smaller embedded
- Establishing methodologies and process to agree:
  - Retrospectivity
  - Cost benefit analysis
  - Derogations

FNN

VDE

EU–Network Codes - national implementation through technical self-regulation

Dipl.-Ing. Jan Suckow,
Forum Network Technology/Network Operation
in the VDE (FNN)

Brussels , September 23rd 2015

ENTSO-E’s Workshop on the Connection Network Codes national implementation

Agenda

- **FNN**
- Challenge
- Approach
- Example

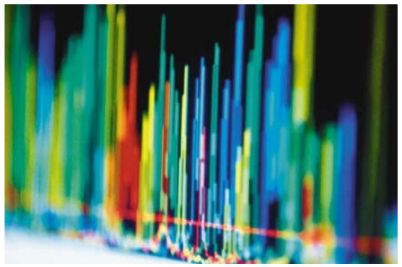
FNN in three sentences

FNN in the VDE is a non profit association working on technologies for electricity networks.

Our aim is a forewardlooking development of the electricity network.

Our special competence is the common work on system needs. Relevant stakeholders together develop solutions for pending technical challenges.

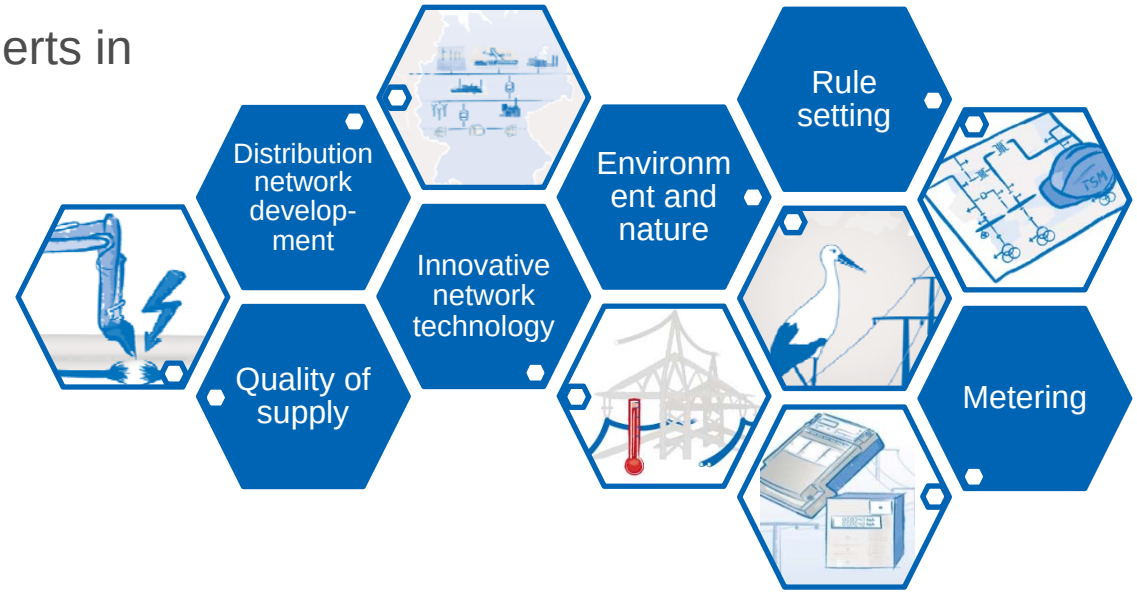
VDE



- VDE is one of the big European associations for electrical and IT networking experts and technologies.
- Goal: to ensure the ongoing development of technologies and to encourage their application in a wide variety of industries by
  - Knowledge transfer within a network of experts/ Technology
  - International norms and standards
  - National rule setting for electricity network
  - Product testing and certification

Competence fields and members of FNN

- Over 370 members (companies, industry, associations)
- More than 400 voluntary experts in over 40 committees: including manufacturers, network operators, scientists, service providers



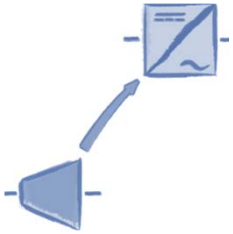
- Rule-setting for technical requirements and operational aspects of electricity networks from 230 V to 380 kV including all affected stakeholder groups

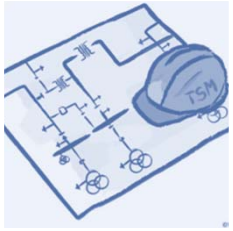
→ Focus: system aspects and requirements of the network for a safe and reliable network operation

FNN: technical rule setting focuses on …

Efficient operation of the grid

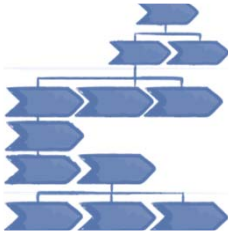
Driving forward network technologies





Ensuring safety, security and reliability and enabling proof of the same

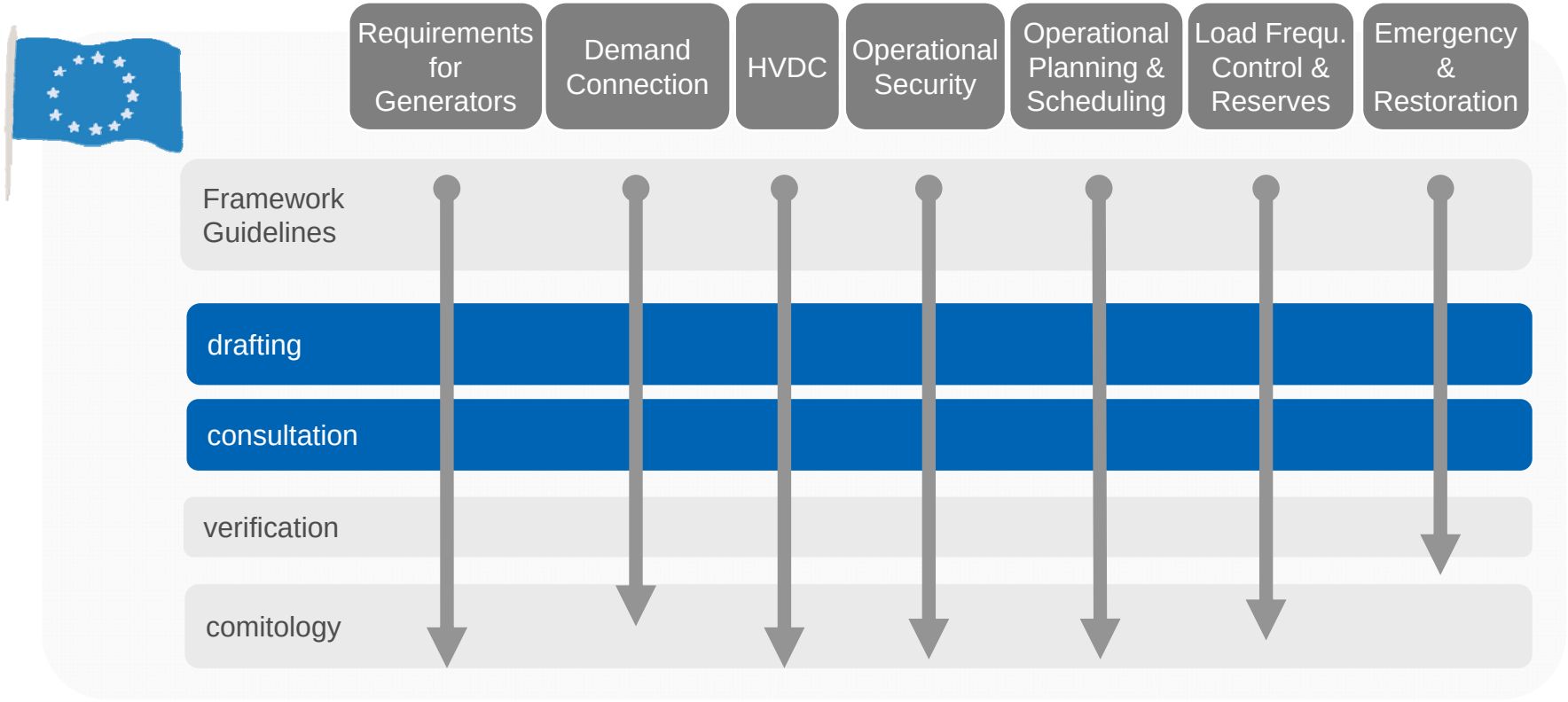
Supporting mass processing



Agenda

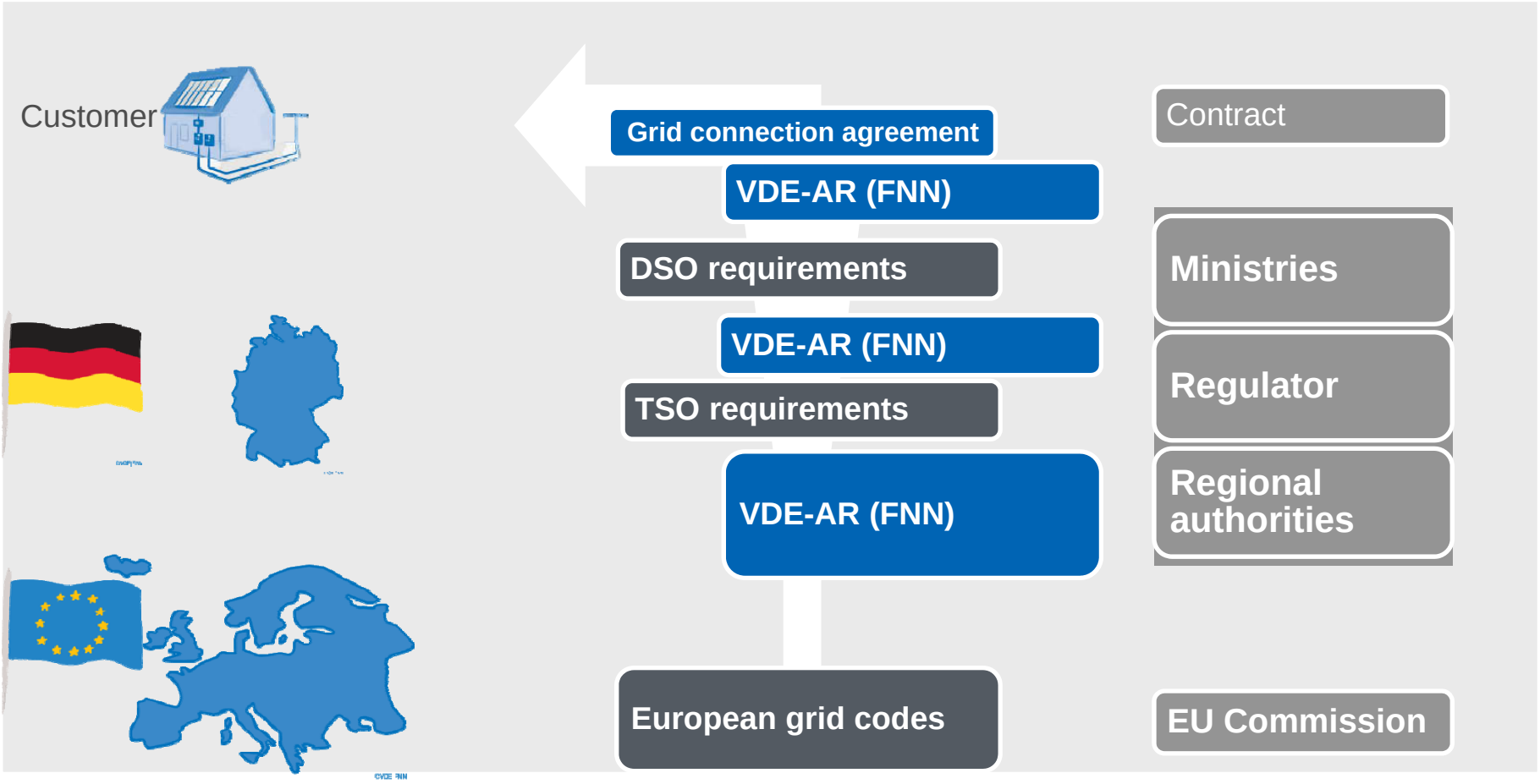
- FNN
- **Challenge**
- Approach
- Example

ENTSO-E Network Codes Overview

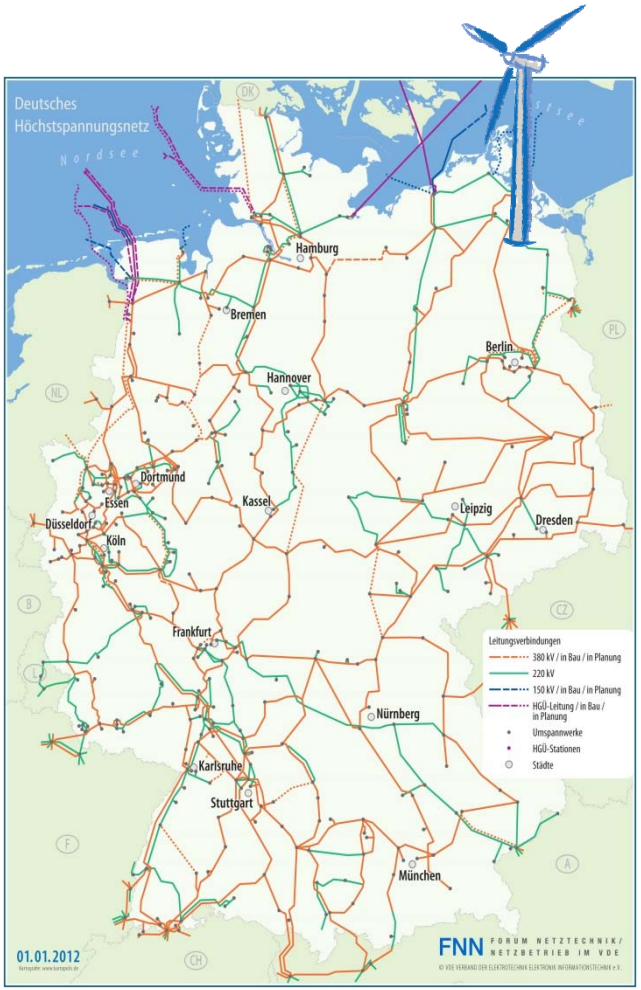


- Almost all NetworkCodes will be published within the next months

European grid codes – VDE-AR – TAB



Germany



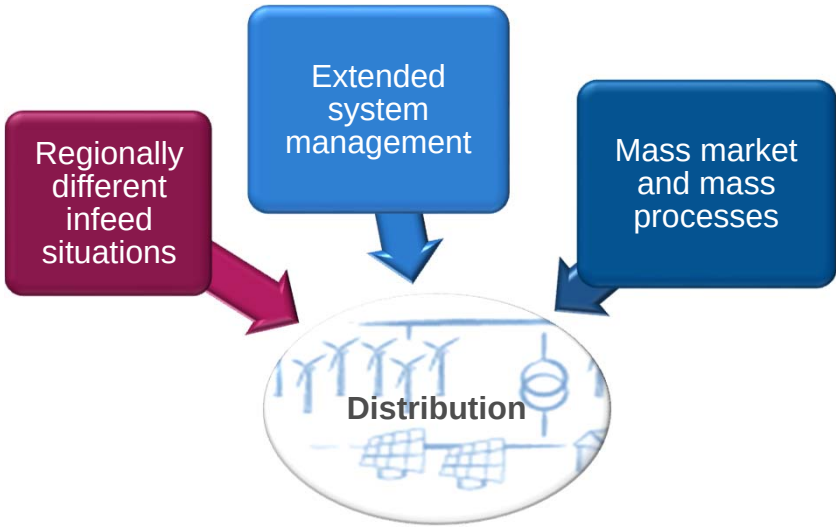
Peak load: 85 GW
Off-peak load: 30 GW

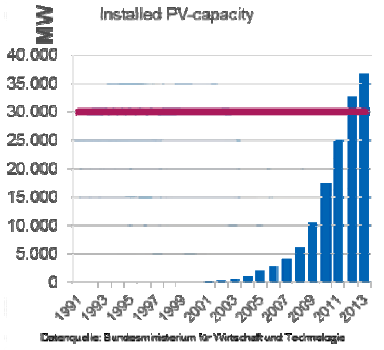
Capacity: 175 GW
Renewables: 75 GW
Photovoltaic: 33 GW
Wind 31 GW
Consumption: 511 TWh / Jahr

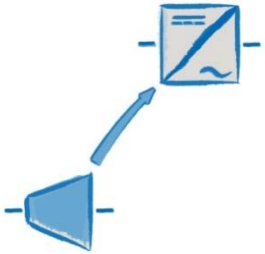
Transmission system operators (TSO): 4
Distribution system operators (DSO): 896 (EU:2400)
75 DSOs: > 100.000 costumers
Suppliers: 1100
Producers (>1 MW): 300

“Energiewende” – consequences for the network

- volatile: weather and time-dependent infeed
- installed capacity exceeds former numbers by far
- high inertia replaced by converters
- Expansion of transmission network
- Expansion in many distribution networks
- Further development / restructuring of system







- Sustainable requirements for Generators/ Installations are needed → European Grid Code sets framework
- Definition of further requirements is needed to reach national goals.

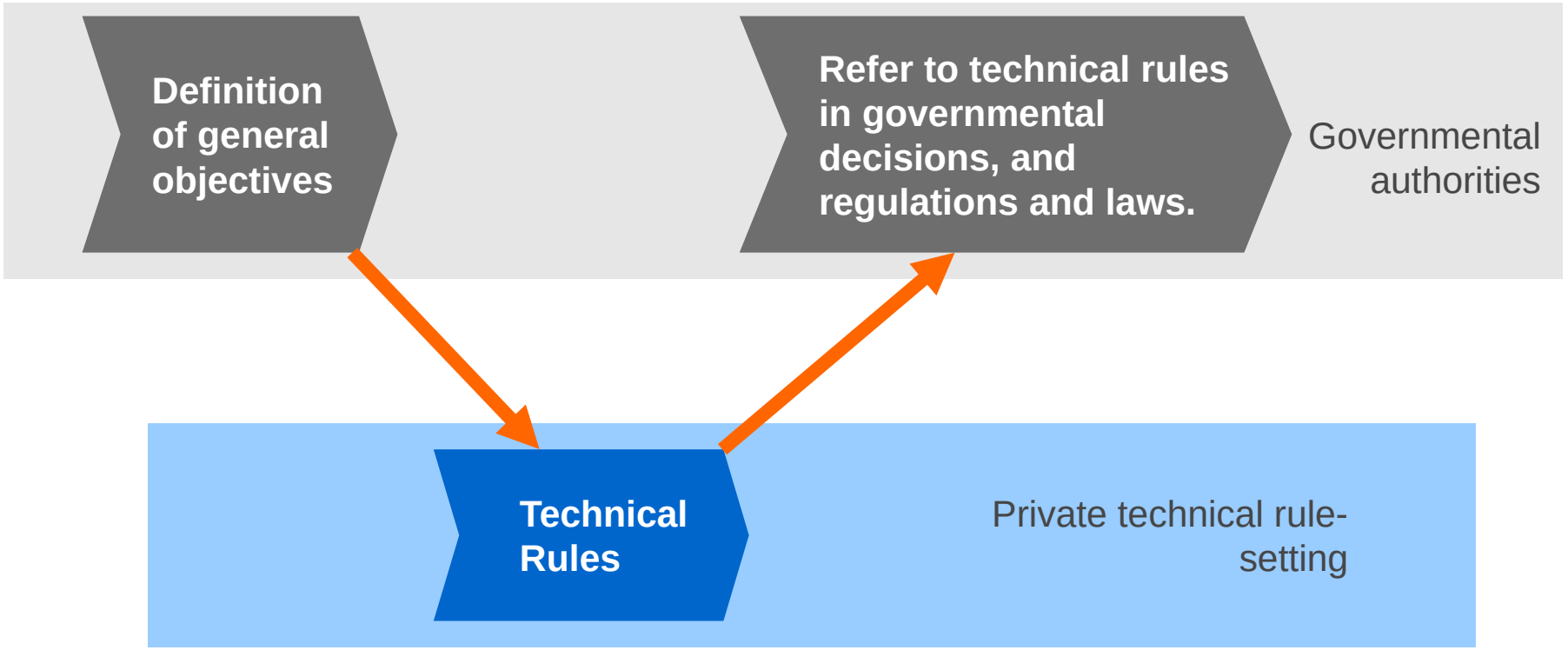
Agenda

- FNN
- Challenge
- **Approach**
- Example

Background- e.g. NC RfG

- *Article 7*
  Regulatory aspects
  - *The **regulatory authorities** where Member States have so provided or Member States **shall ensure** that the technical rules required by this regulation are developed and made public in accordance with Article 5 of Directive 2009/72/EC.*
  - *Where a relevant system operator or TSO is required or permitted to specify or agree on terms and conditions of general application governing connection and access to systems under the following Articles**, at least the methodologies used to calculate or establish these terms and conditions shall require approval by the competent regulatory authority in accordance** with Article 37(6) of Directive 2009/72/EC:*

Technical self-regulation



Legal Impact: sweeping clause in regulatory framework

- Definition of Codes of Practices is difficult without consulting and involving industry (producers, users and system operators)
- Technological Innovation demands a dynamic legal framework
  - technical rules can only be effective , if they can be adapted according to the ongoing change of technology
- Legal connection made through **§ 49 German Energy-Industrial Act-** Requirements for Installation:

  „ have to be installed so the security is given at any time… is assumed if generally accepted codes of practices are applied… which are defined in VDE technical rules“

Legal Impact: Presumption of conformity / Reversal of evidence

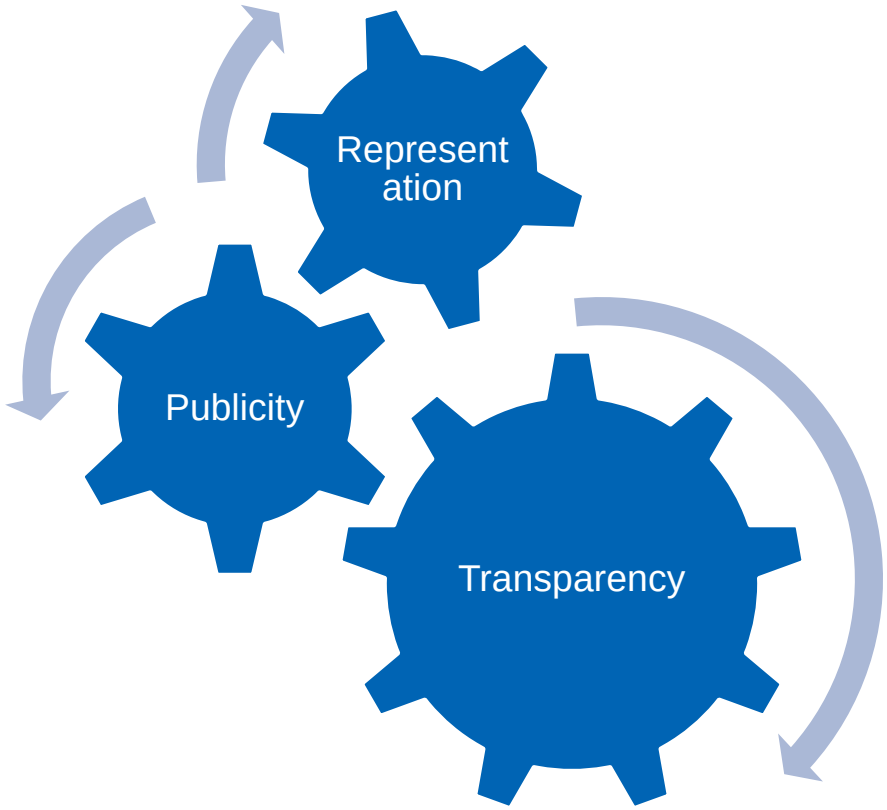
- Connection between general objectives, given by the authorities and generally recognized codes of practice made by non governmental institutions through legal impact: **presumption of conformity and reversal of evidence.**
  - Non binding rules become important in case of accidents or failure.
  - The conformity is assumed if the legal person/product or system design is compliant to the defined codes of practices/ application rule /technical standard
  - Consequence: reverse of evidence

  →Legally non binding Codes of Practice have an important function. Therefor the use and application of technical rules is almost binding

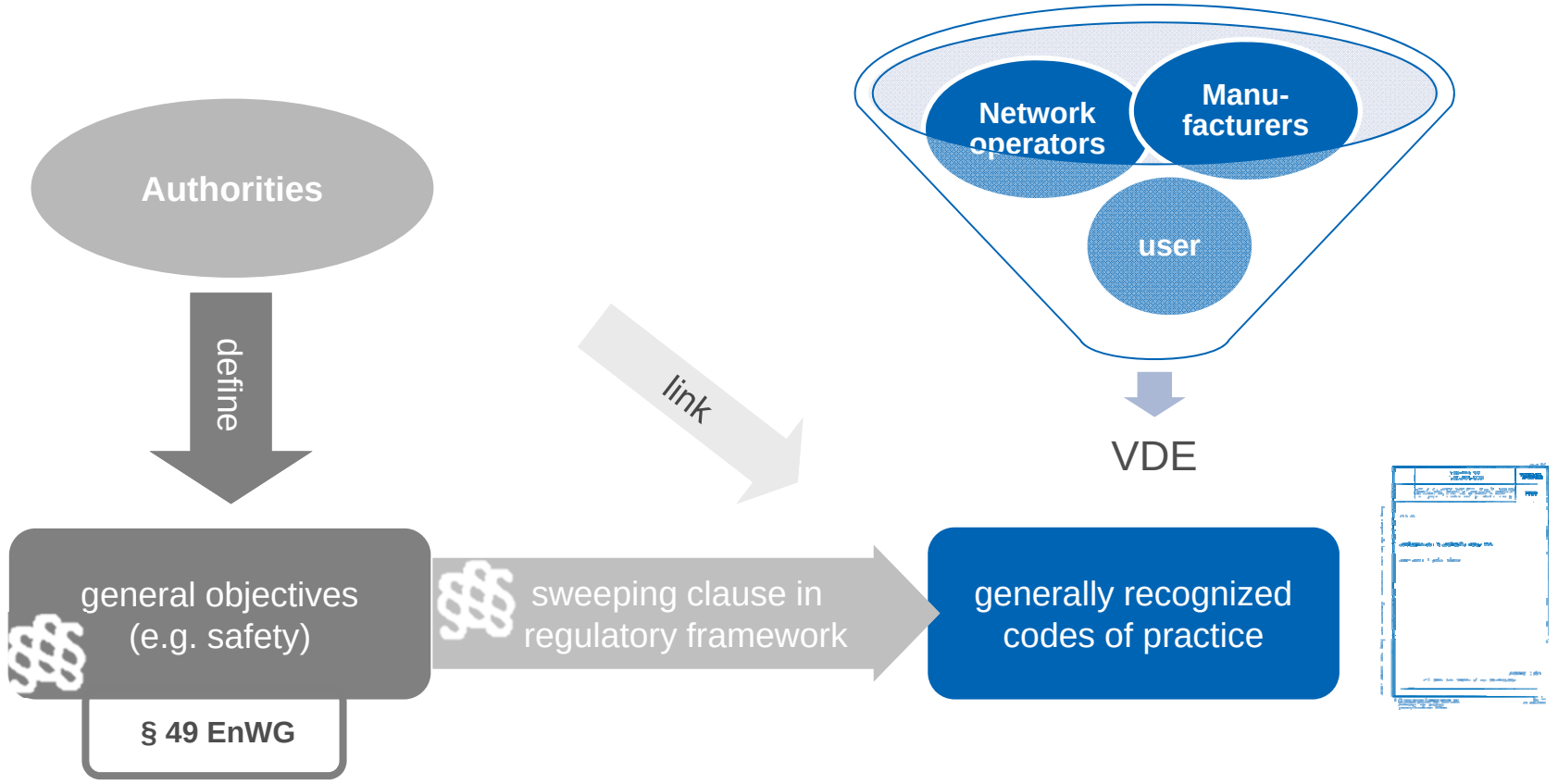
Criteria for defining technical rules

- Task Sharing: general objectives (state) to be defined by technical self regulation (industry)
- Condition: the relevant technical/scientific Institution obligates itself to technically define the general objectives given by the state

  → Through: charter and statute of institution and a transparent procedure with an involvement of the public.

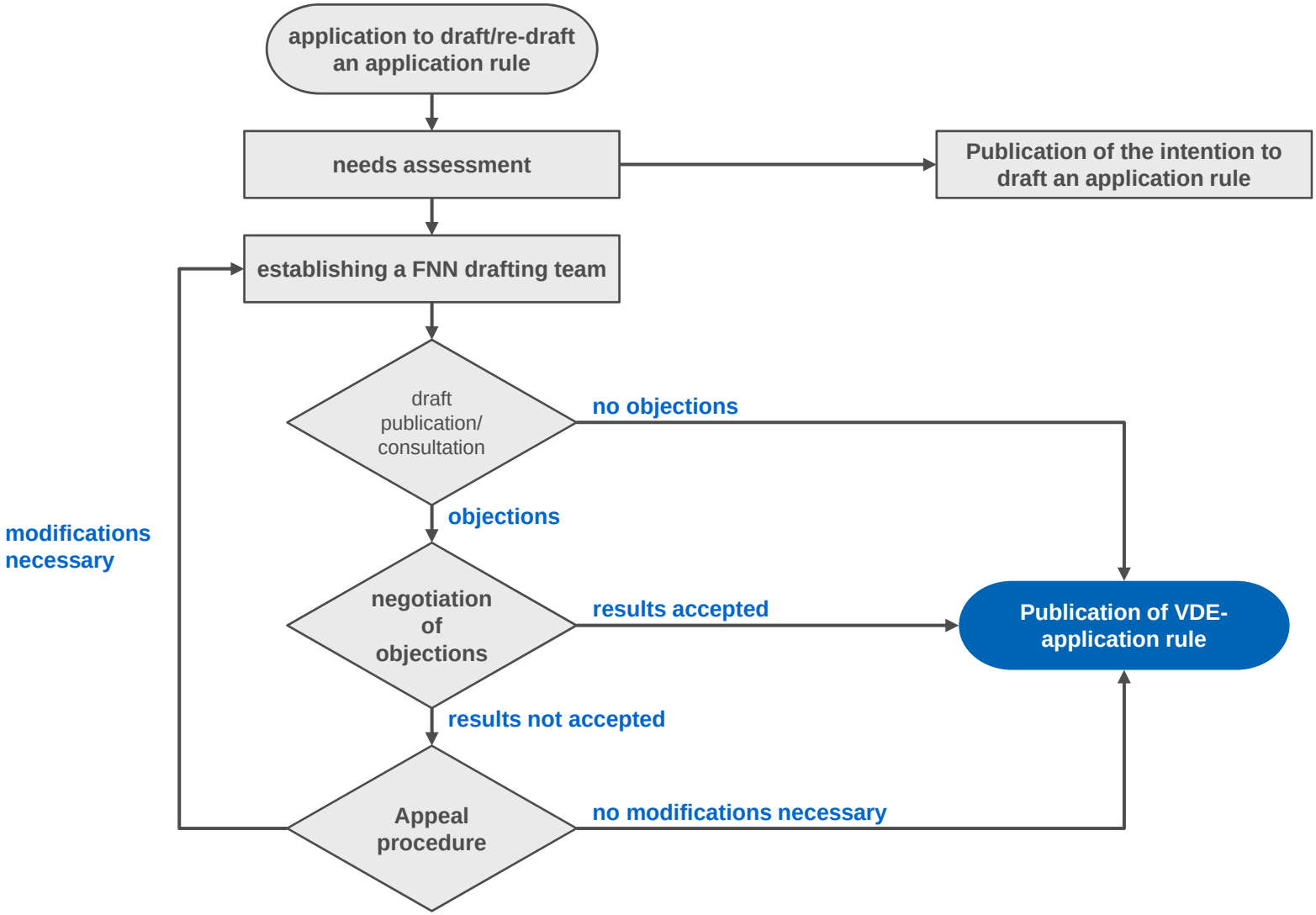


Technical self-regulation in the energy sector:

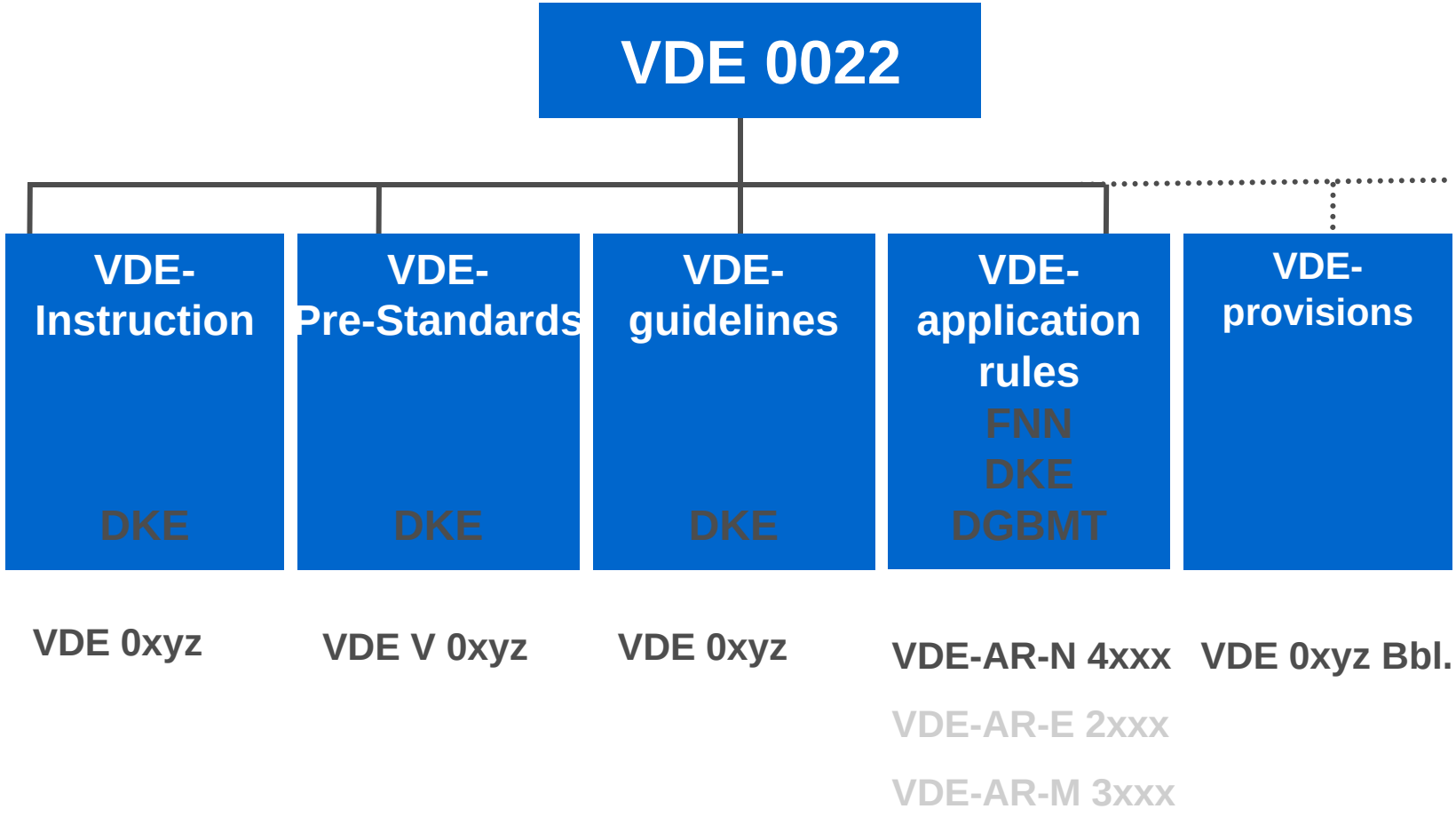


- Takes the burden off the legal framework and authorities
- More flexible toward technical advancement, enabling an anticipatory development

Drafting a VDE application rule (FNN) according to VDE-AR-N 100



VDE – Set of regulation and standards



Interaction of European regulations and standards in energy sector

focused on: System requirements products

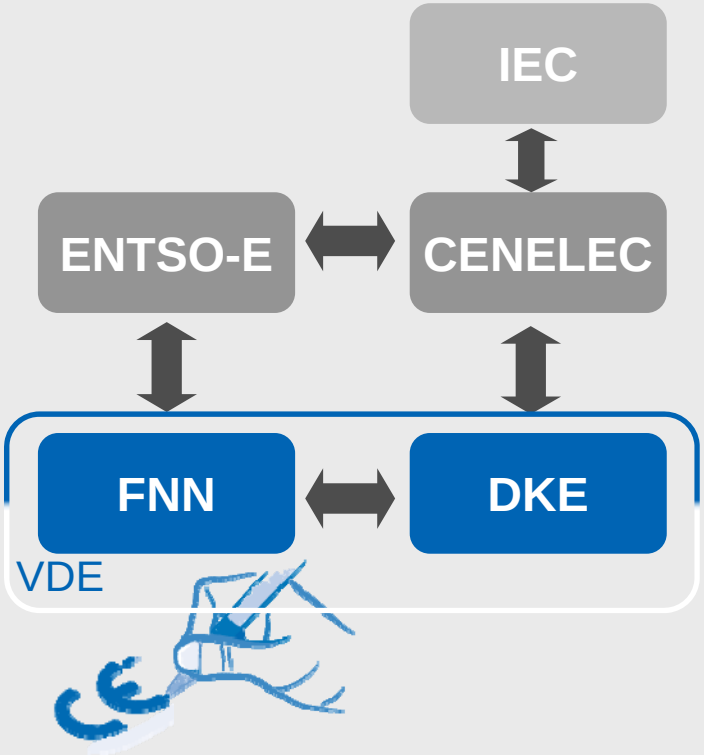
International

Europe

Germany

ACER
EU-COM

Regulator
Ministries
Regional
authorities

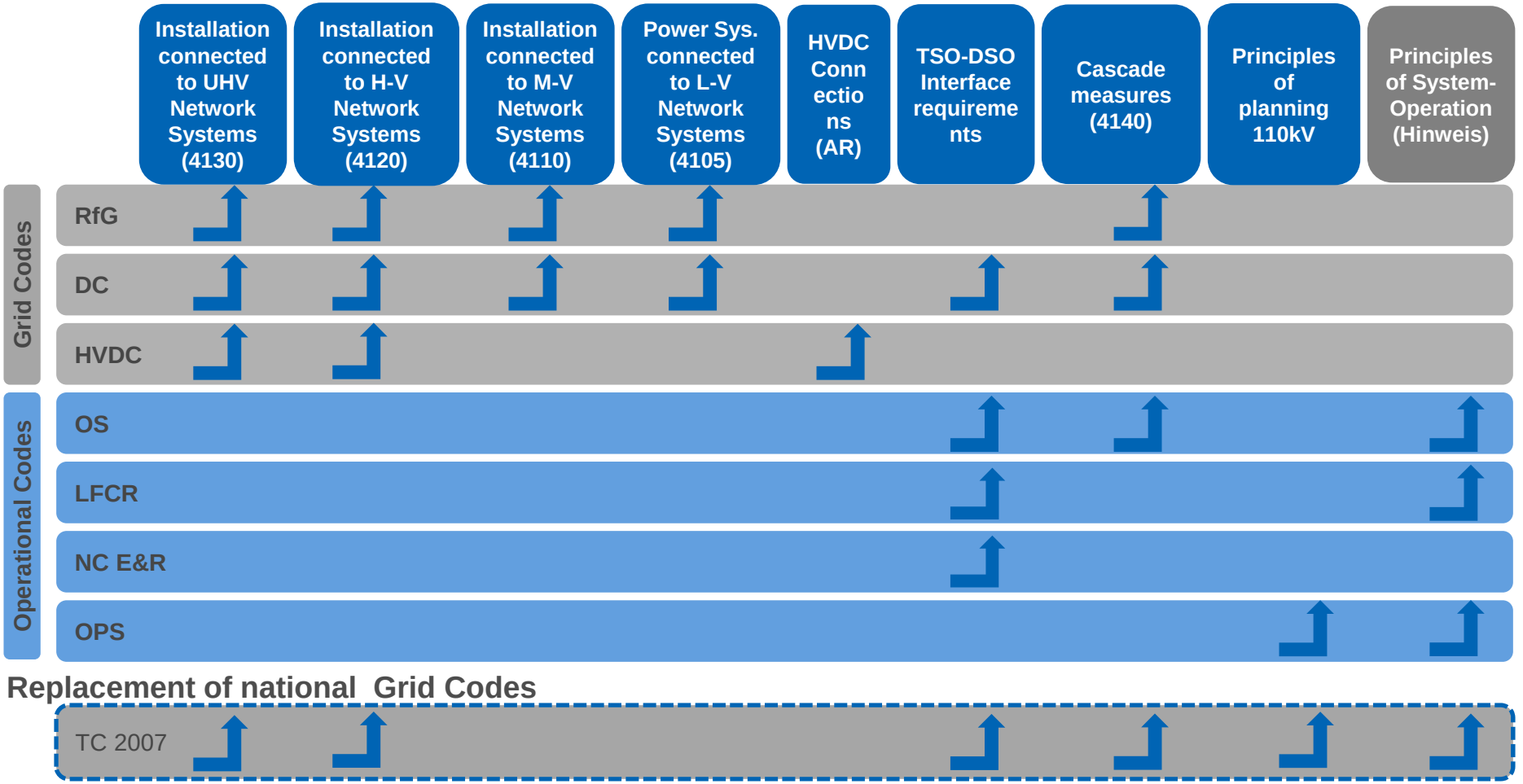


Agenda

- FNN
- Challenge
- Approach
- **Example**

Interfaces NC s and national rules

Status 09/15



All relevant working groups have started and plan to public their final document within the implementation deadline

Existing working groups

Intended working groups

Implementation-matrix RfG

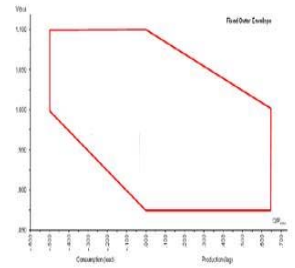
Anforderung	Anforderungsart
FREQUENCY RANGES	Frequency stability
LIMITED FREQUENCY SENSITIVE MODE (OVERFREQUENCY)	Frequency stability
RATE OF CHANGE OF FREQUENCY WITHSTAND CAPABILITY	Frequency stability
CONSTANT OUTPUT AT TARGET ACTIVE POWER	Frequency stability

Die Tabelle stellt die Inhalte des Network Codes Requirements for Generators ins Verhältnis zu VDE-Anwendungsregeln des FNN. Die Darstellung verfolgt das Ziel möglichst alle Inhalte der Network Code in deutsche Regeln zu überführen. Ausgangspunkt ist die Überprüfung der Inhalte des Network Codes. Diese werden den bestehenden Inhalten zugeordnet. Das Ergebniss zeigt an, dass eine Anforderung zu dem gekennzeichneten Thema (bei der nächsten Überarbeitung der zugehörigen VDE-AR-N und/oder innerhalb der 3-jährigen Umsetzungsfrist)inhaltlich übernommen (abschließend geregelt) oder konkretisiert (non exhaustive requ.) werden muss.

	Title	Requirement type	Type A	Type B	Type C	Type D	VDE-AR-N 4110 TAB HöS	VDE-AR-N 4120 Technische Bedingungen für den Anschluss und Betrieb von Kundenanlagen an das Hochspannungsnetz	VDE-AR-N 4115 Erzeugungsanlagen in der Mittelspannung	VDE-AR-N 4105 Erzeugungsanlagen am Niederspannungsnetz	VDE-AR-N 4140 Massnahmen für die Systemsicherheit und deren Kaskadierung
General Requirements	FREQUENCY RANGES	Frequency stability	X	X	X	X	X	X	X	X	
	LIMITED FREQUENCY SENSITIVE MODE (OVERFREQUENCY)	Frequency stability	X	X	X	X	X	X	X	X	
	RATE OF CHANGE OF FREQUENCY WITHSTAND CAPABILITY	Frequency stability	X	X	X	X	X	X	X	X	
	CONSTANT OUTPUT AT TARGET ACTIVE POWER	Frequency stability	X	X	X	X	X	X	X	X	
	MAXIMUM POWER REDUCTION AT UNDERFREQUENCY (Wirkleistungsstückgang bei Unterfrequenz)	Frequency stability	X	X	X	X	X	X	X	X	
	AUTOMATIC CONNECTION (Autom Wiederzuschaltung)	Frequency stability	X	X	X	X		?	X	X	
	REMOTE SWITCH ON/OFF	Frequency stability	X	X				X	X	X	X
	ACTIVE POWER REDUCTION	Frequency stability			X		X	X	X	X	X
	ACTIVE POWER CONTROLLABILITY AND CONTROL RANGE	Frequency stability				X	X	X	X	X	X
	DISCONNECTION OF LOAD DUE TO UNDERFREQUENCY (Lastfähige Kraftwerke PSW)	Frequency stability				X	X	X	X	X	
	FREQUENCY RESTORATION CONTROL (Sekundärregelung)	Frequency stability				X	X	X	X		
	FREQUENCY SENSITIVE MODE (vollständige frequenzabhängige Wirkleistungsregelung +PrReg)	Frequency stability				X	X	X	X		
	~~INERTIA~~	~~Frequency stability~~				~~X~~	~~X~~				
	LIMITED FREQUENCY SENSITIVE MODE (UNDERFREQUENCY)	Frequency stability				X	X	X	X	X	
	MONITORING OF FREQUENCY RESPONSE	Frequency stability				X	X	X	X		
	CONTROL SCHEMES AND SETTINGS	General system management	X	X	X		X	X	X	X	
	INFORMATION EXCHANGE	General system management	X	X	X		X	X	X	X	X
	PRIORITY RANKING OF PROTECTION AND CONTROL (Schutzstaffelung)	General system management	X	X	X		X	X	X	X	
	POWER/VOLTAGE QUALITY	General system management			X	X					
	TRANSFORMER NEUTRL-POINT TREATMENT (Sternpunkt-behandlung)	General system management			X	X	X	X	X		
	CHANGES TO/MODERNISATION OR REPLACEMENT OF EQUIPMENT OF GENERATING UNITS	General system management			X	X	X	X			
	ELECTRICAL PROTECTION SCHEMES AND SETTINGS	General system management	X	X	X		X	X	X	X	
	INSTALLATION OF DEVICES FOR SYSTEM OPERATION AND/ OR SECURITY	General system management			X	X	X	X	X	X	
	INSTRUMENTATION FOR FAULT AND DYNAMIC BEHAVIOUR RECORDING (Störschreiber)	General system management			X	X	X	X	X		
	LOSS OF STABILITY	General system management			X	X	X	X	X	X	
	RATE OF CHANGE OF ACTIVE POWER	General system management			X	X	X	X			
	SIMULATION MODELS	General system management			X	X	X	X	X		
	SYNCHRONISATION	General system management				X	X	X	X	X	
	AUTO RECLOSURES	Robustness of Generating Units			X	X	X	X	X		
	STEADY-STATE STABILITY	Robustness of Generating Units			X	X	X	X	X		
	TORSIONAL STRESS	Robustness of Generating Units			X	X	X	X	X		
	RECONNECTION AFTER AN INCIDENTAL DISCONNECTION DUE TO A NETWORK DISTURBANCE	System restoration	X	X	X		X	X	X		
	BLACK START	System restoration			X	X	X	X	X		
	CAPABILITY TO TAKE PART IN ISOLATED NETWORK OPERATION	System restoration			X	X	X	X	X		
	QUICK RE-SYNCHRONISATION	System restoration			X	X	X	X	X		
	RECONNECTION AFTER TRIPPING ONTO AUXILIARY SUPPLY	System restoration			X	X					
	HIGH/LOW VOLTAGE DISCONNECTION	Voltage stability			X		X	X	X		
	VOLTAGE RANGES	Voltage stability				X	X	X	X		
Synchr. Generator Requirements	POST FAULT ACTIVE POWER RECOVERY	Robustness of Generating Units	X	X	X		X	X	X		
	FAULT RIDE THROUGH CAPABILITY OF SYNCHRONOUS GENERATORS CONNECTED BELOW 110 kV	Robustness of Generating Units	X	X					X		
	FAULT RIDE THROUGH CAPABILITY OF SYNCHRONOUS GENERATORS CONNECTED AT 110 kV OR ABOVE	Robustness of Generating Units				X	X	X			
	VOLTAGE CONTROL SYSTEM (SIMPLE)	Voltage stability	X	X			X	X	X		
	REACTIVE POWER CAPABILITY (SIMPLE)	Voltage stability	X				X	X	X		
	REACTIVE POWER CAPABILITY AT MAXIMUM ACTIVE POWER	Voltage stability			X	X	X	X	X		
	REACTIVE POWER CAPABILITY BELOW MAXIMUM ACTIVE POWER	Voltage stability			X	X	X	X	X		
	VOLTAGE CONTROL SYSTEM	Voltage stability				X	X	X	X		
PowerPark Modules Requirements	SYNTHETIC INERTIA CAPABILITY	Frequency stability			X	X	X	X	X		
	POST FAULT ACTIVE POWER RECOVERY	Robustness of Generating Units	X	X	X		X	X	X		
	FAULT RIDE THROUGH CAPABILITY OF POWER PARK MODULES CONNECTED BELOW 110 kV	Robustness of Generating Units	X	X					X		
	FAULT RIDE THROUGH CAPABILITY OF POWER PARK MODULES CONNECTED AT 110 kV OR ABOVE	Robustness of Generating Units				X	X	X			
	REACTIVE CURRENT INJECTION	Voltage stability	X	X	X		X	X	X		
	REACTIVE POWER CAPABILITY (SIMPLE)	Voltage stability	X				X	X	X		
	PRIORITY TO ACTIVE OR REACTIVE POWER CONTRIBUTION	Voltage stability			X	X	X	X	X		
	REACTIVE POWER CAPABILITY AT MAXIMUM ACTIVE POWER	Voltage stability			X	X	X	X	X		
	REACTIVE POWER CAPABILITY BELOW MAXIMUM ACTIVE POWER	Voltage stability			X	X	X	X	X		
	REACTIVE POWER CONTROL MODES	Voltage stability			X	X	X	X	X		
	POWER OSCILLATIONS DAMPING CONTROL	Voltage stability			X	X	X	X	X		

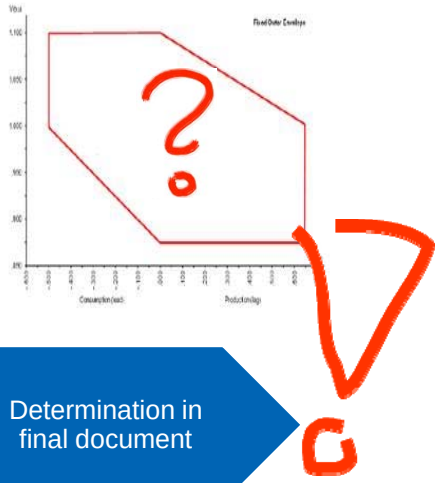
VDE AR-N 4105	VDE AR-N 4140
X	
X	
X	
X	

e.g.: national definition of reactive power capabilities



Stakeholder interaction- e.g. through workshops

objections



Non exhaustive requirement

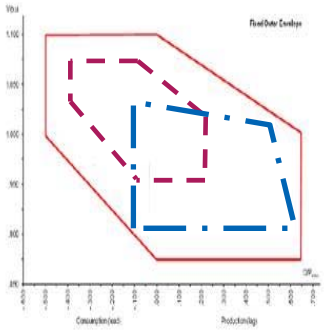
Assignment to adopt a certain code of practice

Discussion in relevant committee/working group

Public consultation

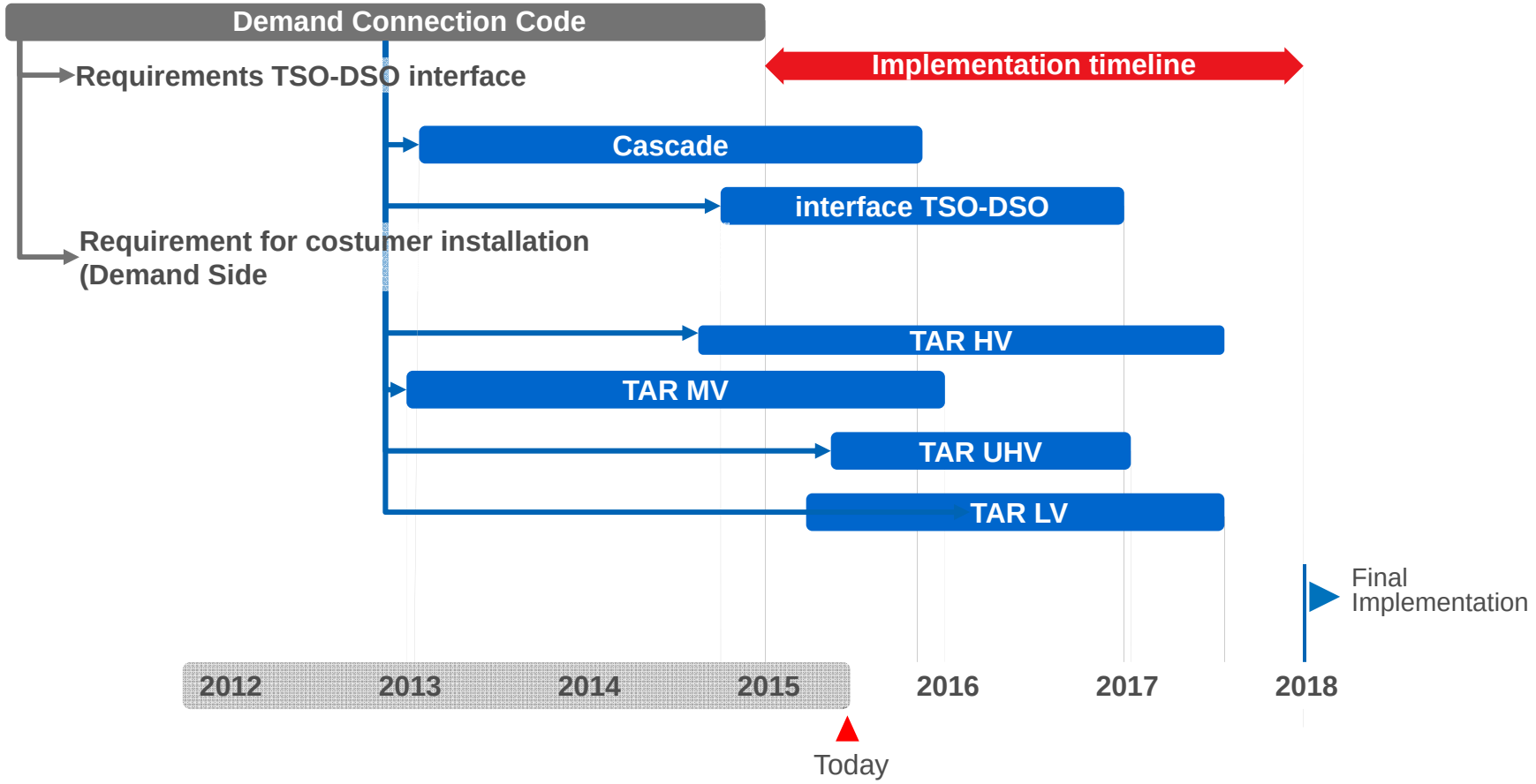
Determination in final document

Constitution of working group, affected stakeholders are considered and invited

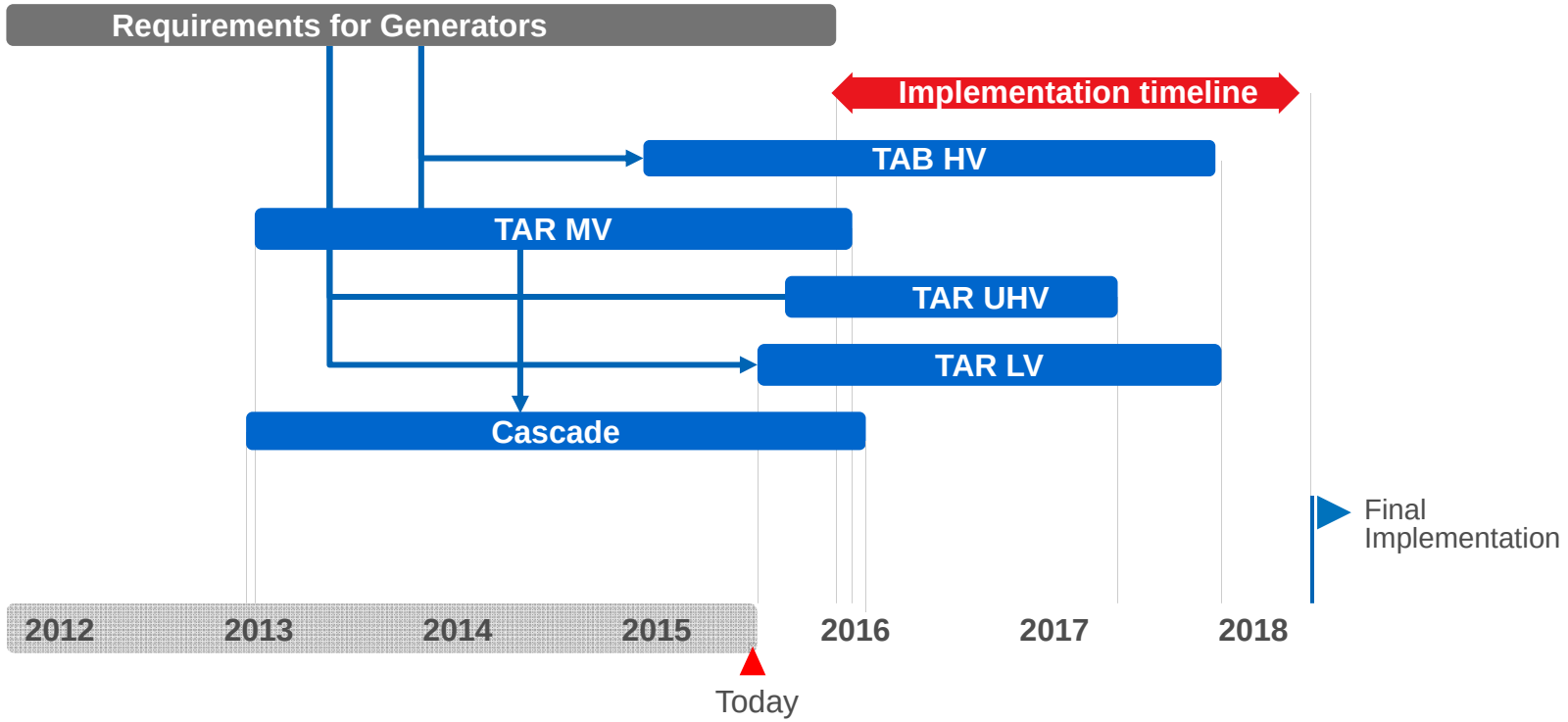


Objection and feedback in public consultation has to be included and the results have to be justified

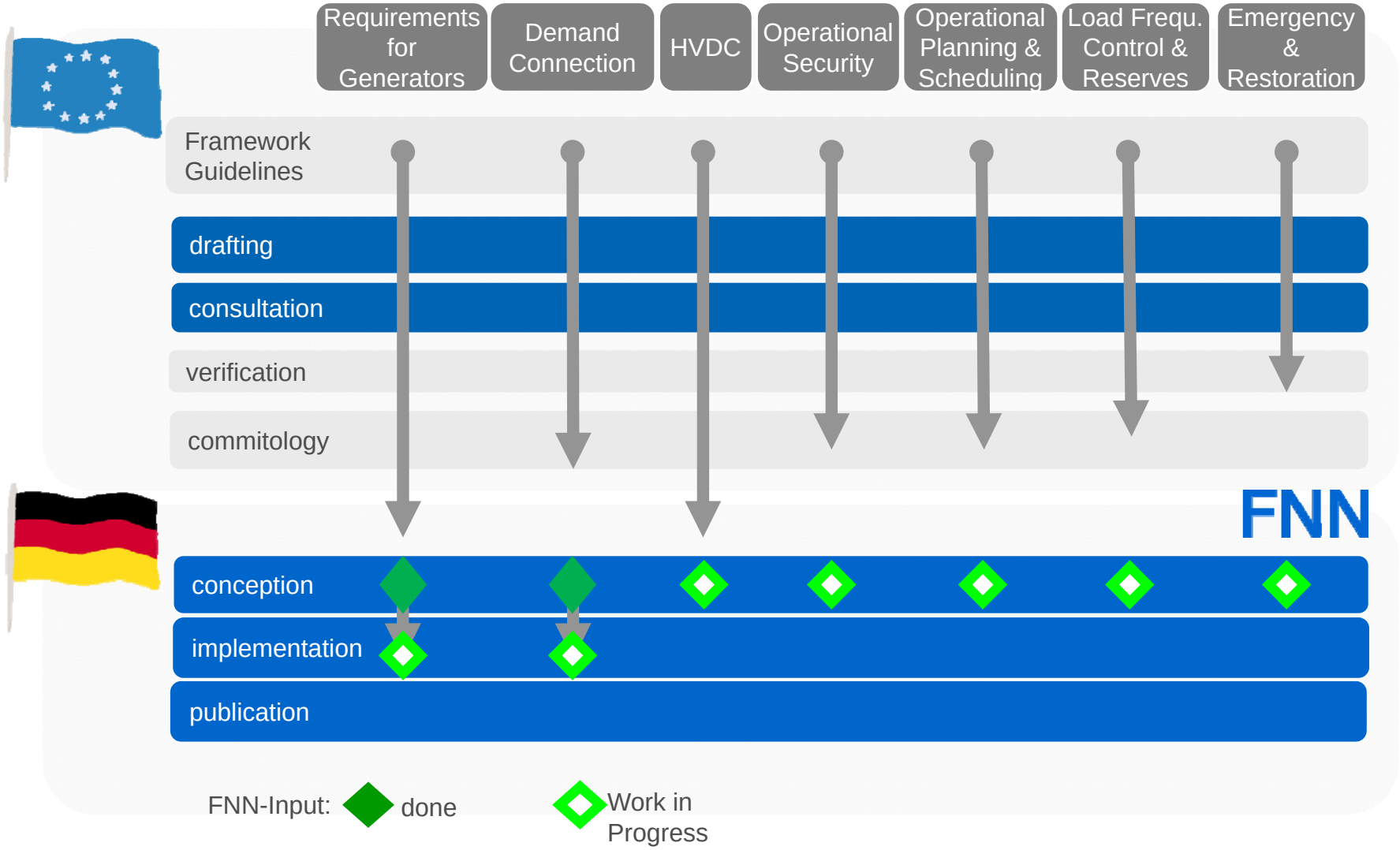
Plan: Implementation Demand Connection Code



Plan: Implementation of NC Requirements for generators (RfG)



ENTSO-E Network Codes -Overview



FNN

The objective is a consistently reliable system operation with increasing absorption of electricity from renewable energy sources.

Collaboration between affected expert groups to define forward-looking specifications produces enhanced investment security for product developers, manufacturers, network clients, and network operators.

The work of the FNN ensures that innovative technologies are compliant with European Network Codes, fit for everyday purpose and system compatible more quickly.

FNN

VDE

Thank you!

Dipl.-Ing. Jan Suckow
Referent
Forum Network Technology/Network Operation in the VDE (FNN)
Bismarckstraße 33
10625 Berlin Germany

Implementation of Connection Codes in Norway

Norwegian Water Resources and Energy Directorate (NVE)

Brussels, 23rd September 2015

Astrid Ånestad, Staff Engineer

Todays practice

- By national regulations, the TSO shall approve the technical solutions of all new (or major changes in existing) grid units and generators connected on high voltage.
  - Requirements stated in guideline from TSO.

- Connection agreements are made between grid users and grid system operators on all voltage levels.

The role of the TSO (Statnett)

- NRA has asked the TSO to assess the connection codes for national implementation
  - Overview of where the connection codes will change todays practice.
  - Where there are opening for, and necessary with, national adaptations, clarify wanted proposals for requirements.
  - Cooperate closely with national stakeholders.
  - Focus on technical assessments.
  - Deliver proposals for general national requirements to the NRA.

The role of DSOs, grid users

- Participate in the working groups for discussions on specific technical assessments.
- Contribute on views and suggestions to the TSO in the proses of formulating proposals for general national requirements.
- Ensure that all relevant technical issues are addressed.

The role of the NRA (NVE)

- Arrange organisation meetings
  - Involve mayor industry organisations.
  - Clarify overarching issues during the implementation assessment.
- Participate as observers in discussions between the TSO and stakeholders groups organised by the TSO.
- Approve final proposal for general national requirements.
- Adjusting current relevant regulations where necessary

Connection codes national implementation – Norwegian case

Brussels, 23 st September 2015

Stian Boye Skaatan, Advisor

Statnett

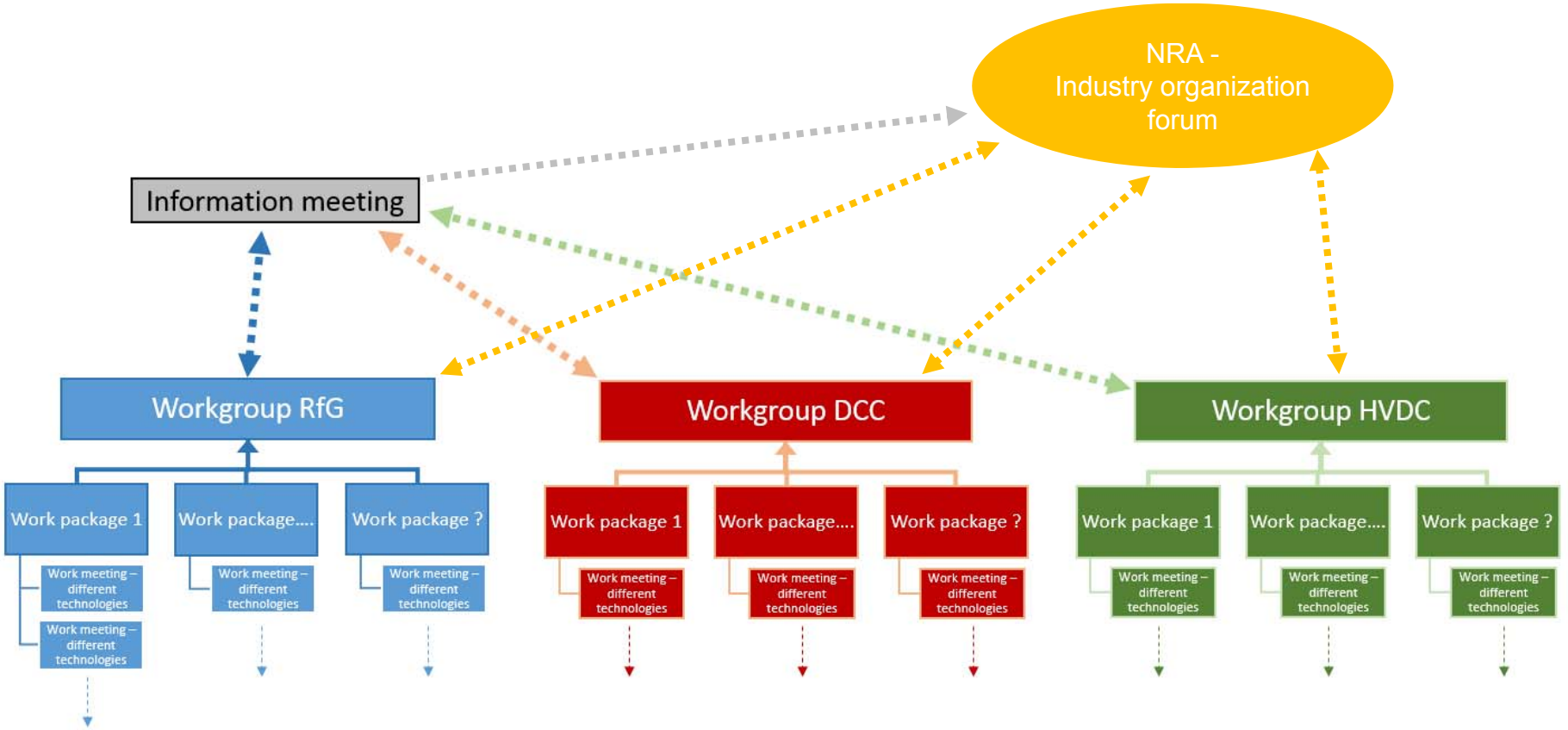
Statnett will deliver recommendations to the NRA

- Consider how the technical requirements should be specified to suit Norwegian conditions
- Suggest how the processes and responsibilities should be defined in Norway
- Be based on the existing guideline "Functional requirements for the Norwegian power system"
- Work closely with the industry and industry organizations

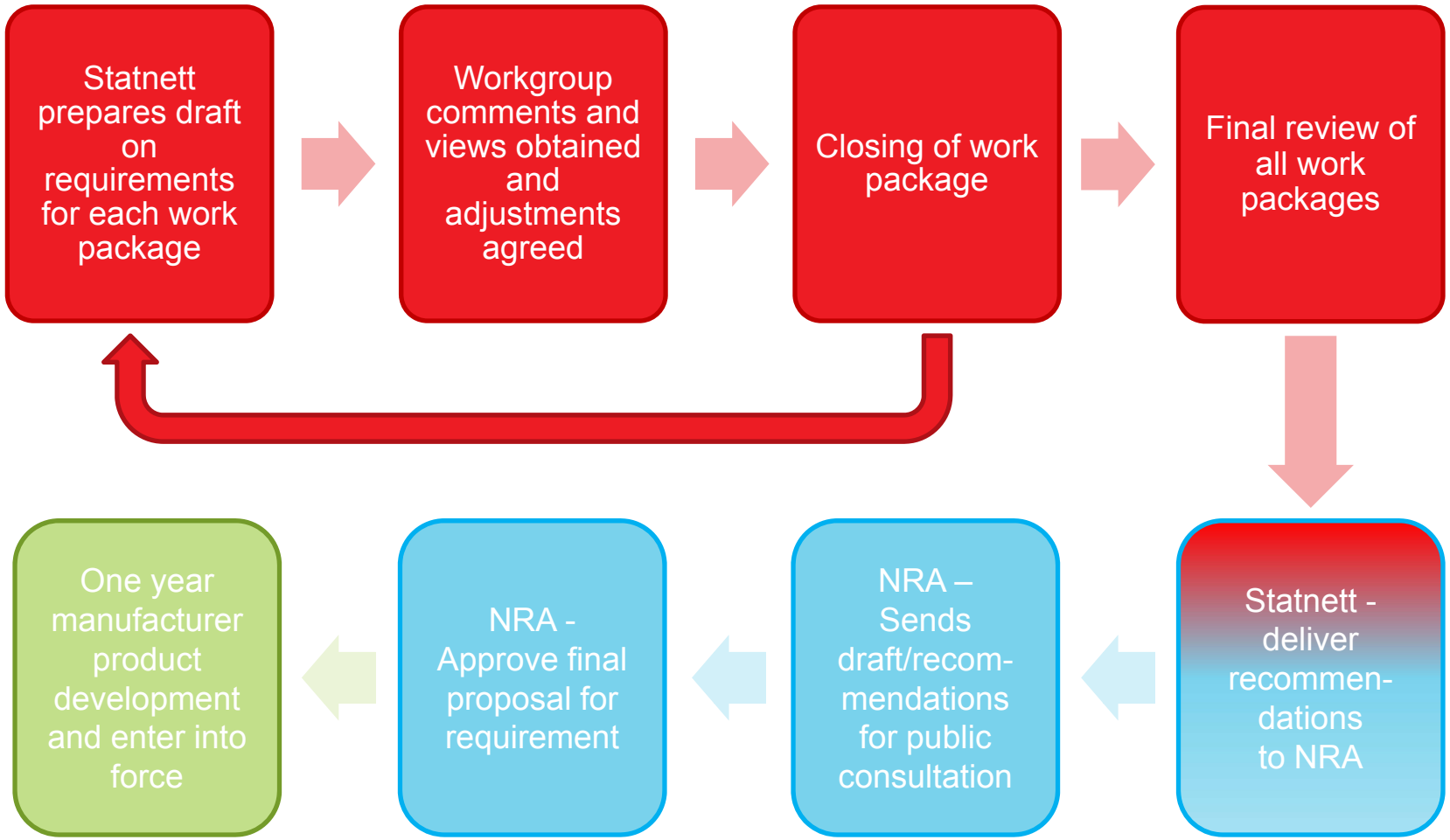




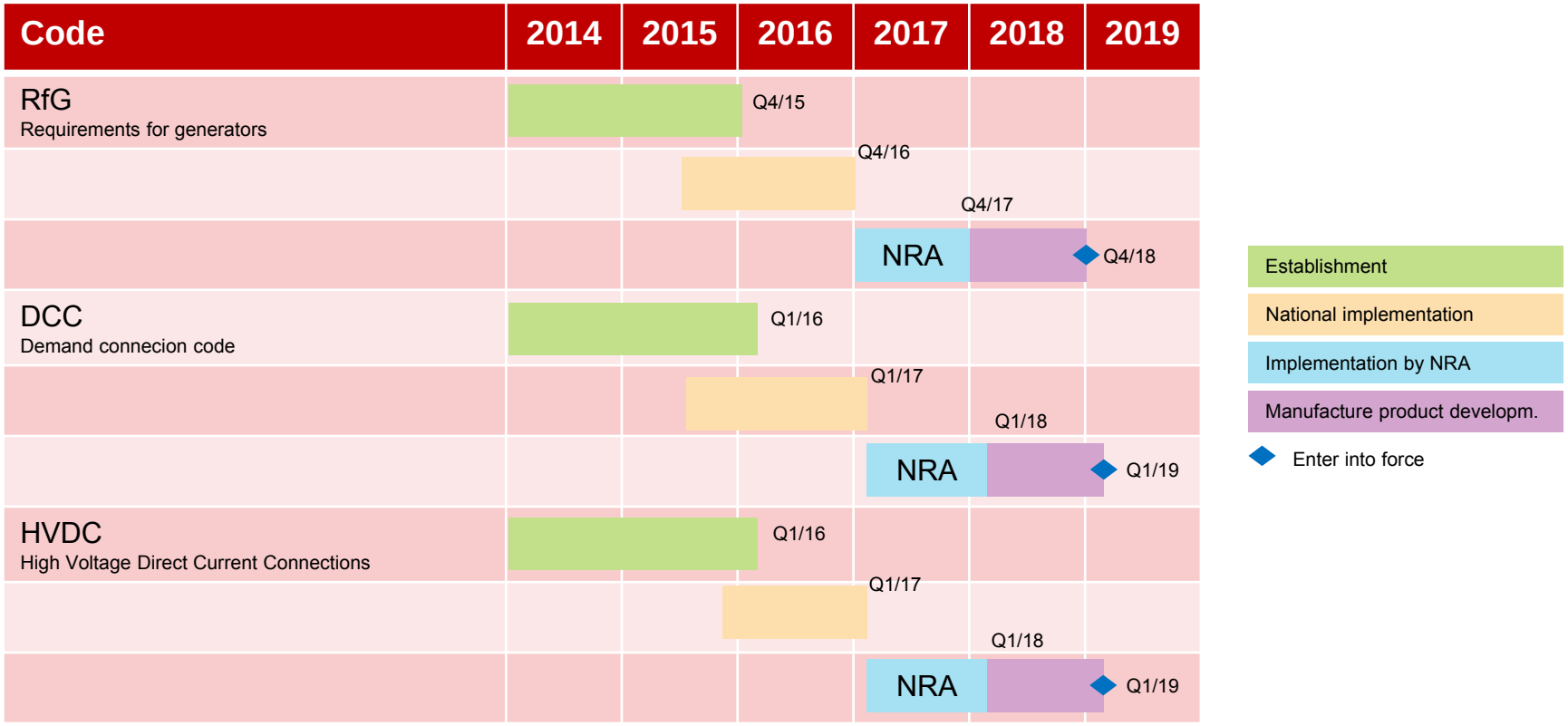
Organization of workgroups and industry organization involvement



Working method



Schedule


Code
2014
2015
2016
2017
2018
2019
RfG
Requirements for generators
Q4/15
Q4/16
Q4/17
NRA
Q4/18
DCC
Demand connecion code
Q1/16
Q1/17
Q1/18
NRA
Q1/19
HVDC
High Voltage Direct Current Connections
Q1/16
Q1/17
Q1/18
NRA
Q1/19
Establishment
National implementation
Implementation by NRA
Manufacture product developm.
Enter into force

Involvement of stakeholders

- Total of 25 external participants in the WGs.
- Participants from:
  - DSOs
  - Different type of industry
  - Hydropower and wind power experts
  - HVDC experts
  - Standardisation organisations
- NRA as observer in WGs

Deliveries to the NRA

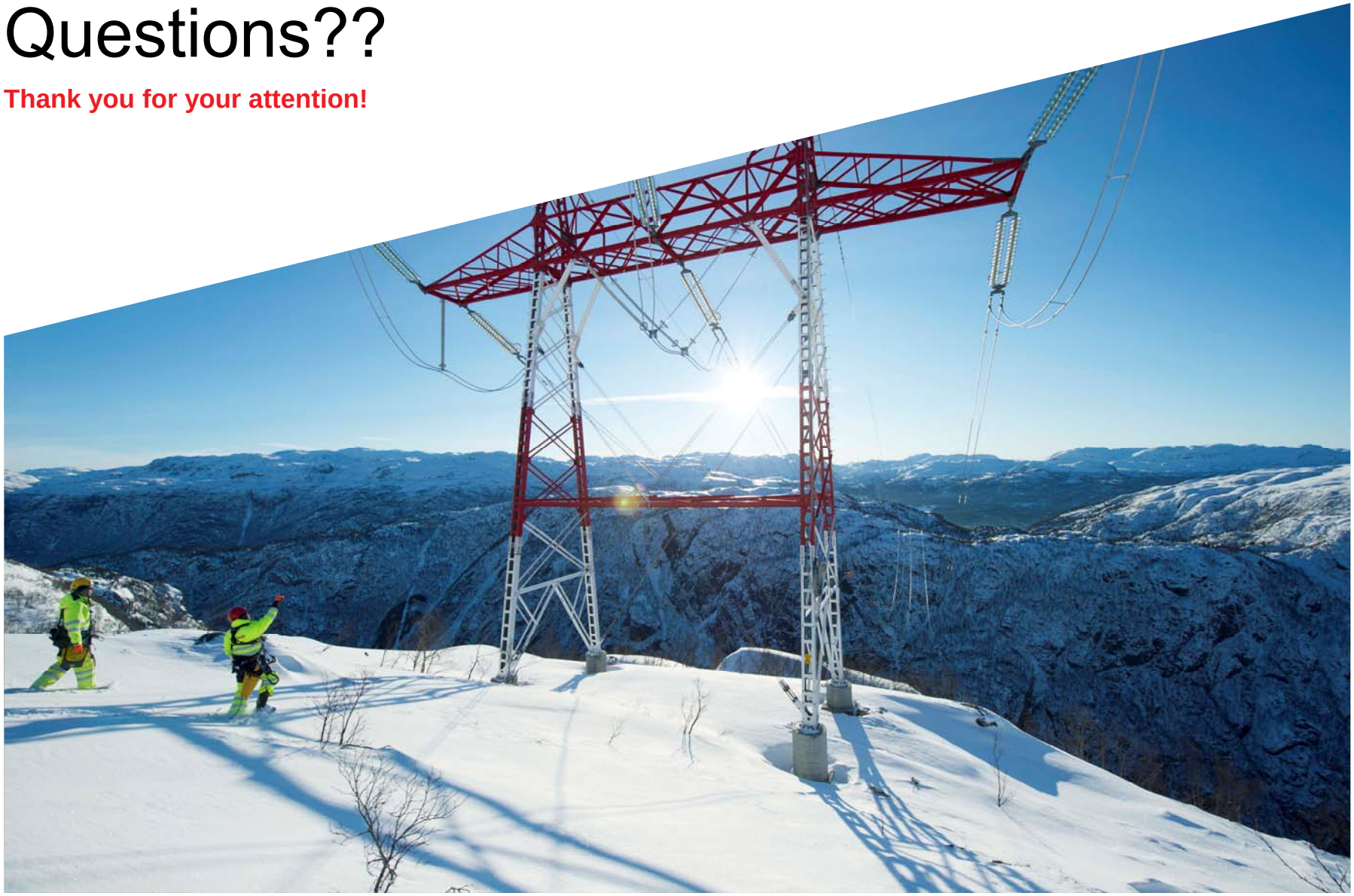
- One document per Network Code.
- Consist of suggestions and base for a Norwegian legislation, as well as an interpretation document.
- Include a written submission that reviews disagreements between Statnett and WG participants.
- Include an explanation of why Statnett has chosen to put forward their given suggestions.

Key Challenges

- Implementation through EEA (European Economic Area) – only for non EU members.
- Involvement of smaller industry players and petroleum sector.
- Time frame and resources.

Questions??

Thank you for your attention!



ENTSO-E NEXT STEPS

ENTSO-E supports the CNC implementation

Ralph Pfeiffer

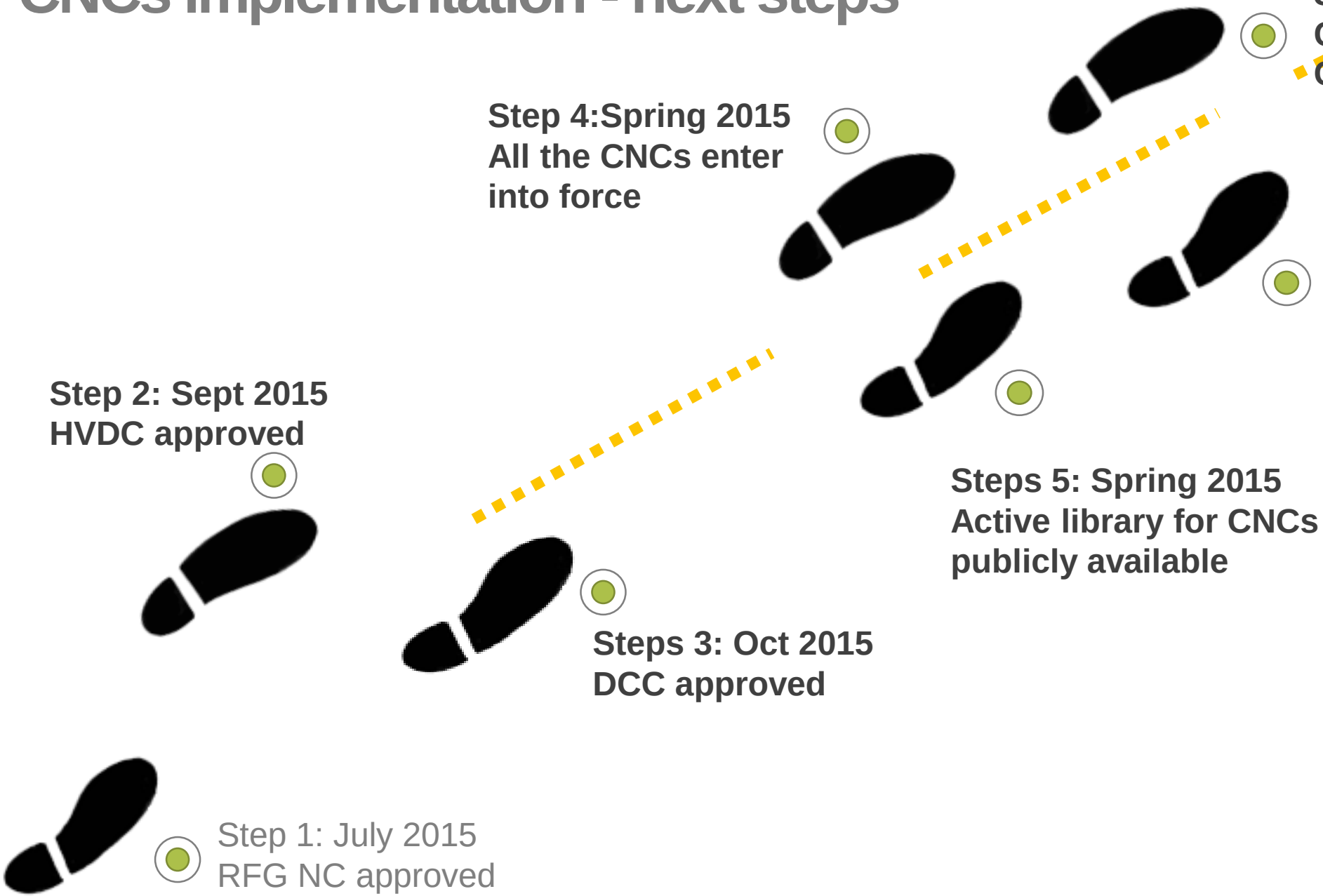
Workshop “Implementing the European Connection Network Codes – challenges and solutions”

23 September 2015

entsoe

Reliable Sustainable Connected

CNCs implementation - next steps



Step 1: July 2015
RFG NC approved

Step 2: Sept 2015
HVDC approved

Steps 3: Oct 2015
DCC approved

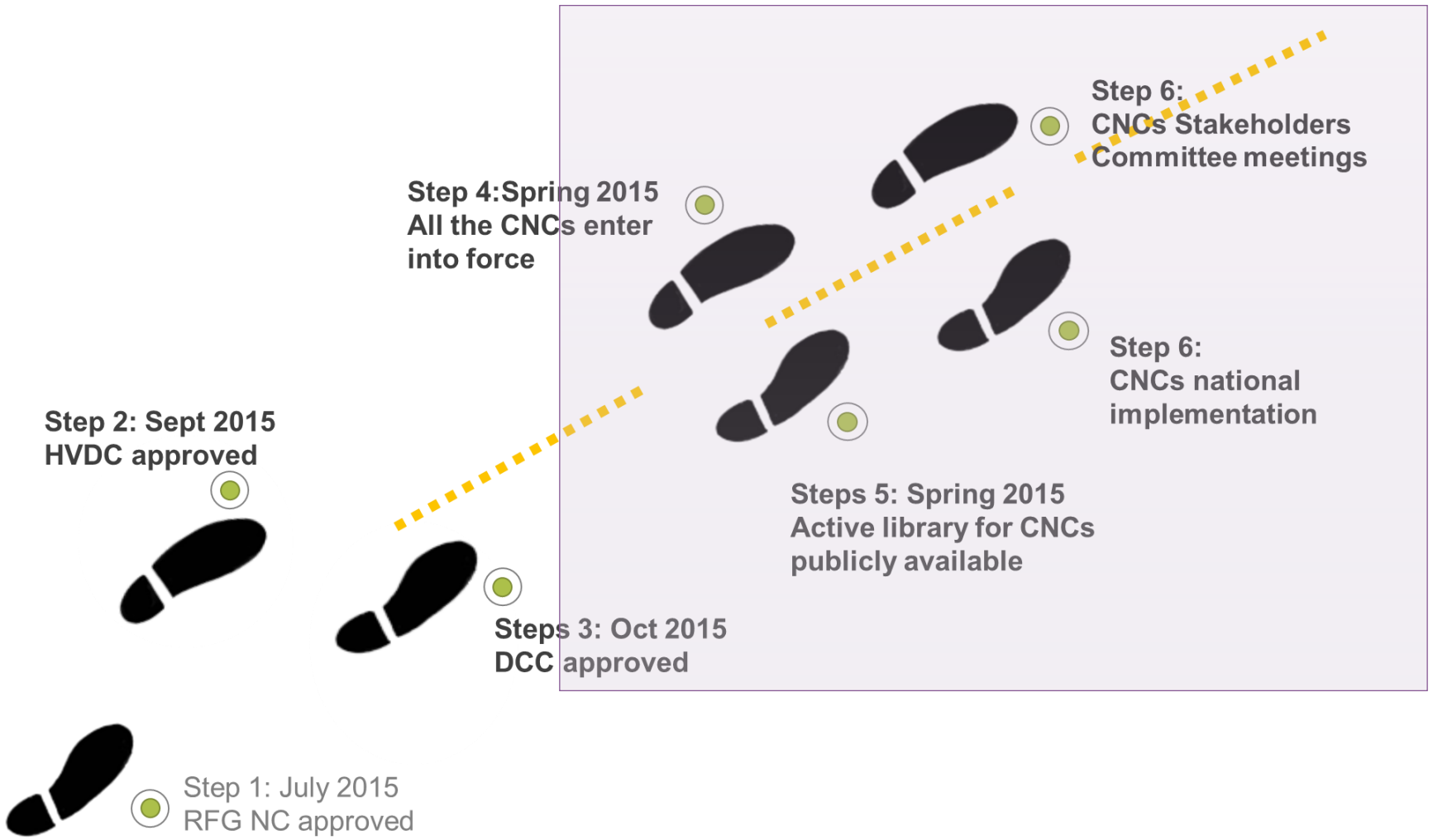
Step 4:Spring 2015
All the CNCs enter into force

Steps 5: Spring 2015
Active library for CNCs publicly available

Step 6:
CNCs national implementation

Step 6:
CNCs Stakeholders Committee meetings

ENTSO-E role the CNCs implementation



ENTSO-E informs

ENTSO-E guides

ENTSO-E monitors

ENTSO-E supports the CNCs implementation

ENTSO-E informs

1. Informs all the stakeholders through the Active Library website:

- **Overview implementation process** in each country – when available
- **Latest status** in the implementation of each country
- **Links to the national implementation sites** – when available
- **Inform on the network code maintenance and amendment**
- **Make available latest available public document** related to the CNC implementation
- **Links to the relevant events** at the European (Stakeholder Committee) and national- when available

ENTSO-E supports the CNC implementation

ENTSO-E guides

2. Creates the internal communication platform for all the TSOs:

- Enhances the exchange of experience
- Builds the library of best practices to share between all the TSOs
- Deliver guidelines and examples for supporting the TSOs in the implementation process

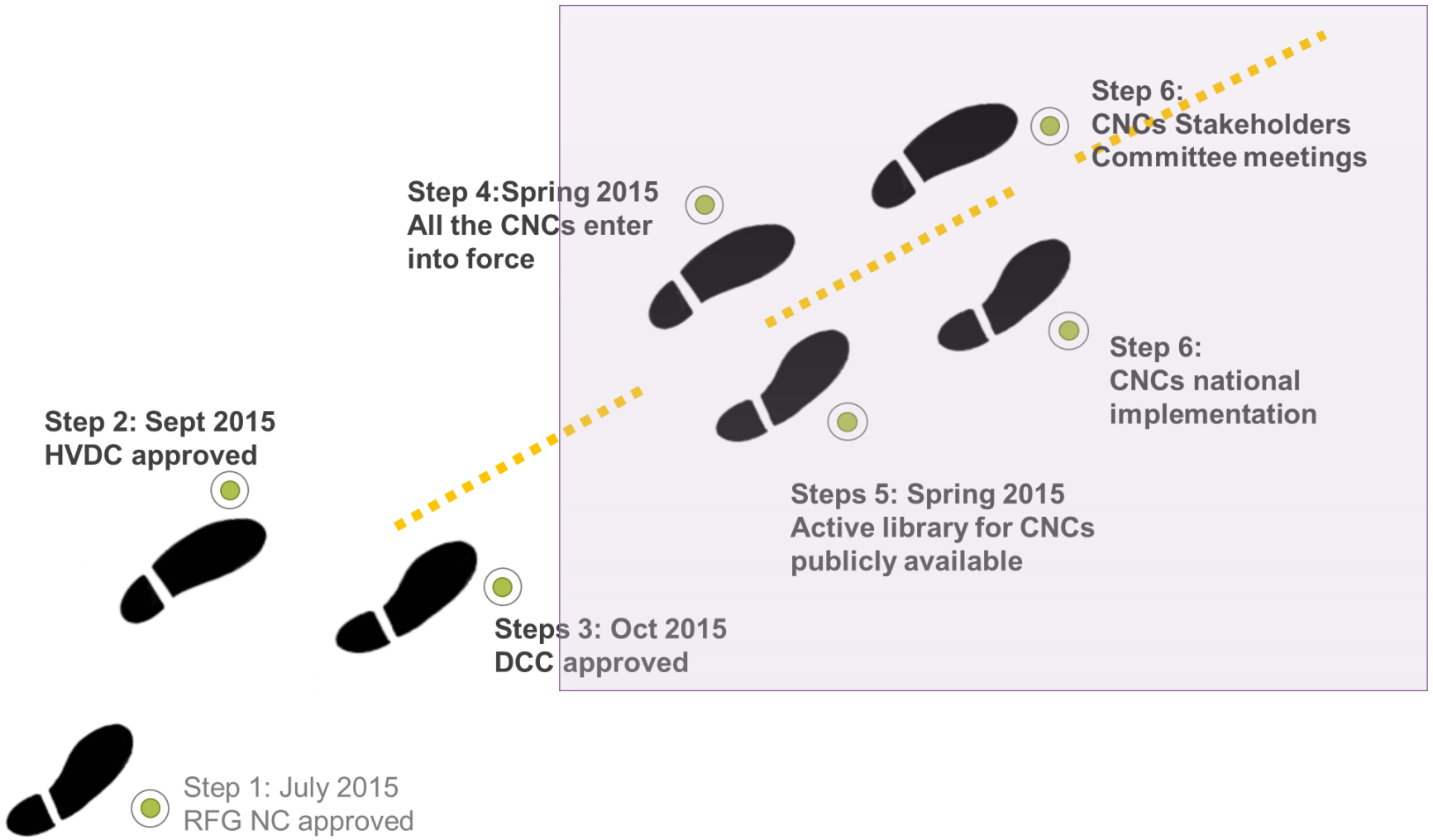
ENTSO-E supports the CNC implementation

ENTSO-E monitors

3. Together with ACER ENTSO-E will monitor and enhance the Connection Codes implementation for the years to come

- Timelines still to be defined
- Level of monitoring by ACER and ENTSO-E to be further refined
- Stakeholders Committee on its way to be set
    - Expected first meeting in Spring 2016

ENTSO-E role the CNCs implementation



ENTSO-E informs

ENTSO-E guides

ENTSO-E monitors


entsoe
Reliable Sustainable Connected

ACER
Agency for the Cooperation of Energy Regulators

Grid connection codes - Next steps

Uros Gabrijel / ACER

ENTSO-E's WS on CNC national implementation 23/09/2015

ACER's next steps (1)

- Apply the provisions of the grid connection codes:
  - Establish, in close cooperation with ENTSO-E, the European Grid Connection Stakeholders Committee
  - Compile a list of the relevant information to be provided by ENTSO-E with regard to implementation monitoring
  - Monitor the derogations procedures
  - Issue a potential opinion on classification of emerging technologies

ACER's next steps (2)

- Apply the provisions of Regulation (EC) No 714/2009
  - Monitor the implementation of the grid connection codes (Article 9)
  - Propose NC/GL amendments (Article 7.1) in accordance with the Agency Guidance on the Evaluation Procedure for Network Code Amendment proposals

- Apply the provisions of Regulation (EC) No 713/2009
  - Make recommendations to assist regulatory authorities and market players in sharing good practices, where necessary (Article 7)

ACER
Agency for the Cooperation of Energy Regulators

Thank you for your attention!

www.acer.europa.eu