Reactive Power Management and Voltage Control

Introduction to the working group

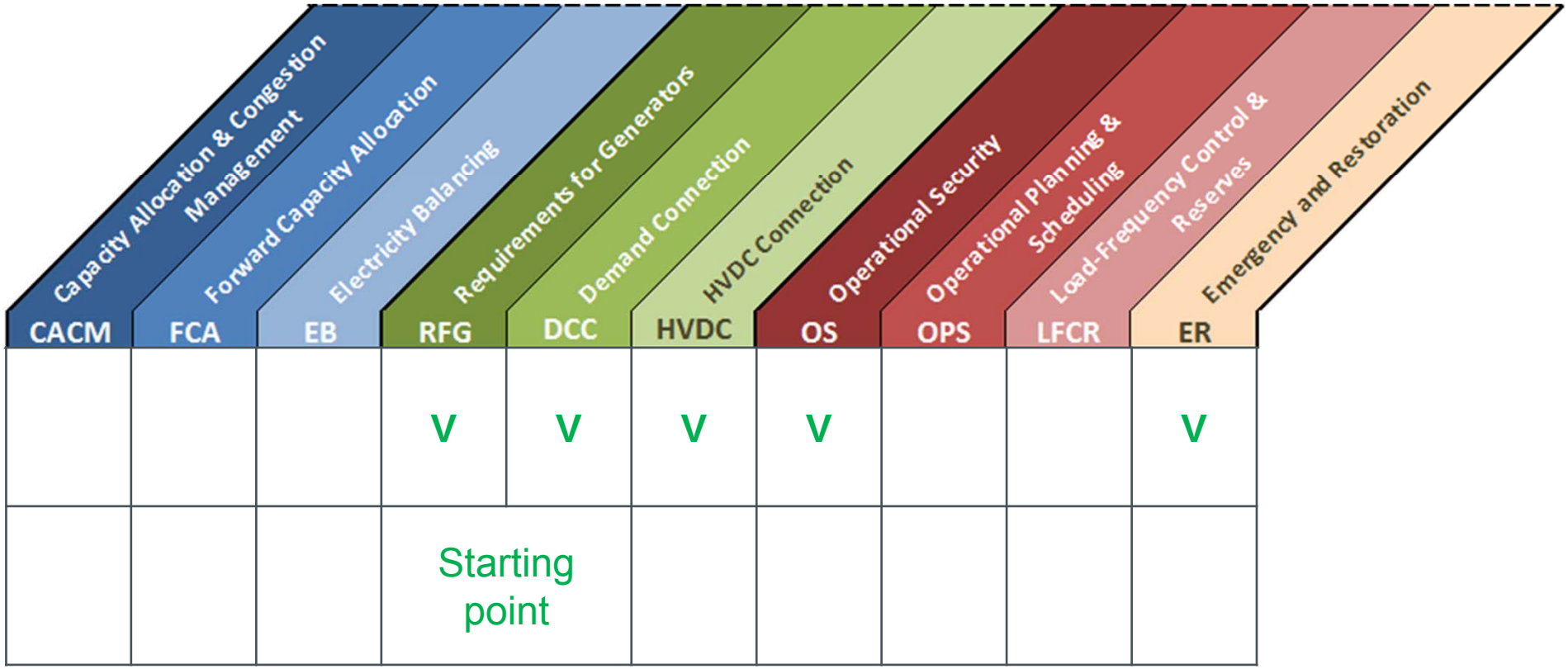
Belgian Grid Working Group

Brussels, 9/10/2015

Agenda

1. Related network codes
2. Requirements for Generators
3. Demand Connection Code
4. Operational Security
5. Belgian context for implementation

Network Codes related to Reactive Power Management and Voltage Control



Requirements for Generators (RfG)

- **Requirements** for grid connection of power generating facilities:
  - synchronous power generating modules
  - power park modules
  - offshore power park modules
- Regulation has two main **goals**:
  1. **to ensure fair conditions of competition** in the internal electricity market
  2. **to ensure system security** and the **integration of renewable** electricity sources, and **to facilitate Union-wide trade** in electricity.
- This regulation also lays down the **obligations** for ensuring that **system operators make appropriate use of the power generating facilities' capabilities in a transparent and non-discriminatory manner**
- **Topics:** classification in type A, B, C and D generators, onshore/offshore power park modules and their specific requirements on reactive power management and voltage control

RfG – EU grid codes let room for discussion

Types	ENTSO-e Latitude	Requirements for RPM & VC
Type A	Maximum Capacity >= Limit A-B & PoC < 110 kV	No requirements
Type B	Maximum Capacity >= Limit A-B & PoC < 110 kV	Requirements on: • Reactive power capability • Voltage control system → selectable setpoint
Type C	Maximum Capacity >= Limit B-C & PoC < 110 kV	Extra requirements on: • Connection cable/line compensation • Reactive power capability for varying voltage
Type D	Maximum Capacity >= Limit C-D Or PoC >= 110 kV	Extra requirements on: • HV/LV capabilities to stay connected • Auto. Voltage regulator → parameters/settings to be aggreed

Limit A-B ≤ 1MW

Limit B-C ≤ 50MW

Limit C-D ≤ 75MW

RfG – EU grid codes let room for discussion

Other types	Requirements for RPM & VC
Type B Power Park modules	Requirements on reactive power capability
Type C Power Park modules	Extra requirements on: • Connection cable/line compensation • Reactive power capability for varying voltage • Voltage/reactive power/power factor control
Offshore Power Park modules	Extra requirements on: • HV/LV capabilities to stay connected • Reactive power capability for varying voltage
Black start generators	Specific requirements:

Demand Connection Code (DCC)

- **Requirements** for grid connection:
  - demand facilities
  - distribution systems (incl. closed distribution systems)
- Regulation has two main **goals**:
  1. **to ensure fair conditions of competition** in the internal electricity market
  2. **to ensure system security** and the **integration of renewable** electricity sources, **to facilitate the offer of demand-side response services**, and **to facilitate Union-wide trade** in electricity.
- This regulation also lays down **a common framework for demand connection contracts** between transmission system operators and demand facility owner or the distribution system operator
- **Topics:** General voltage requirements, Reactive power requirements, Specific provisions for reactive power control, Specific requirements on TSO-DSO interaction

DCC – EU grid codes let room for discussion

Requirements on :

1. Import/export of reactive power (limits)
2. Reactive power exchange between TSO and DSO
3. Reactive power export between TSO and distribution facilities @ critical moments
4. Active control of reactive power exchange by the distribution facilities

→ all DSO related topics: ongoing discussions in Synergrid

Operational Security (OS)*

- **Content**
  - Operational security requirements and principles for Transmission Systems applicable to all TSOs, DSOs and Significant Grid Users in **Normal and Alert System State**.
  - General provisions in relation to the **Emergency State, Blackout State and Restoration**
  - Provisions for **training and certification** of System Operator Employees
- Regulation has three main **goals**:
  1. to **determine** common Operational Security **requirements and principles**
  2. to **ensure conditions for maintaining Operational** Security throughout the EU
  3. to **coordinate system operation** in a common and coherent way throughout the EU
- **Topics:** will describe how the capabilities defined in the requirements of RfG, DCC and HVDC will be used to fulfill these three goals

* Merged in Guideline Transmission System Operation

Belgian context for implementation

- Switch centralized production → decentralized production
  - moments with VERY LOW loading of TSO lines/cables AND almost NO centralized production (summer/interseason)
  - Reactive absorption needs ↑, while absorption means ↓
  - ⇔ **Risk on overvoltages and damage of HV equipment in extreme situations**
- Higher interconnectivity with other TSO grids
  - Moments with VERY HIGH loading of lines/cables AND almost NO centralized production (winter/interseason)
  - Reactive injection needs ↑, while injection means ↓
  - ⇔ **Risk on voltage collapse and instability of the HV system in extreme situations**

Reactive power management becomes more complex

The EU grid codes let room for discussion but we need to take into account the Belgian context

Thank you for your attention!

ELIA SYSTEM OPERATOR
Boulevard de l'Empereur 20
1000 Brussels

+32 2 546 70 11
info@ elia.be

www.elia.be
An Elia Group company