

Introduction to EU Netcode Emergency & Restoration

Working Group System Operation

12/12/2017

General overview EU NC Emergency & Restoration

1. General Provisions

Subject matter and scope, Definitions, **Regulatory aspects and approval**, Recovery of costs, Consultation and coordination, Confidentiality obligations, Agreement with TSOs not bound by this Network Code

Art. 1 - 10

2. System Defence Plan

- Design, implementation & activation of the System Defence Plan
- System protection schemes
- System defence plan procedures

Art. 11 - 22

3. Restoration Plan

- Design, implementation & activation of the Restoration Plan
- Re-energisation procedure & strategy
- Resynchronization procedure and strategy
- Frequency management procedure

Art. 23-34

4. Market interactions

- Procedure, rules and conditions for suspension and restoration of market activities
- Communication procedure
- Settlement principles

Art. 35 - 39

5. Information exchange and communication, tools and facilities

- Information exchange and communication
- Tools and facilities

Art. 40-42

6. Compliance and review

- Compliance testing of TSO, DSO and SGU capabilities
- Compliance testing of system defence plan & restoration plan

Art. 43 - 51

7. Implementation

- Monitoring & stakeholder involvement

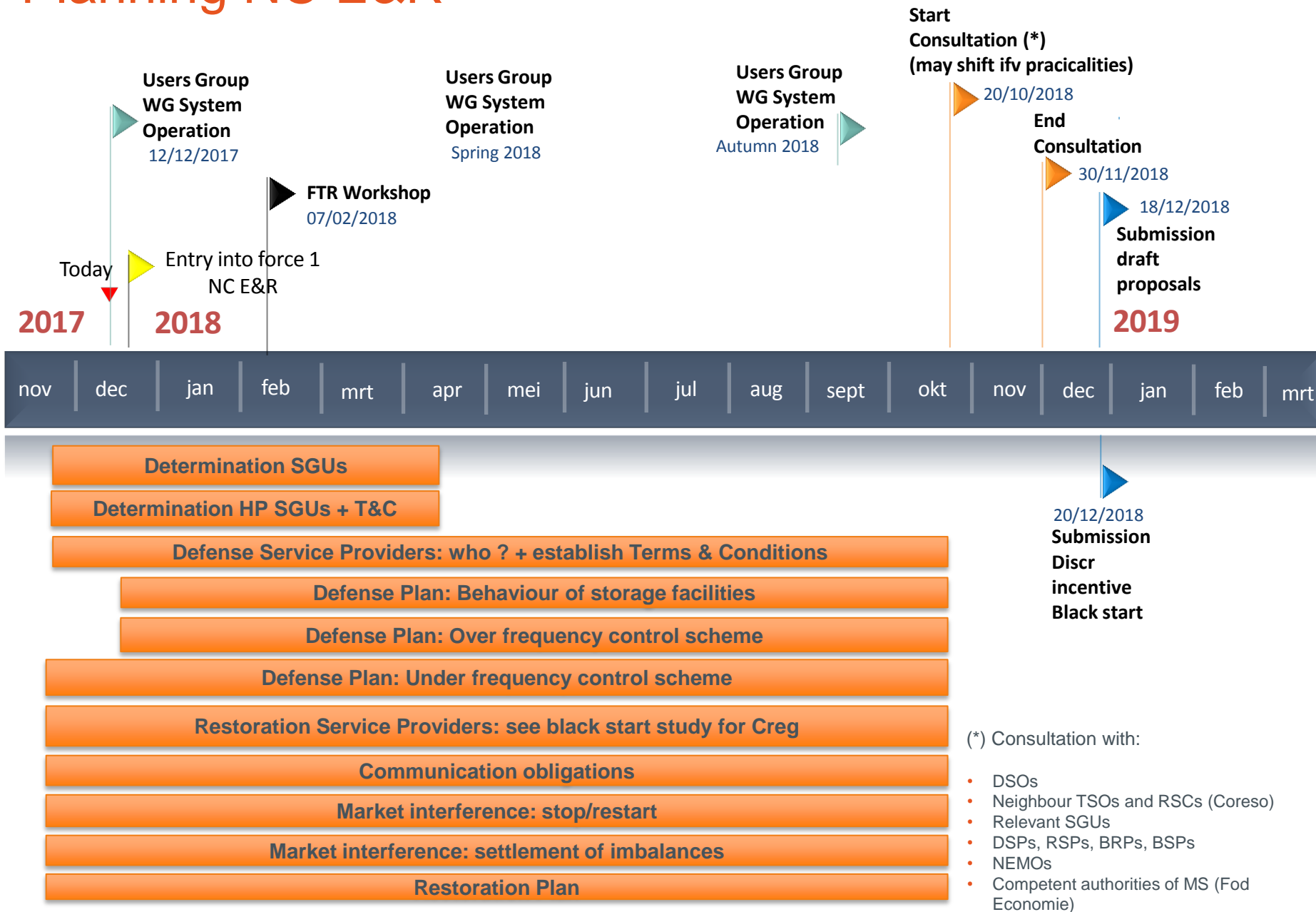
Art. 52 - 53

8. Final Provisions

- Amendments & entry into force

Art. 54-55

Planning NC E&R



Deliverables Art 4.2: Elia shall submit the following proposals to the Creg for approval

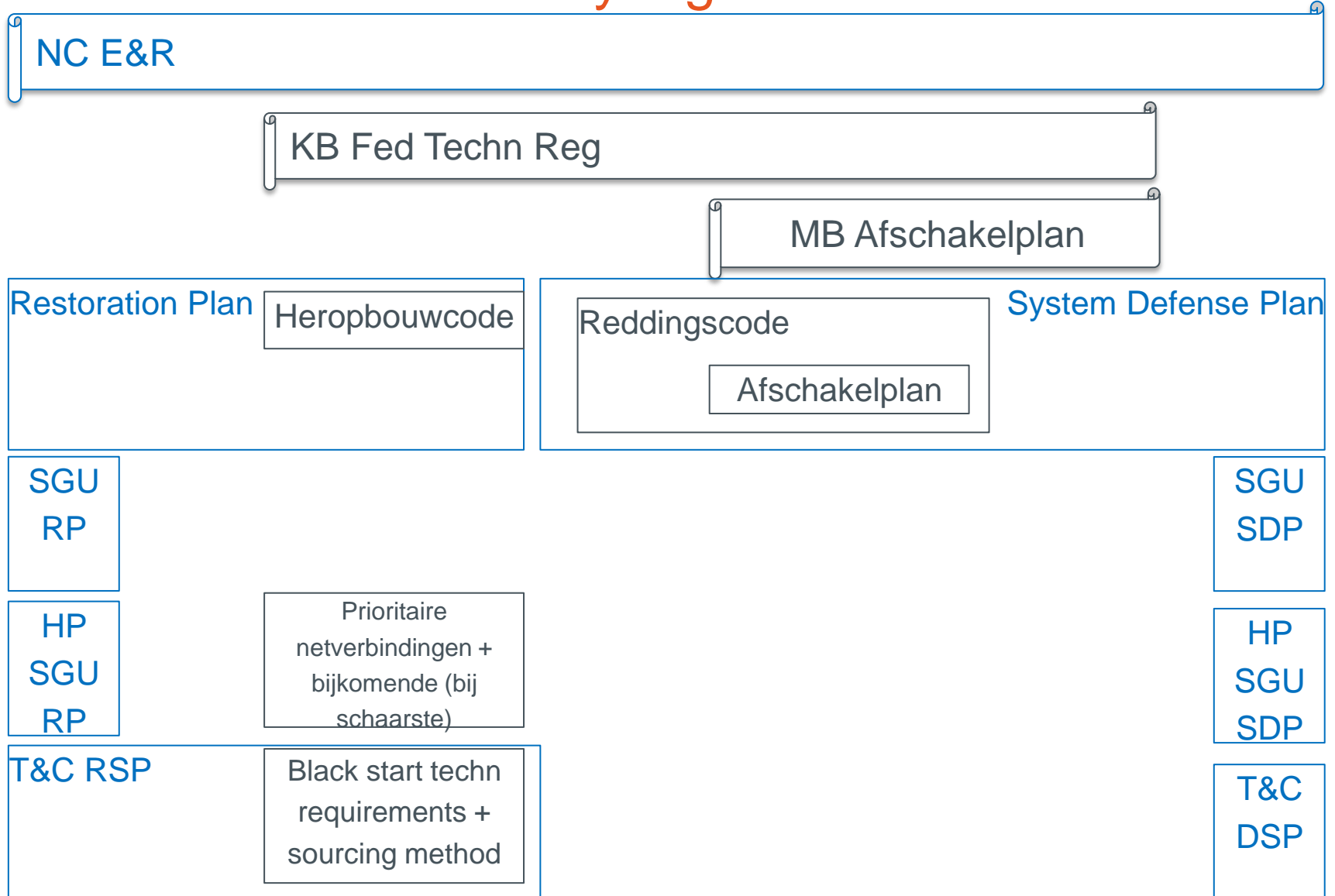
Creg shall decide within 6 months from submission date

- a) T&C to act as **defense service providers** if on a contractual basis;
- b) T&C to act as **restoration service providers** if on a contractual basis;
- c) List of **SGUs** ... and the list of the measures to be implemented by these SGUs, identified for defense and restoration plans.
- d) List of **high priority SGUs** or the principles applied to define those and the T&C for disconnecting and re-energizing the high priority grid users, unless defined by the national legislation of Member States.
- e) The rules for **suspension and restoration** of **market** activities;
- f) specific rules for **imbalance settlement** and settlement of balancing energy in case of suspension of market activities
- g) the **test plan** in accordance with Article 43(2).

Elia shall notify the Creg the **system defence plan** and the **restoration plan**

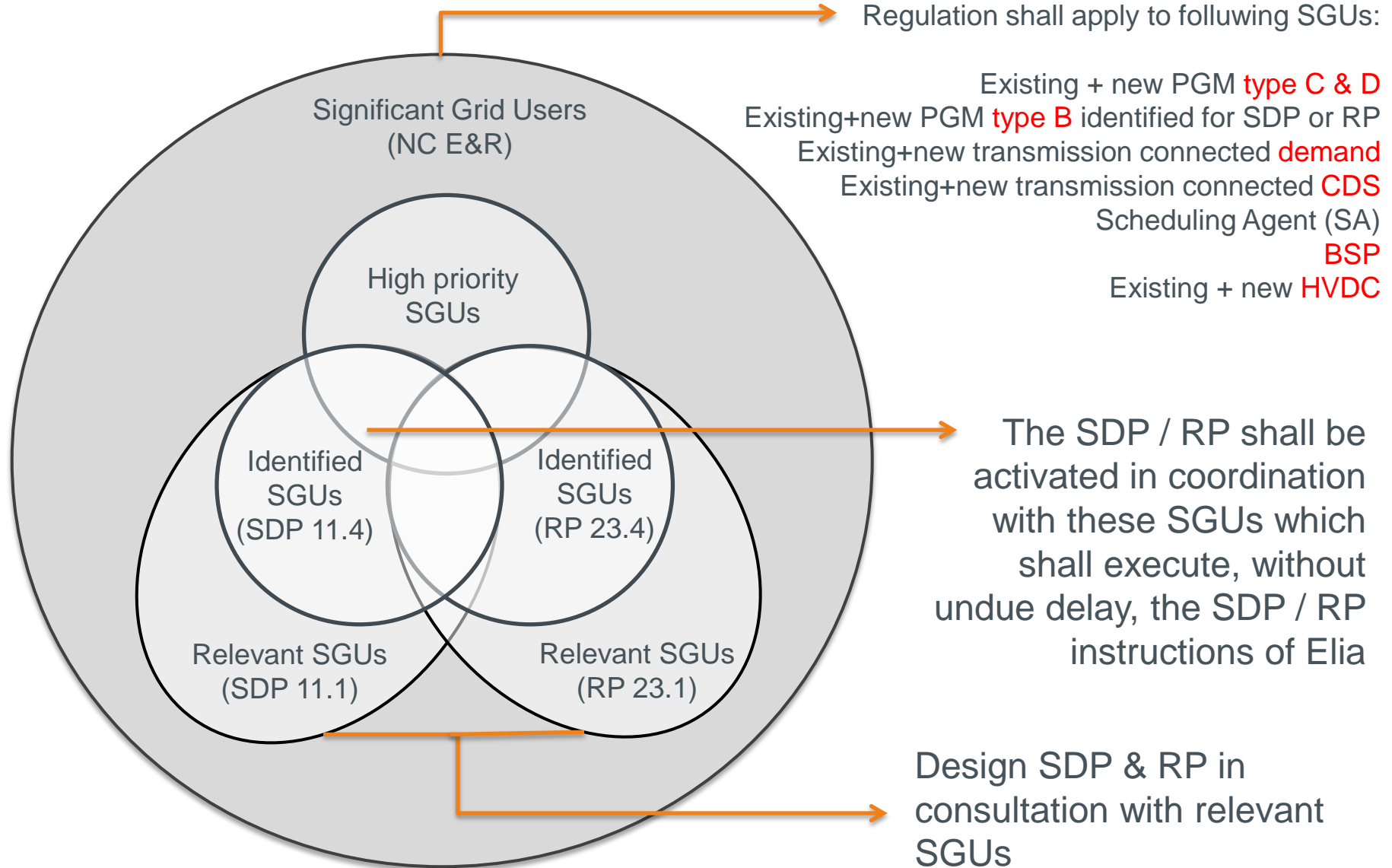
Legal framework

Hiërarchy legal docs



NC E&R – Significant Grid User definition

NC E&R - Significant Grid User Scope



Proposal for SGU identified in SDP and RP

- PGM of type D
- PGM of type C (e.g. CHPs 45 MW)
- Transmission connected demand facilities
- Transmission connected CDS
- Providers of **redispatching** of power generating modules or demand facilities by means of aggregation
- Providers of active power **reserve** (FCR, FRR, RR)

Each TSO shall define, in consultation with DSOs and SGUs identified pursuant to Article 23(4) NC ER and Restoration Service Providers, technical requirements to be fulfilled by their **voice communication systems** as well as its own voice communication system in order to allow their **interoperability** and to guarantee that the **TSO's incoming call** can be **identified** by the other party and **answered** immediately

Each **TSO, DSO, SGU** identified pursuant to Article 23(4) NC ER, and **RSP** shall have a **voice communication system**, or where foreseen a **data communication system**, implemented with sufficient equipment **redundancy in case of failure** of any individual communication system equipment and **backup power supply** sources to allow the exchange of the necessary information for RP, **during at least 24 hours**, in case of total absence of external electrical energy supply.

NC E&R – High priority SGU definition

High priority SGUs

A part of the Significant Grid Users, as defined in the NC E&R, for which the specific conditions apply for disconnection and re-energization.

Keep definition of “prioritaire netverbindingen” in FGC and MB “afschakelplan”:

1. Technische hulpsystemen TSO en DSO
2. Ziekenhuizen
3. Beheerscentrales noodoproepen

Bij schaarste kunnen ministers En+Ec bijkomende netverbindingen bepalen die moeten worden hervoeed

Defense Plan and Defense Service Providers

Defense Plan (art 11-22)

DSP = legal entity with legal or contractual obligation to provide a service contributing to one or several measures of the System Defense Plan (SDP)

The SDP shall include at least the following Protection schemes and procedures:

- (i) automatic **under-frequency** control scheme in accordance with Article 15;
- (ii) automatic **over-frequency** control scheme in accordance with Article 16;
- (iii) automatic scheme against **voltage collapse** in accordance with Article 17 (optional)
- (i) **frequency deviation** management procedure in accordance with Article 18;
- (ii) **voltage deviation** management procedure in accordance with Article 19;
- (iii) **power flow management** procedure in accordance with Article 20;
- (iv) **assistance for active power** procedure in accordance with Article 21; and
- (v) **manual demand disconnection** procedure in accordance with Article 22.

Notification by TSO of measures to be implemented on DSO, SGU, DSP's installations, deadlines, maintenance

Defense Service Provider (DSP)

Definition: DSP = legal entity with legal or contractual obligation to provide a service contributing to one or several measures of the System Defense Plan (SDP)

Art 4.4. The T&C to act as DSP and as RSP shall be established either in the national legal framework or on a contractual basis.

If established on a contractual basis, each TSO shall develop a proposal for the relevant T&C, which shall define at least:

- (a) the **characteristics** (requirements, penalties, ...) of the service to be provided;
- (b) the possibility of and conditions for **aggregation**; and
- (c) for RSP, the target **geographical distribution** of power sources with BS and island operation capabilities.

To be further analysed what is understood by Defense Service Provider
Discussions with other EU TSOs are ongoing

Defense Plan

Art 15 Under-frequency control scheme

UFLS: New load shedding project

Requirement: cumulative demand to be disconnected at final mandatory level (48 Hz) = 45 % of Total Load at national level. Implementation range +/- 7% of Total Load

Adjustment of actual load shedding plan is being analysed, in coordination with DSOs and relevant stakeholders

Defense Plan

Art 16 Over-frequency control scheme

Art 16 Automatic over-frequency control scheme

1. The scheme for automatic over-frequency control of the system defence plan shall lead to an **automatic decrease of the total active power injected** in each LFC area.
2. In consultation with the other TSOs of its synchronous area, each TSO shall set out the following parameters of its scheme for automatic over-frequency control:
 - (a) the **frequency thresholds for its activation**; and (b) the **reduction ratio of injection** of active power.
3. Each TSO shall design its automatic over-frequency control scheme taking into account in its LFC area the capabilities of:
 - the **power generating modules** concerning the LFSM-O
 - the energy **storage** units, → see proposal slides Aymen 13/11/17

If the **LFSM-O does not exist or is not sufficient** to fulfil the requirements set out in points (a) and (b) of §2, each TSO shall set up in addition a **step-wise linear disconnection of generation** in its LFC area.

The TSO shall establish the maximum size of the steps for **disconnection of PGM and/or of HVDC** systems in consultation with the other TSOs of its synchronous area.

Defense Plan

Art 18 Frequency deviation management procedure

Art 20 Power flow management procedure

Frequency deviation mgt procedure (art 18)

Each TSO shall be entitled to establish an **active power set-point** that each SGU identified or DSP shall maintain.

The SGUs and DSP shall execute **without undue delay** the instructions given by the TSO directly or indirectly through DSOs and shall remain in that state until further instructions are issued.

Each TSO shall be entitled to **disconnect** (all) SGUs and DSPs, directly or indirectly through DSOs. SGUs and DSPs shall remain disconnected until further instructions are issued.

Prior to the activation of the automatic LFDD scheme set out in Article 15 each TSO shall, **activate demand response** from the relevant DSPs and:

- (a) switch **energy storage** units acting as load **to generation** mode at an active power set-point established by the TSO in the system defence plan;
- (b) Or, when the energy storage unit is not capable of switching fast enough to stabilise frequency, **manually disconnect the energy storage** unit.

Defense Plan

Art 19 Voltage deviation management procedure

Voltage deviation mgt procedure (art 19)

1. The procedure for the management of voltage deviations of the system defence plan shall contain a set of measures to **manage voltage deviations outside the operational security limits** set out in Article 25 of Regulation (EU) 2017/1485.
2. Each TSO shall be entitled to **establish a reactive power range or voltage range** and **instruct the DSOs and SGUs identified** for this measure pursuant to Article 11(4) to maintain it, in accordance with Articles 28 and 29 of Regulation (EU) 2017/1485.

Defense Plan

Art 21 Assistance for active power procedure

Assistance for active power procedure (art 21)

In case of absence of control area adequacy in the DA or ID timeframe:

a TSO shall be entitled to request assistance for active power from:

- (a) any BSP, which, upon the TSO request, shall change its availability status to make available all its active power, provided it was not already activated through the balancing market, and conforming to its technical constraints;
- (b) any SGU connected in its LFC area, which does not already provide a balancing service to the TSO, and which, upon the TSO request, shall make available all its active power, conforming to its technical constraints; and
- (c) other TSOs that are in the normal or alert state.

A TSO may activate the assistance for active power from a BSP or a SGU, under points (a) and (b) of paragraph 1, only if it has activated all balancing energy bids available, taking into account the available cross zonal capacity at the moment of absence of adequacy of the control area.

Defense Plan

Art 22 Manual demand disconnection procedure

Manual demand disconnection procedure (art 22)

1. In addition to the measures set out in Art 18 to 21, each TSO may establish an amount of netted demand to be manually disconnected, directly by the TSO or indirectly through DSOs, when necessary to **prevent the propagation or worsening of an emergency state**.
2. TSO shall activate the manual disconnection of the netted demand referred to in §1 to:
 - (a) resolve overloads or under voltage situations;
 - (b) or resolve situations in which assistance for active power pursuant to Article 21 has been requested but is **not sufficient to maintain adequacy** in day-ahead and intraday timeframes in its control area, leading to a risk of frequency deterioration in the synchronous area.
3. The TSO shall notify DSOs of the amount of netted demand established pursuant to paragraph 1 to be disconnected on their distribution systems. Each DSO shall disconnect the notified amount of netted demand, without undue delay.



Behouden van procedure bij schaarste en plotse fenomenen zoals vermeld in MB afschakelplan

Restoration Plan

Art 23.4(e) Essential substations for restoration plan procedures

Restoration plan (art 23)

In particular, the restoration plan shall include the following elements:

- a list of the measures to be implemented by the TSO and DSOs on its installations
- a list of the SGUs and High Priority SGUs and T&C for re-energization
- a list of substations which are essential for its restoration plan procedures
- the number of power sources in the TSO's control area necessary to re-energise its system with bottom-up re- energisation strategy having black start capability, quick re-synchronisation capability (through houseload operation) and island operation capability;

Study ongoing to analyse the required amount and sourcing method for restoration services

Essential substations for restoration plan procedures art 23.4

Voltage level (kV)						Relevant for			Essential substations for restoration plan procedures	Communication		Auxilliary power
400	220	150	70	36	< 36 kV	TSO	DSO	CDSO		Voice	Data	
x	x	x				x			All 380 kV, 220 kV and 150 kV substations owned by TSO (not by demand facilities, CDSOs, ...)	x	x	x
x	x	x	x	x	x	x	x		Substations supplying important nodes of Elia's datacom network		x	x
x	x	x	x	x	x	x	x	x	Substations to which are connected PGMs of type C or D	x	x	x
x	x	x	x	x	x	x	x		Substations to High Priority SGUs in the RP or with legal obligation to re-energize with priority		x	x
x	x	x	x	x	x	x	x	x	Substations to restoration service providers (subst & control room)	x	x	x

Art 42.5. Substations identified as essential for the restoration plan procedures pursuant to Article 23(4) shall be operational in case of loss of primary power supply for **at least 24 hours**.

Also relevant for DSOs

Info exchange and Communication during emergency, blackout & restoration, tools & facilities

Art 40 Information exchange when in Emergency, Blackout and Restoration states

Involved stakeholders:

DSOs, SGUs identified in art 23(4), RSPs, DSPs, NEMOs, other TSOs

Need for common understanding on the following items:

- Analysis of exact information to be exchanged
- Analysis of appropriate tools to be used to transmit info (EMS, other means, ...)
- Roadmap to comply with NC E&R art 40

Communication systems Art 41

Each **TSO**, **DSO**, **SGU** identified pursuant to Article 23(4) NC ER, and **RSP** shall have a **voice communication system**, or where foreseen a **data communication system**, implemented with sufficient equipment **redundancy in case of failure** of any individual communication system equipment and **backup power supply** sources to allow the exchange of the necessary information for RP, **during at least 24 hours**, in case of total absence of external electrical energy supply.

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Tools and facilities (art 42)

Each DSO and SGU identified pursuant to Article 23(4) as well as restoration service provider shall make available critical tools and facilities referred to in Article 24 of Regulation (EU) 2017/1485 and used in the restoration plan for at least 24 hours in case of loss of primary power supply, as defined by the TSO.

Substations identified as essential for the restoration plan procedures pursuant to Article 23(4) shall be operational in case of loss of primary power supply for at least 24 hours.

Q&A



Many thanks for your attention!

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