European Network Codes:
RfG GB Grid Code Application Options



Summary of Presentation to JESG
17 April 2013

nationalgrid

Summary

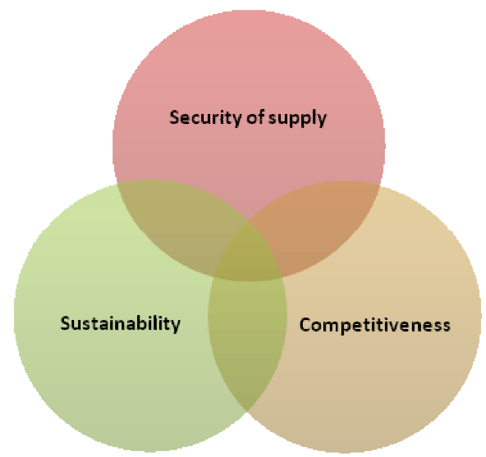
- Background
- Assumptions / Starting Point
- Differences between the ENTSO-E RfG and GB Grid Code
- Implementation Options
- Advantages / Disadvantages
- Summary
- Views from JESG Members / Other Options

3rd Package Intended Benefits

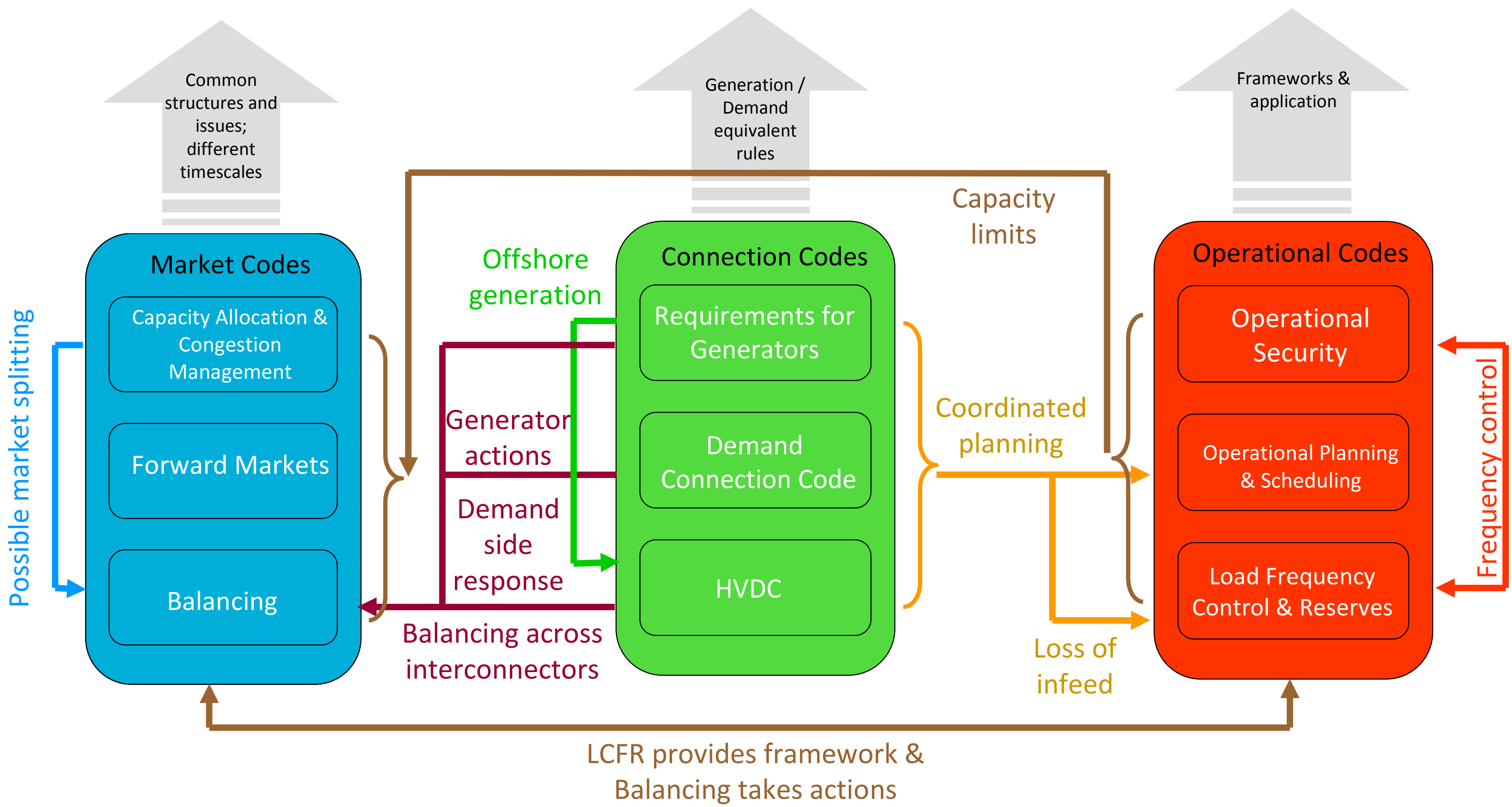
Enabling renewables
- Creating clear connection rules.
- Providing harmonisation to benefit manufacturers.
- Creating markets to reduce risks.

Ensuring security of supply
- A coordinated approach to system operations.
- Greater optimisation to enhance efficiency.
- More flexible markets (e.g. balancing).

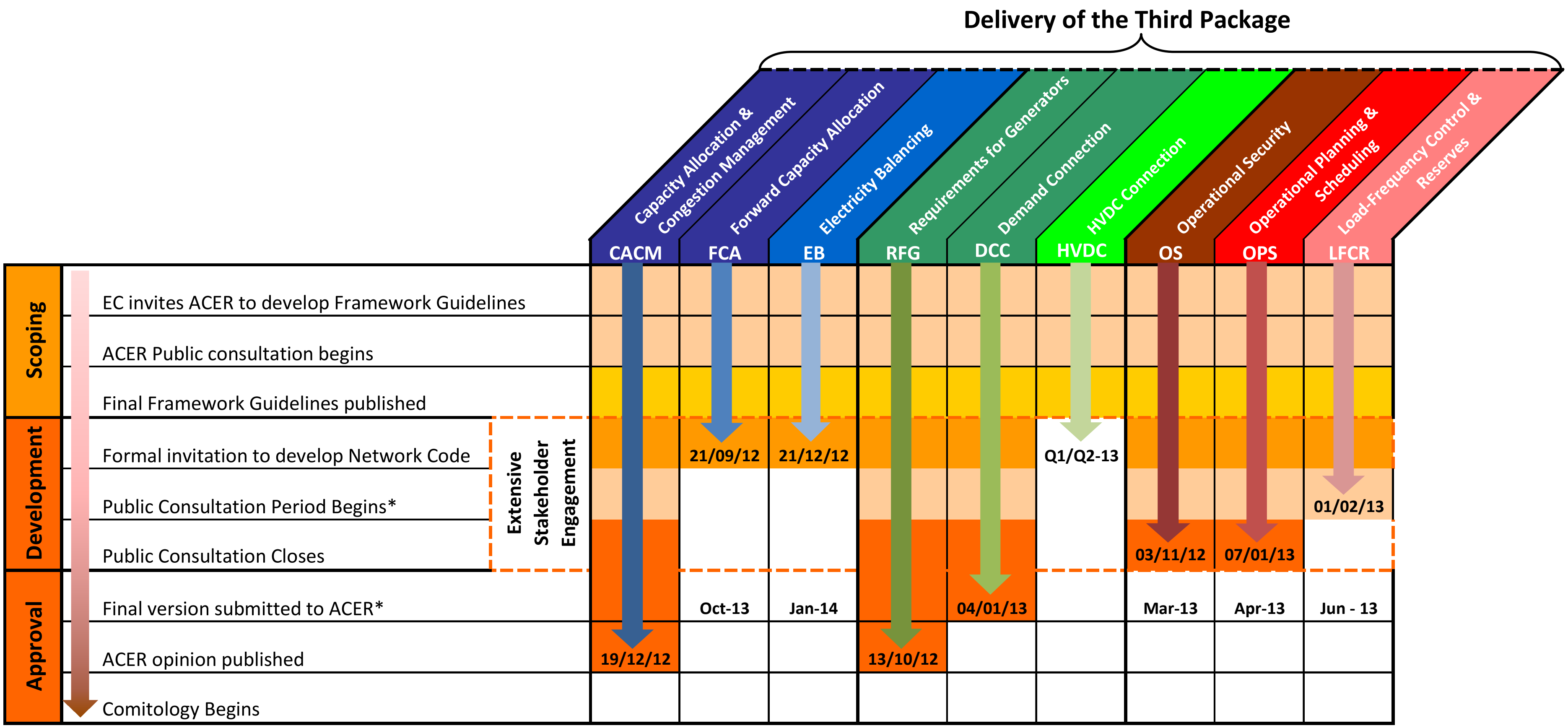
Enhancing competition
- A single market design across Europe (in all timescales).
- Promoting cross border trade & enhancing liquidity.
- Reducing risk for all market players



ENC High Level Interactions



Development Progress



ENC Development

Group	Network Code	Content
Connection Codes	**Requirements for Generators**	**Sets functional requirements which new generators connecting to the network (both distribution and transmission) will need to meet, as well as responsibilities on TSOs and DSOs .**
	Demand Connection	Sets functional requirements for new demand users and distribution network connections to the transmission system, basic Demand Side Response capabilities, as well as responsibilities on TSOs and DSOs.
	HVDC	Sets functional requirements for HVDC connections and offshore DC connected generation.
System Operation Codes	**Operational Security**	Sets common rules for ensuring the operational security of the pan European power system.
	Operational Planning & Scheduling	Explains how TSOs will work with generators to plan the transmission system in everything from the year ahead to real time.
	Load Frequency Control & Reserves	Provides for the coordination and technical specification of load frequency control processes and specifies the levels of reserves (back-up) which TSOs need to hold and specifies where they need to be held.
Market Codes	**Capacity Allocation & Congestion Management**	Creates the rules for operating pan-European Day Ahead and Intraday markets, explains how capacity is calculated and explains how bidding zones will be defined.
	Balancing	Sets out the rules to allow TSOs to balance the system close to real time and to allow parties to participate in those markets.
	Forward Capacity Allocation	Sets out rules for buying capacity in timescales before Day Ahead and for hedging risks.

Why is GB application complex?

The following needs to be considered for all European Network Codes (ENCs):

- Length of the implementation period;
- Potential requirement to coordinate with adjoining TSOs (and NRAs);
- GB Implementation should be consistent across all codes with RfG being the first.
- Consideration where the application requires subsequent ENCs to be implemented in order to facilitate full enforcement;
- Range of legal instruments which require amendment.
- The structure of the current GB Grid Code is very different to that of the proposed ENTSO-E RfG
- The Generation Thresholds in GB are very different to those is Europe – there is significant overlap with the Distribution Code

Implementation Option Considerations

Consideration must be given to the following points:

- All Codes (G Code / D Code) are to be fully consistent with the requirements of the ENTSO-E RfG
- The proposals should be designed in the best interests of all Stakeholders (Generators, DNOs, Transmission Owners System Operators and conventional customers (including Residential))
- Minimise the number of Industry Codes that each party is required to comply with
- Ensure contractual arrangements between appropriate parties is in place *(Not for RfG implementation but an important factor)*

High-level RfG Implementation Options (from options paper)

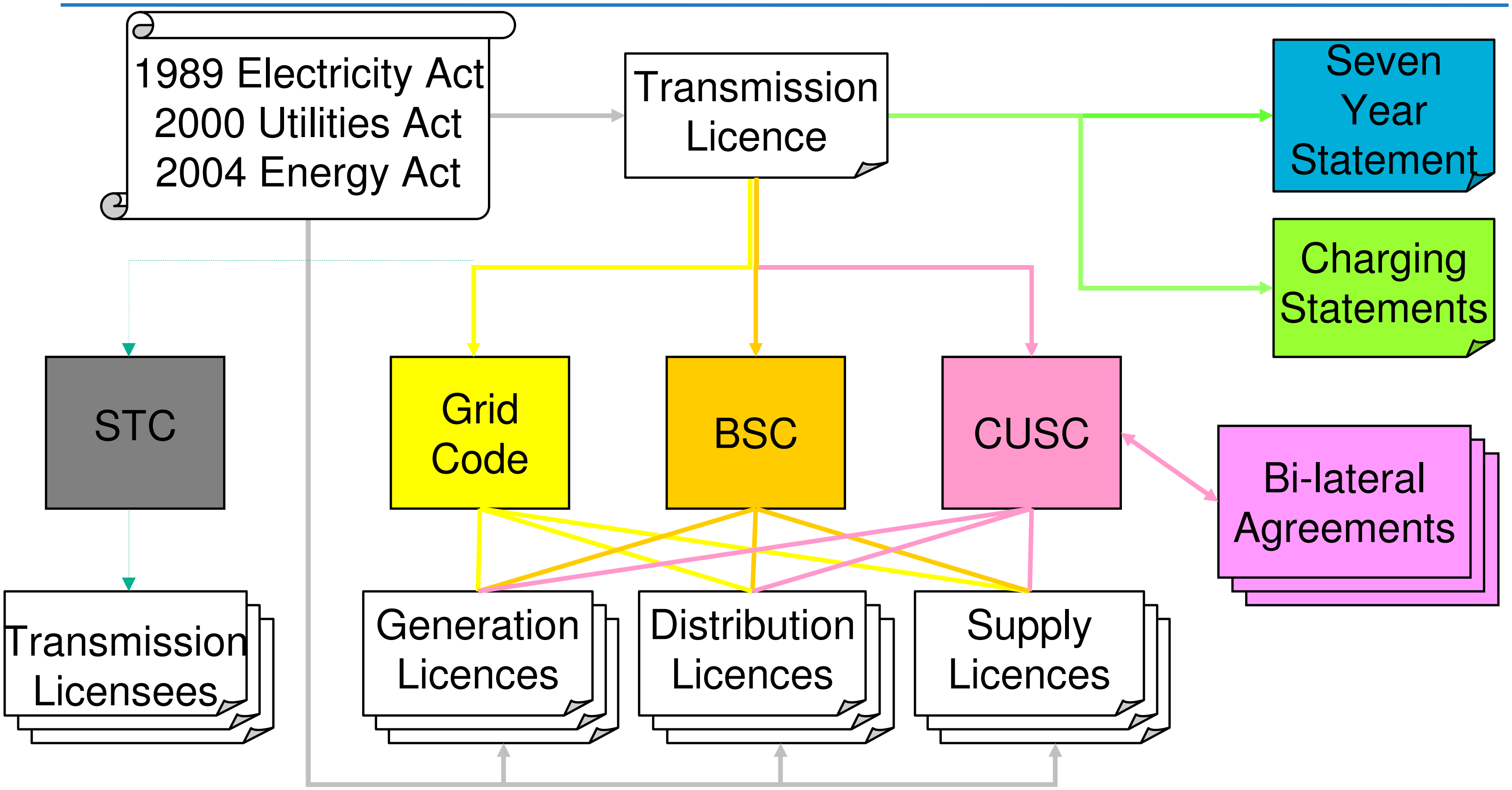
nationalgrid

- **Option 1** - write new code to cover ENC requirements but retain existing grid code as well. *End up with two documents to maintain but on the plus side, it will be easier to interpret for existing non-captured users. Probably less pressure on the codes to converge than some of the other options which is both good and bad.*
- **Option 2** - amend the GB Grid Code to include ENC requirements. *Sits between options 1&4 but no separate advantages.*
- **Option 3** - remove all ENC-related provisions from the GB Grid Code and create a stand-alone EU relevant document. *End result similar to option 1 but messy realisation.*
- **Option 4** - rewrite the Grid Code completely. *A neater solution while potentially time-consuming. Retrospective application will be more of an issue*
- **Option 5** - combine the GB Grid Code and GB Distribution Code. *Could be used in conjunction with any of the other options. May be employed later.*
- **Option 6** - amend the GB Grid Code to cross-refer directly to the RfG ENC. *Not workable given the required Member State specificity contained within the ENCs*

Options 1 & 4 to be taken forwards – which are in the first instance identical.

The Industry Framework / Obligations

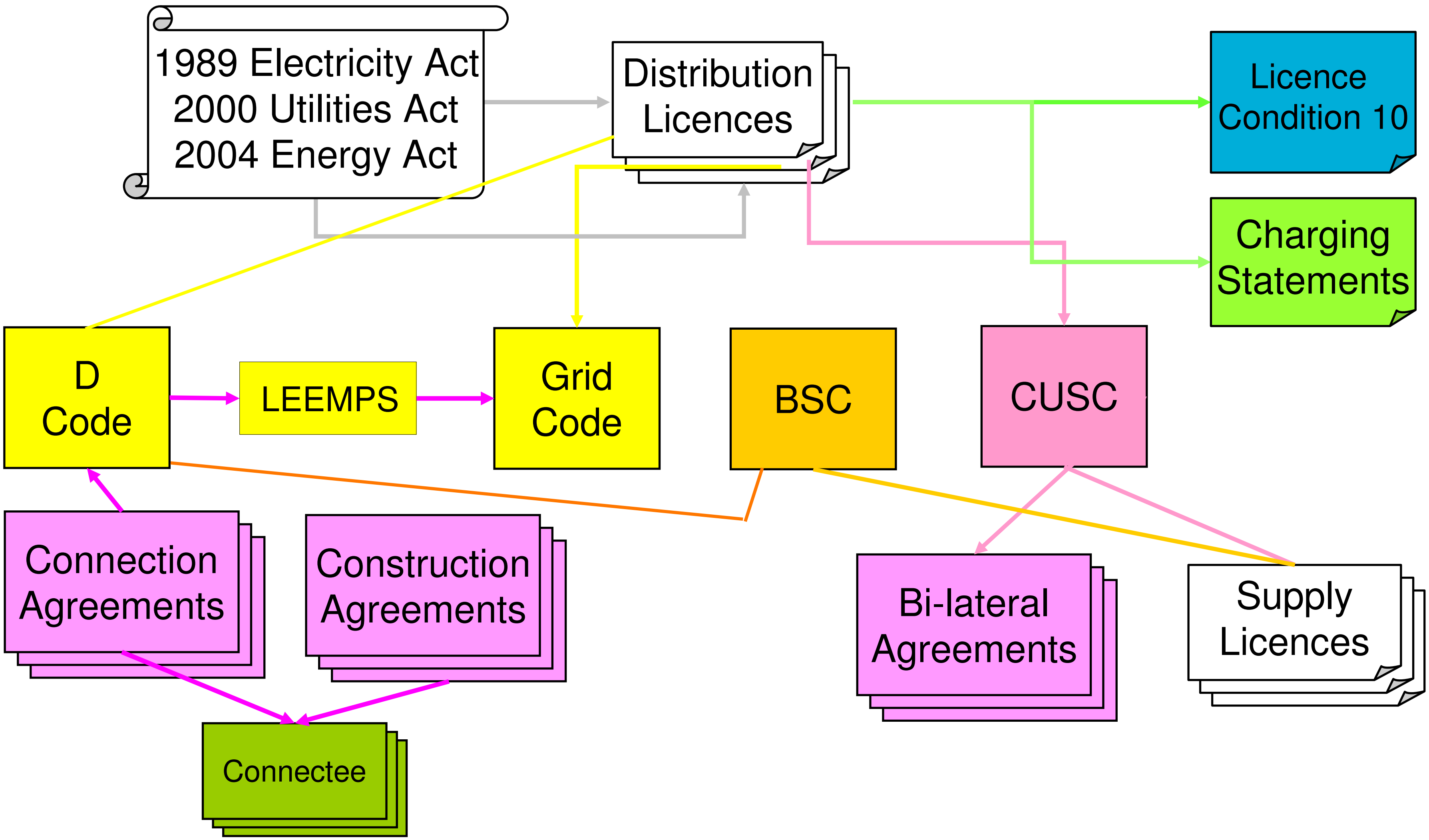
Transmission



The Industry Framework / Obligations

Distribution

nationalgrid



Thresholds

- Under the ENTSO-E Provisions Type A – C Power Generating Modules are connected below 110kV and ranging in size between 800 W – 30MW.
- Type D is any Power Generating Module which is connected at or above 110kV or above 30MW.
- In summary Type A – C Power Generating Modules will be connected to the Distribution Network and need to comply with the requirements of the Distribution Code
- Type D Generating Modules will either be directly connected and need to comply with the requirements of the Grid Code or Embedded and need to meet the requirements of the Distribution Code and Grid Code.

Or putting it another way…
GB Generator Banding/Thresholds

- Existing requirements – as stated in Grid Code and SQSS:

Generator Size	Direct Connection to:		
	SHET	SPT	NGET
Small	<10MW	<30MW	<50MW
Medium			50-100MW
Large	10MW+	30MW+	100MW+

Note:

- In Scotland, transmission voltages are ≥132kV
- In England & Wales, transmission voltages are ≥275kV

- RfG banding (GB Synchronous Area):

RfG Type	Generator Capacity	Connection Voltage
A	800W-1MW	<110kV
B	1-10MW	<110kV
C	10-30MW	<110kV
D	≥30MW	>110kV

Note:

- No geographic specificity
- Much smaller generators captured by code (down to domestic user levels)

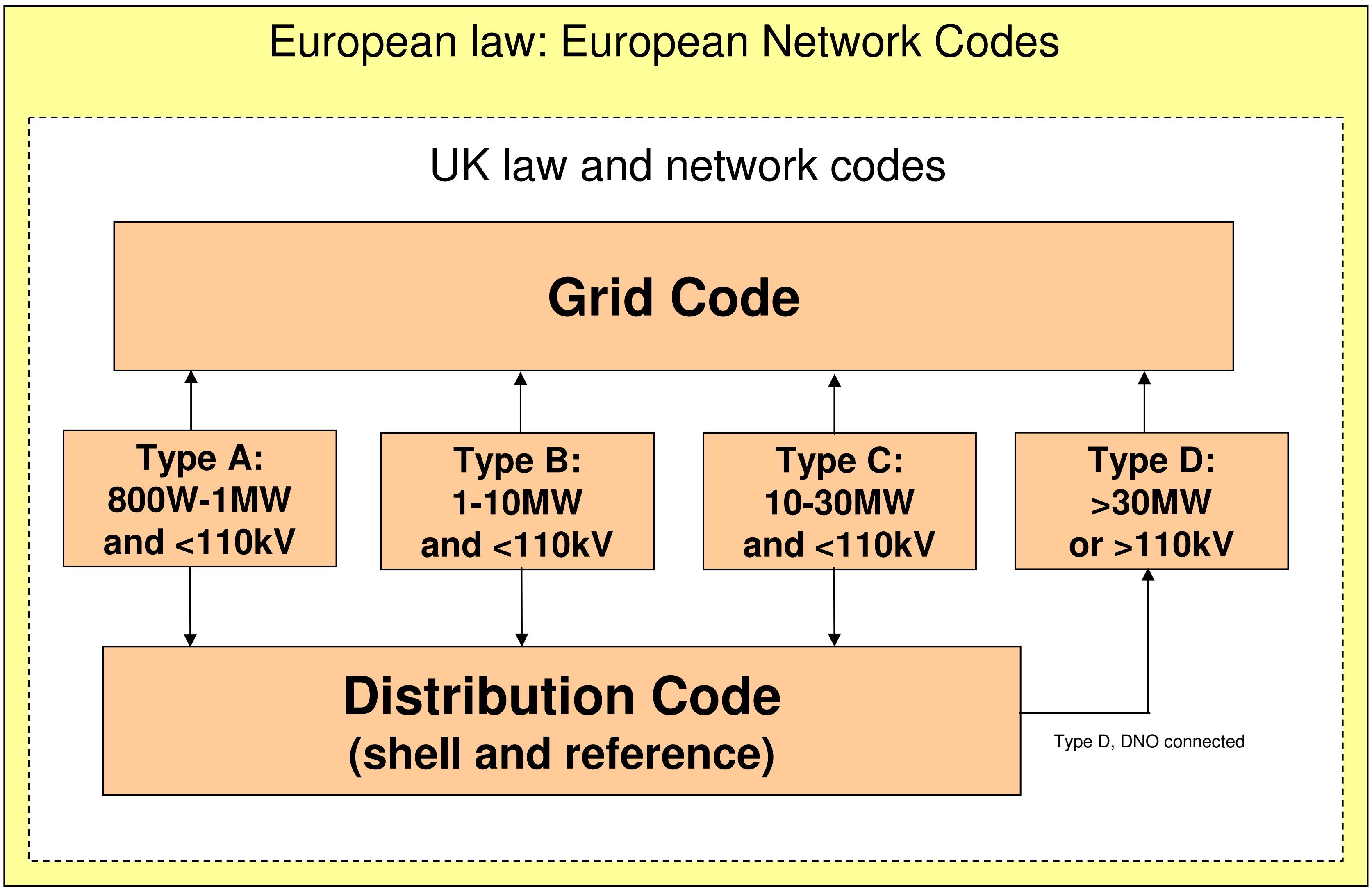
Implementation Options

nationalgrid

- Option I – Place all the Type A – D RfG requirements in the GB Grid Code
- Option II – Place all the Type A – C RfG requirements in the Distribution Code / Engineering Recommendations and all the Type D RfG requirements in the Grid Code
- Option III – Place Type A – D RfG requirements in a set of Engineering Recommendations and reference Grid Code and Distribution Code to this
- All options assume that the current Codes would need to be frozen for existing Generators.

NB A further outcome, being a compromise between II and III depending on the technical issue may also be possible.

Option I
Place all requirements in Grid Code



Option I

Place all requirements in Grid Code

- Advantages
  - All Type A – D RfG Requirements reside in one document
  - Retain structure of existing GB Code and amend Generator clauses to ensure consistency with RfG
  - Approach could be applied to other European Codes (eg HVDC and DCC)
  - Removal of Regional Differences with Scotland
- Disadvantages
  - High volume of current Small Power Stations would need to access the Grid Code and other industry codes, resulting in complexity and high administrative burden
  - Contractual complexity
  - Grid Code becomes very cumbersome
  - Interaction with DNO's requires further examination
- Legal text has been developed for a number of examples associated with this Option

Examples Prepared – Option I

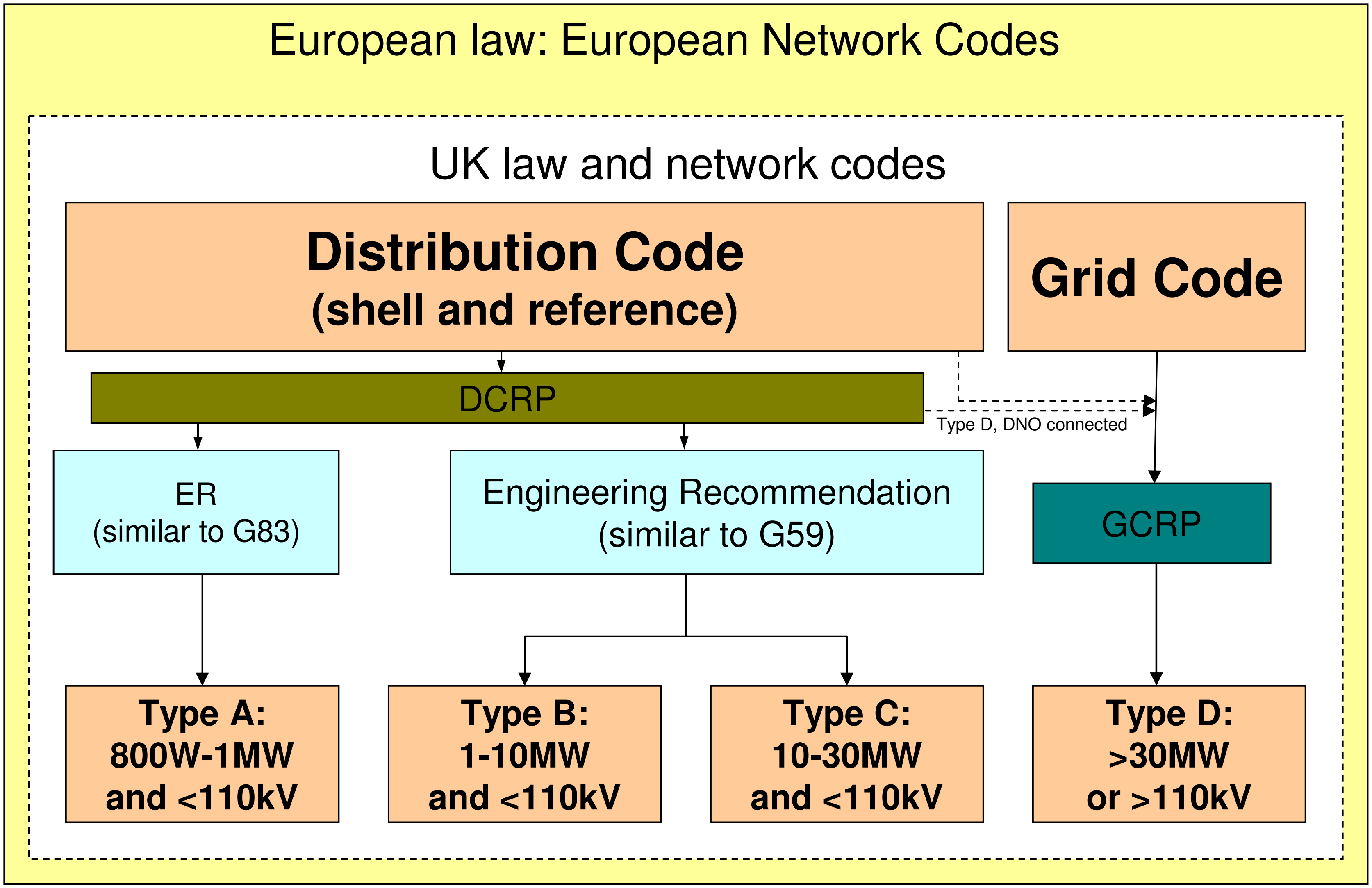
(All obligations Type A – D included in Grid Code)

nationalgrid

- **Frequency Range** – No substantial change required to GB Code other than change to definitions.
- **Voltage Range** – No substantial change required to GB Code other than Glossary and Definitions although there is a consistency issue relating to voltages between 110kV and 132kV.
- **Voltage Waveform Quality** – No change required to GB Code – Quality of Supply issues are not captured in the ENTSO-E RfG
- **Power Output with Falling Frequency** – Code amended to cater for all Type A – D Power Generating Modules. The section on HVDC has been removed although this would need to be re-inserted when the HVDC Code is implemented into the GB Grid Code.
- **Black Start** – Minor amendments introduced, largely relating to the Glossary and Definitions.
- **Fault Ride Through** – Substantial re-write of the existing GB Code. Detailed example written on the basis that all the requirements.

Option II

Place Type A - C requirements in D Code / ER and Type D in Grid Code



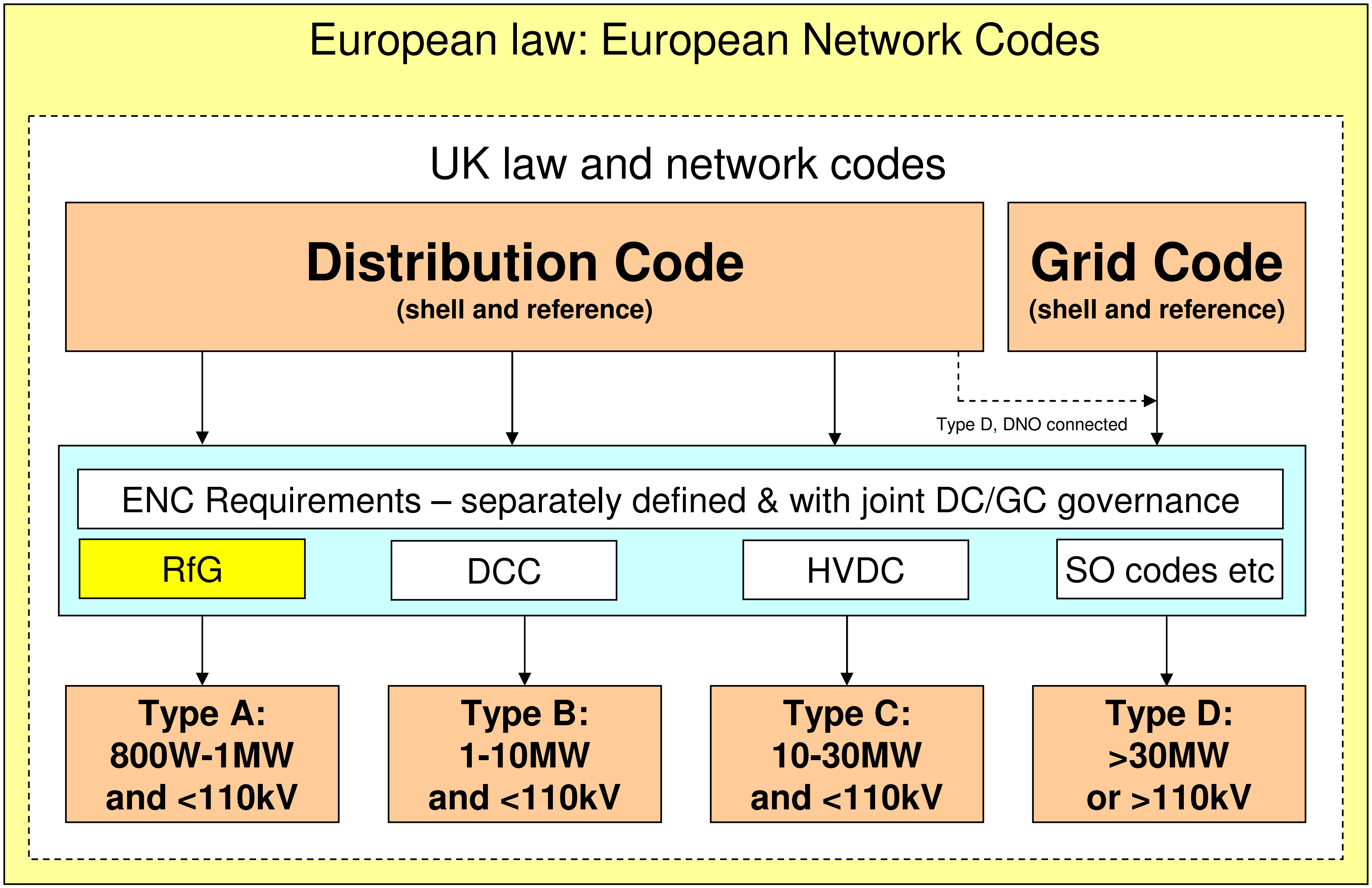
Option II
Place Type A - C requirements in D Code / ER and Type D in Grid Code

nationalgrid

- Advantages
  - Retain structure of existing GB Code and amend Generator clauses to ensure consistency with RfG
  - Approach could be applied to other European Codes (eg HVDC and DCC – see slide 19)
  - Removal of Regional Differences with Scotland
  - Contractual structure remains similar to current arrangements
  - Clear definition of which code applies to which party
- Disadvantages
  - Small number of Users would need to access both G Code and D Code as per current arrangements, but small number of Users believed to be affected.

Option III

Place Type A - D requirements in ER and G Code / D Code operate as a Shell / Reference



Option III

Place Type A - D requirements in ER and G Code / D Code operate as a Shell / Reference

nationalgrid

- Advantages
  - Avoids some Generators from having to read both G Code and D Code
- Disadvantages
  - Places both the G Code and D Code as a shell in respect of Generator Requirements. This is current D Code practice but not G Code.

nationalgrid

Pros and Cons

Issue	Approach		
	Option I: Place all Requirements in GC	Option II: Place Type A - C requirements in DC / ERs, Type D stays in GC	Option III: Place all Type A - D requirements in ERs; GC / DC operate as Shells / Reference
Ease of use - users	Small generators have to refer to GC with high costs and admin	Clarity of which doc applies to which party will be OK	Probably easier for users
Ease of use - TSO/DNOs	DNOs need to refer to GC	Little change to current	Harder - as multiple docs to maintain and coordinate
Number of documents	Single document - and removes need for DC references	Small number of users (type D, DNO connected) would need to refer to both DC/GC	Multiple documents but does keep all users in either DC or GC
Retains existing codes structure	Yes, but GC becomes more cumbersome through extension to more users	Yes	No. Fundamental changes and multiple documents
Retains contractual structure	Increases complexity for D-connected gens	Yes	Makes it simpler in principle
Applicable to other ENCs	Yes, straightforward although multiple changes will be reqd	Yes, really as is	Yes, and can build in more annexes to DC/GC 'shells' fairly simply
DNO/SO/TO interactions require examination	Yes - to cover D-connected users	Yes - but requirements should cascade fairly neatly	Interactions probably straightforward and covered in DC/GC 'shells'
Removes regional differences with Scotland	Yes	Yes	Yes

Colour code:

Red – difficult or increases complexity

Amber – some issues

Green - straightforward

nationalgrid

Views from JESG Members invited:

- Thoughts on options - which are preferred?
- Are there further options?
- What mechanism for effecting changes to the GB codes should be used?
- What strategy is required to handle interactions between the GB codes?
- What governance arrangements should be considered?
- What major risks or pieces of work can be identified?

national**grid**

Useful Links & Contact Information

- ENTSO-E (section of site with ‘Vision’ paper and supporting information)
  - https://www.entsoe.eu/major-projects/network-code-development/
- ACER
  - http://www.acer.europa.eu/portal/page/portal/ACER_HOME/Activities
- European Commission
  - http://ec.europa.eu/energy/index_en.htm
- JESG (Joint European Standing Group; set up as a forum for communication with GB stakeholders on European code development)
  - http://www.nationalgrid.com/uk/Electricity/Codes/systemcode/workingstandinggroups/JointEuroSG/

For more information, please contact:

Rob Wilson – National Grid Electricity Codes Team

robert.wilson2@nationalgrid.com

Or team email address:
europeancodes.electricity@uk.ngrid.com