

EU Netcode Emergency & Restoration

Users group WGSO

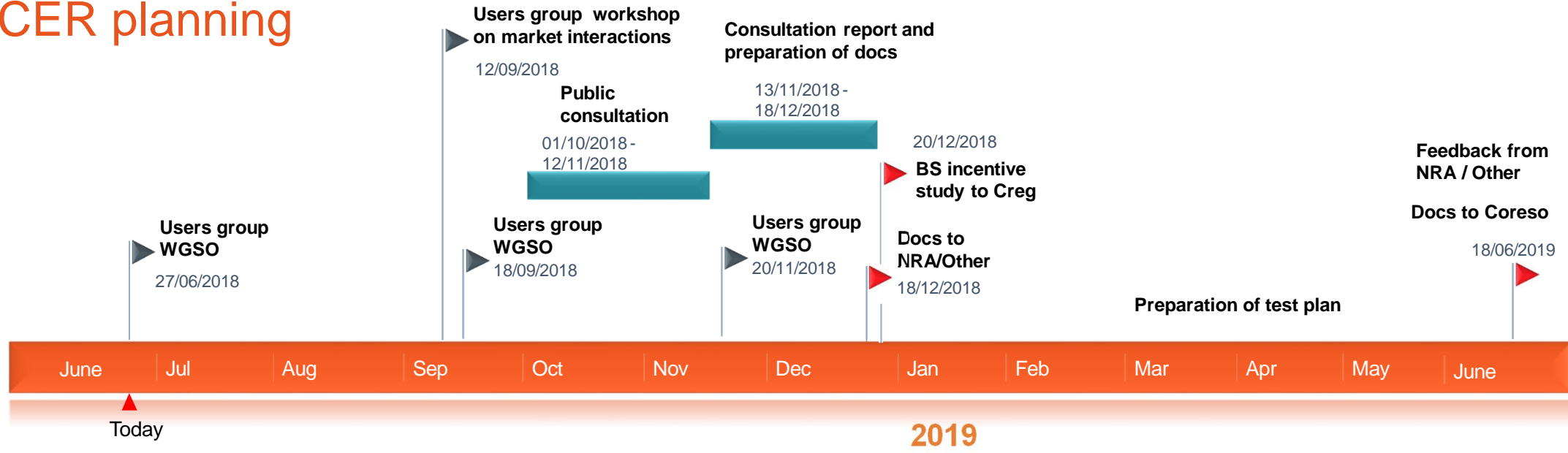
27/06/2018

Agenda

1. Planning
2. Feedback previous WGSO meeting
3. Identified Significant Grid Users versus Service Providers
4. Design of System Defense Plan
5. Terms and Conditions for Defense Service Providers
6. Design of Restoration Plan
7. Terms and Conditions for Restoration Service Providers
8. Technical requirements for voice communication systems
9. Status on CREG incentive study for Black start and AS redesign
10. Market Interactions

1. Planning

NCER planning



First conceptual ideas for:

- Terms & Conditions for Defense and Restoration service providers
- Rules for suspension and restoration of Market activities
- Rules for suspension/imbalance settlement

- Consultation Defense Plan Design
- Consultation Restoration Plan design

- List of SGUs identified
- List of HP SGUs

Consultation on BS incentive study Creg

First draft for:

- Terms & Conditions for Defense and Restoration service providers
- Rules for suspension and restoration of Market activities
- Rules for suspension/imbalance settlement

- Consultation on Defense Plan Design
- Consultation on Restoration Plan design

Consultation on BS incentive study Creg

Design proposal for Defense and Restoration plan


Consultation on BS incentive study Creg

18/09/2019
Coreso technical report on the consistency of the measures

2. Feedback previous WGSO meeting

Feedback WGSO 20/04

- Are providers of Demand Response connected to the distribution grid categorized as SGU?

 They are **SGU** according to NCER art 2.2(e): (e) providers of redispatching of power generating modules or demand facilities by means of aggregation and providers of active power reserve in accordance with Title 8 of Regulation (EU) 2017/1485; and

As there are no mandatory obligations for DP or RP in national legislation or in EU connection codes for providers of Demand Response in distribution grids, they are **not identified** in the list of art 11.4c or 23.4c.

However, they can offer flexibility on voluntary basis through existing flexibility platforms by themselves or via aggregators.

- Are High Priority significant grid users a subset of SGUs ?

 See topic 3


- What is the role of aggregators in the different rules for BSPs, BRPs, ... ?



 See topic 4


- What is to be understood by "make active power available for customers"? What means "activate everything" for aggregators? Is it the aggregated volume of all clients that can be available on this moment?

 See topic 4

Feedback WGSO 20/04

- Would the signal related to the assistance from active power procedure be sent directly to the power plants ?
 To be further investigated
- What would be the applicable tariff for DSPs? Is there a foreseen remuneration for BSPs in Emergency as they are automatically considered to be DSPs?

 See topics 4 and 5
- How will Elia manage islanding operation?
 See topic 6
- What is the status regarding to communication during a blackout?

 See topic 8

3. NC E&R –Significant Grid User and Service Provider approach

High priority significant grid users for defense & restoration plan

SGUs Identified and Service providers

SGU Identified

- We have reviewed our interpretation of SGUs identified based on Entsoe [supporting documents](#).
- Some measures of the Plans are based on capabilities that are **mandatory** for the Grid Users (“minimum operational requirements”) according to requirements in:
 - NC RFG, NC DC and NC HVDC (for new facilities) or
 - national legislation (for **existing** facilities)
- These capabilities can thus be directly used by the TSO in its Plans. For instance: Type C and D PGM shall be able to follow an Active Power set-point instructed by the TSO.
- In the design of its Plans, the TSO is requested to identify these capacities, and to **identify the concerned grid users**.

Service providers

- Some measures of the Plans are based on capabilities that are foreseen to be provided on a **voluntary** basis according to the connection codes. For instance: A Power Generation Module providing Black start capability voluntarily.
- To use these capabilities, the TSO is requested to procure these services via “**Service Provider**” mechanism described in the code. This mechanism allows to define the obligations of each party, and conditions for the service delivering.

Adaptations to be made in national legislation

Art 279: § 3. Het beschermingsplan bepaalt onder meer de maatregelen die de transmissienetbeheerder neemt en alle maatregelen die op het eerste verzoek van de netbeheerder moeten worden genomen door elke partij die valt onder de toepassing van de Europese netcode E&R, conform artikel 2 van de Europese netcode E&R.

Te vervangen door: Het beschermingsplan bepaalt onder meer de maatregelen die de transmissienetbeheerder neemt en stelt onder meer dat op het eerste verzoek van de netbeheerder, alle beschikbare productie-eenheden (van type C en D, groter dan 25 MW) op elk moment door de toegangsverantwoordelijke moeten geactiveerd kunnen worden teneinde:

1° de levering van reactief vermogen te wijzigen, volgens een setpunt bepaald door de netbeheerder;

2° de levering van actief vermogen te wijzigen, volgens een setpunt bepaald door de netbeheerder.

Art 281: § 3. Het herstelplan bepaalt onder meer de maatregelen die de transmissienetbeheerder heeft genomen en de maatregelen die moeten worden genomen op het eerste verzoek van de transmissienetbeheerder, door de betrokken partijen zoals bepaald in artikel 25§3 van de Europese netcode E&R.

Te vervangen door: Het herstelplan bepaalt onder meer de maatregelen die de transmissienetbeheerder neemt en stelt onder meer dat op het eerste verzoek van de netbeheerder, alle beschikbare productie-eenheden (van type C en D, , groter dan 25 MW) op elk moment door de toegangsverantwoordelijke moeten geactiveerd kunnen worden teneinde :

1° een toevoer van reactief vermogen te leveren, volgens een setpunt bepaald door de netbeheerder;

2° een toevoer van actief vermogen te leveren, volgens een setpunt bepaald door de netbeheerder.

SGU identified for system defense plan art 11.4(c)

Type of user	Capability used in System Defense Plan	Reference to legal obligation	Status
Existing and new PGM type C and D with $P_{\text{installed}} > 25 \text{ MW}$	Follow an active or reactive power setpoint instruction from TSO in defense plan	Mandatory according to FTR art 279.3	SGU identified

Existing and new transmission connected demand facilities or CDS, should activate upon TSO's request their available reserves (even if not contracted or offered as balancing energy bid)

This is a mandatory requirement in the NCER art 21 (not in the connection codes or in federal grid code → no SGU identified in SDP)

SGUs identified for restoration plan art 23.4(c)

Type of user	Capability used in Restoration Plan	Reference to legal obligation	Status
Existing and new PGM type C and D with $P_{\text{installed}} > 25$ MW	Follow an active power setpoint instruction from TSO in restoration plan	Mandatory according to FTR art 281.3	SGU identified
New PGM type C and D with $P_{\text{installed}} > 25$ MW	Houseload operation (resynchronisation + re-energization)	Mandatory according to NC RfG art 15.5(c)	SGU identified
Existing and new transmission connected demand facilities	Execution of operational procedures. (clearing, switching, block loading,...)	Mandatory according to FTR art 281.2	SGU identified
Existing and new transmission connected CDS	Execution of operational procedures. (clearing, switching, block loading, ...)	Mandatory according to FTR art 281.2	SGU identified
Existing and new HVDC	Execution of operational procedures. (clearing, switching, block loading, ...)	Mandatory according to FTR art 281.2	SGU identified
Existing and new PGM type C and D with $P_{\text{installed}} > 25$ MW	Black start	Not mandatory in FTR or NC	Restoration service provider on contractual basis
Existing PGM type C and D with $P_{\text{installed}} > 25$ MW	Houseload operation	Not mandatory in FTR or NC	Restoration service provider on ad-hoc basis

High priority significant grid users in System Defense Plan

The high priority significant grid users, as defined in the NC E&R, for which the specific conditions apply for disconnection and re-energization, are according to Elia not necessarily a sub category of Significant Grid Users pursuant NCER art 2.

The “prioritaire netverbindingen” referred to in FTR Art 279§7 will be classified as HP sgu

1° de technische hulpsystemen nodig voor de vitale werking van de netten van de transmissienetbeheerder en de distributienetbeheerders;

2° de ziekenhuizen bedoeld in artikel 2 van de gecoördineerde wet van 10 juli 2008 op de ziekenhuizen en andere verzorginrichtingen;

3° de beheerscentrales van noodoproepen (100, 101 en 112) op basis van artikel 2, 61°, van de wet van 13 juni 2005 betreffende de elektronische communicatie en de provinciale crisiscentra bedoeld door de ministeriële omzendbrief NPU-1 van 26 oktober 2006 betreffende de nood- en interventieplannen.

The minister of Energy actualizes the nominative list of priority grid-connections and yearly notified to TSO and DSOs before 1 Sept

High priority significant grid users in Restoration Plan

EntsoE support doc: “The restoration plan need to consider civil security and nuclear safety issues identified typically by the responsible national authorities when defining “high priority Grid Users” (economic efficiency versus security obligations)”

The “prioritaire netverbindingen” referred to in FTR Art 279§7 will be classified as high priority sgu

- Auxiliaries of nuclear power plants
- Important Fluxys sites

1° de technische hulpsystemen nodig voor de vitale werking van de netten van de transmissienetbeheerder en de distributienetbeheerders;

2° de ziekenhuizen bedoeld in artikel 2 van de gecoördineerde wet van 10 juli 2008 op de ziekenhuizen en andere verzorginrichtingen;

3° de beheerscentrales van noodoproepen (100, 101 en 112) op basis van artikel 2, 61°, van de wet van 13 juni 2005 betreffende de elektronische communicatie en de provinciale crisiscentra bedoeld door de ministeriële omzendbrief NPU-1 van 26 oktober 2006 betreffende de nood- en interventieplannen.

The minsiter of Energy actualizes the nominative list of priority grid-connections and yearly notified to TSO and DSOs before 1 Sept

Term & conditions for re-energization are to be drafted and will include the different approach for the different priority categories, as currently included in the restoration plan.

4. Design of System Defense Plan

System Defense Plan (NCER art 11)

3 automatic control schemes and 5 manual operation procedures

(a) system protection schemes including at least:

- (i) automatic under-frequency control scheme in accordance with Article 15;
- (ii) automatic over-frequency control scheme in accordance with Article 16; and
- (iii) automatic scheme against voltage collapse in accordance with Article 17.



Working group in place



*Questionnaires sent
Answers expected end of June 2018*



Elia is already compliant (blocking on-load tap changers on transformers, no automatic under-voltage load shedding, no special protection schemes)

(b) system defence plan procedures, including at least:

- (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.

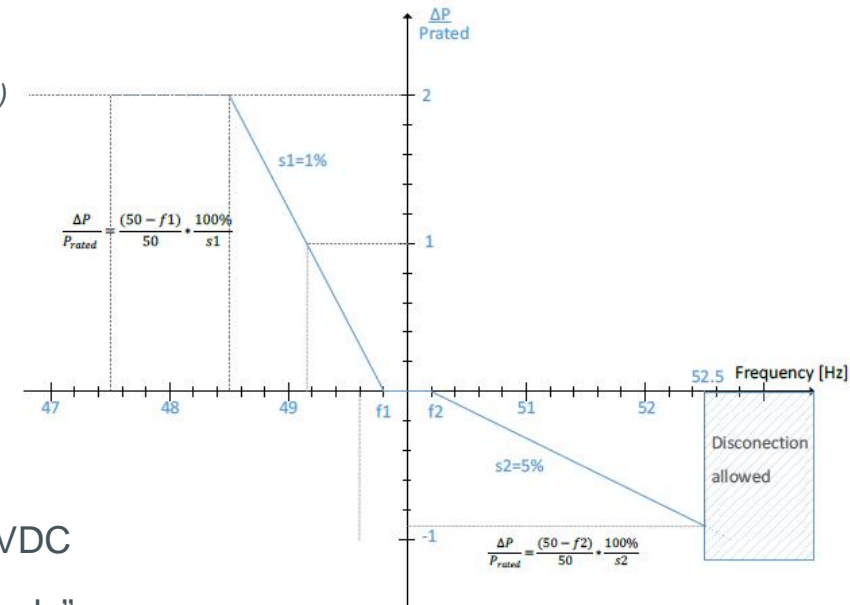


Define for this procedures:

- Involved parties
- Activation criteria
- Measures to be activated

Frequency deviation management procedure

- Frequency deviation management procedure (art 18) (*probably in case of system split*)
 - Objective: support frequency before the nomination of a “frequency leader”
 - Activation in case of frequency deviations > 200 mHz → Emergency state
- Automatic actions that will take place
 - All contracted primary reserves have been fully activated automatically.
 - Automatic activation of Limited Frequency Sensitive Mode;
 - Automatic reaction or manual adjustment of energy storage systems and HVDC
 - Load Frequency Control (*Automatic activation of secondary reserves*) will be in “frozen mode”
- Measures that Elia can activate before a “Frequency leader” will be appointed



- In case of persisting low frequencies: step-by-step activation of normal and **Emergency reserves** (see slide 22)
- Smooth active power reduction by lowering voltages by 5% in distribution systems
- As last resort measure in case of slow frequency collapse (*between 49,8 and 49 Hz*): manual load shedding (art 22)
- Automatic load shedding in case of fast frequency collapse (*below 49 Hz*)

Voltage deviation management procedure

- The procedure applies to problems which develop slowly (minutes) and operators have time to activate appropriate measures.
 - Objective: bring voltages back within normal operational limits
 - Activation criteria: if voltages are outside operational limits
- Modifications to existing defense plan
 - Existing “Action Mvar” i.e. “All production units to max Mvar” will be removed from the existing defense plan.
 - In case of voltages out of operational limits in a region, launch “Emergency Elia” signal + detailed analysis of the situation.
- Possible actions to be activated by Elia: (case by case and controlled by operator)
 - Use of reactive power devices (tap-changers, reactors, capacitor banks, SVC, etc.) in coordination with RCCs and DSOs;
 - Request (or control if available) additional voltage/reactive support from power plants;
 - Requesting maximum or minimum values of Reactive Power to specific PGMs of type C and D
 - Requesting additional Reactive Power support from Nemolink or Alegro
 - Help from Tennet or Rte
 - Manual load shedding (art 22)

Power flow management procedure


- Power flow management procedure (art 20)
 - Objective: bring power flows back within operational security limits
 - Activation criteria: if power flows are outside operational limits (overloaded system elements, excessive loop flows, ...)
- Possible actions to be activated by Elia to relief the overload before activation of the defense plan:
 - Countertrade and redispatch as described in CACM
 - Activate specifically located reserves to relief the overloads
 - Cross-Zonal Allocated Capacity curtailment.
- Possible actions to be activated by Elia to relief the overload as part of the defense plan:
 - Elia may start/stop/change setpoints/ disconnect SGUs directly or indirectly through DSOs → This is a manual procedure, case by case
 - Manual load shedding in the zones required to relief the overload (art 22)
- Manual or automatic opening of a cross border interconnector shall be among the last measures to be considered.
 - Always coordinated with other TSOs, unless an immediate risk for personal safety or equipment damage exists.

Assistance for active power procedure (Activation of “emergency reserves”)

- To compensate ACE(*) or in case Elia is requested by other TSO in Emergency, Elia activates balancing energy bids (free bids + contractual reserves) + inter-TSO contracts
- If excessive ACE persist, Elia sends a “Balancing Warning” (via RSS feed) to BSPs to send more energy bids.
- If excessive ACE persists and becomes critical for system security, the assistance for active power procedure is activated → **Go into Emergency State**. This includes:
 - Activation of non-contractual inter-TSO assistance *(as available)*
 - Activation of the assistance from BSP and SGU → called here “**emergency reserves**” (art 21.2)
- It concerns reserves that BSP or SGU have physically at their disposal, but were not offered to the market as balancing energy bids (non-CIPU units, demand side reduction, ...)
- A specific signal for the activation of “emergency reserves” is to be developed ≠ balancing warning
- Adjustment in T&C BSP and in SGU connection agreement is required concerning activation of “emergency reserves”
- Remaining actions if not sufficient:
 - Smooth load reduction U – 5%
 - Manual load shedding plan activation (art 22)

(*) ACE = Area Control Error

Adjustments in current Reddingscode / Code de sauvegarde

- Generic command “**Action MW**” which contains instruction to increase active power on all production units to 95% of Pmax, will be replaced by market based activation of balancing energy + “emergency reserves”
 - Action “**Starting Turbojets**” which contains instruction to start available turbo jets (small open cycle gasturbines), will be replaced by market based activation of balancing energy + “emergency reserves”
 - The actual defense plan contains a set of **automatic** actions activated at **f < 49,7 Hz**
 - U-5% → direct signal to Elia transformers
 - Stop Coo in pump mode
 - Start turbojets
- Scada-to-Scada signal to ARP
- 
- Fast reaction:
 - U-5% → direct signal to Elia transformers
 - Stop Coo in pump mode
 - Automatic LFSM-U activation on all production units (already if f < 49,8 Hz)
 - Slower reaction:
 - Send signal to BSP and SGU to activate all available reserves

Information to stakeholders about the system state

- Name “Alarm Elia” changed in “**Emergency Elia**” → to reflect the corresponding system state
 - Signal Scada to Scada sent only in the Emergency State **AND** when actions from the System Defense Plan are required
 - It concerns a “Be prepared” signal to grid users to follow up Elia’s instructions without undue delay
- Addition of a signal “**Blackout Elia**”
 - Signal must “arrive” during blackout.
 - Sent simultaneously to Nemo’s, Coreso, Tennet, Rte, Amprion, Ngrid, BRPs, BSPs, DSOs and regulatory authorities
 - Communicate best estimate time to restore the transmission system (NCER art 38)
 - Further communications via CCC, via blackout proof communication system (slide 40)
- Addition of a signal “**Market suspension – Market restoration**”
 - In blackout, SGUs, DSOs, BSPs, RSPs operate their installations following TSO instructions → Central Dispatch
- Addition of a signal “**Restoration Elia**” → Restoration not only after blackout, but also after system split

We need a kind of (blackout proof) National warning system (sms, rss feed, website, e-mail, national media, linked to EMS) to inform stakeholders, compliant with NCER art 38 & 40 → **stakeholder preferences?**

5. Terms and Conditions for Defense Service Providers

Defense Service Provider (DSP)

- DSP = legal entity with legal or contractual obligation to provide a service contributing to one or several measures of the System Defense Plan (SDP)
- Some measures of the System Defense Plan are based on capabilities that are foreseen to be provided on a **voluntary** base, rather than based on mandatory legal requirements in European Grid Codes or National Legislation.
- To use these capabilities, the TSO is requested to procure these services via “**Service Provider**” mechanism described in the code. This mechanism allows to define the obligations of each party, and conditions for the service delivering.
- In Belgium, transmission or distribution connected entities who want to offer demand side management or provide flexibility can do this via recently developed platforms. E.g. Bidladder.
- BSP and SGU who have remaining reserves available should activate this upon request of TSO (NCER art 21)
- **Conclusion: we do not see the need to introduce “Defense Service Providers” because demand side response can already be provided on a voluntary basis through the existing platforms for flexibility, which continue operation in emergency state.** (see slide 16)

6. Design of Restoration Plan

Actual restoration procedures

Fase 1: Diagnosis of the situation

- Identification of the root cause of the blackout
- Overview of the status of the grid
- Determination of the restoration scenario
- Blackout proof communication to stakeholders and government

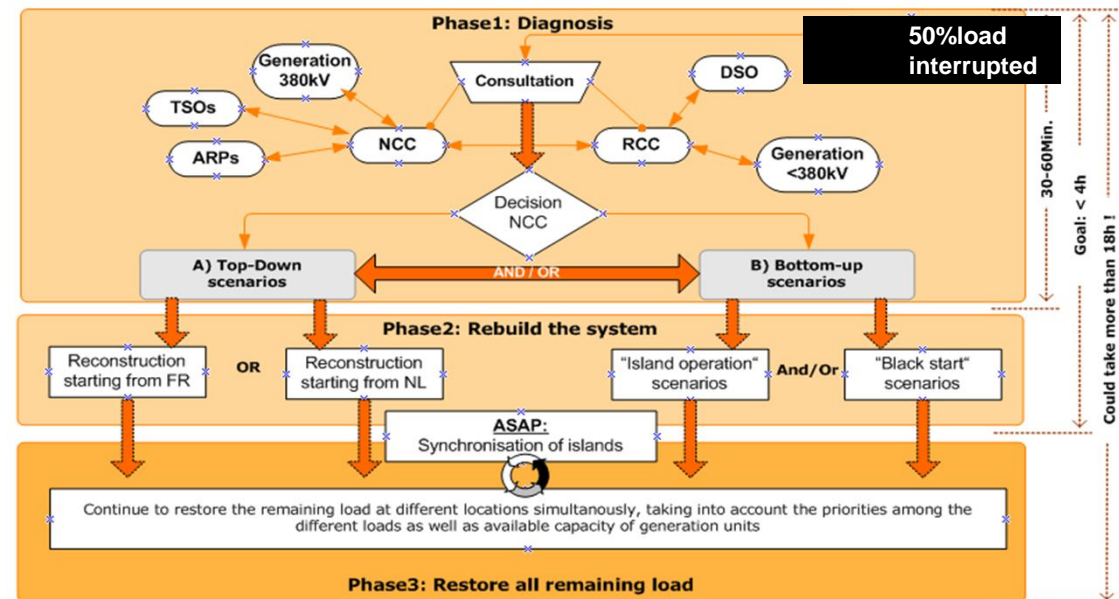
Fase 2: Building islands (bottom up)

- Parallel application of black start procedures or re-energization from houseloaded units.
- Voltage and frequency management
- Create a backbone of the system
- Connection of block load in distribution networks
- Build network path to critical load
- Criteria for decentralized production (wind, PV, CHP, ...)

Fase 3: Resynchronisation

- Synchronisation of individual islands to backbone of the system
- Synchronisation with neighbour countries
- Re-energization of remaining load

Strategy of the restoration code



Principles of actual restoration plan

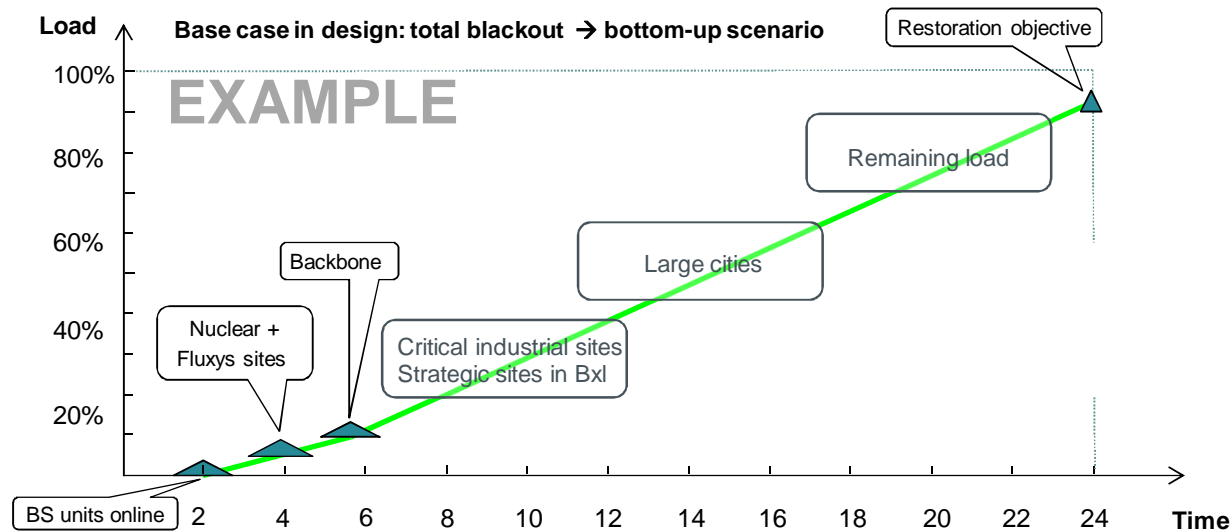
The existing restoration plan is designed based on the following 4 assumptions during the restoration process

- Telephone communication (internal + external) is possible
- Remote control of switching devices is possible
- Network assets are intact
- Sufficient amount of well-trained staff is available



Ongoing blackout mitigation project 2017-2028:

- Roll out of diesel generators in 456 substations
- Upgrade of battery autonomy in rest of substations
- Installation of private satellite network as redundant system for voice and data communication



NCER: The Restoration Plan shall include ...

(*)Not necessarily only after blackout, but also after system split

In particular, the **restoration plan shall include:**

- (a) a list of the measures to be implemented by the TSO and DSOs on its installations;
- (b) a **list of the SGUs identified** and a list of the measures to be implemented by those SGUs; (see slide 9)
- (c) the list of **high priority SGUs** and the terms and conditions for their disconnection and re-energisation;
- (d) a list of **substations** which are **essential for its restoration plan** procedures;
- (e) 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;
- (g) the implementation deadlines for each listed measure.

Re-energization procedure

- Measures to apply Top Down (from neighbour TSO) and Bottom up, using black start and houseloaded plants.
- Measures to control frequency and voltage.
- Measures to build and re-synchronize islands

Frequency management procedure(*)

- Load Frequency Control settings
- **Appointment of frequency leader**
- Establishment of a target frequency (e.g. 51 Hz)
- **F management in case of frequency deviation or area split**
- Determination of max amount of load to be connected

Resynchronization

- **Appointment of resynchronization leader**
- Measures allowing a TSO to apply a resynchronization strategy
- Max phase angle, frequency and voltage differences for connecting lines

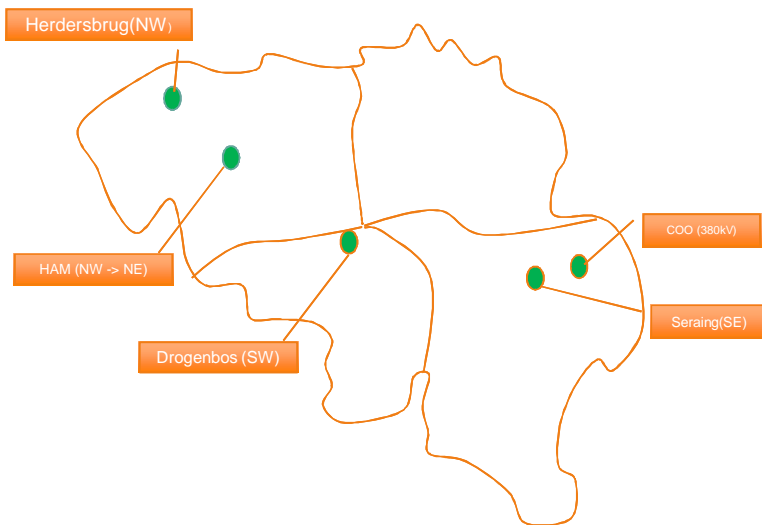


Restructuring existing restoration plan

NCER requirements for restoration plan

- List of substations essential for the restoration plan procedures
 - They should be operational at least 24h during a blackout
 - All 380 kV, 220 kV and 150 kV substations
 - Two waves approach 2018-2022 and 2022-2027 according to planned roll-out of diesels in substations

- Number of power sources having black start, islanding or houseload operation capabilities



- Number of power sources having black start capabilities:
 - 5 units contracted until end of 2020 (subject to Creg approval of actual tender)
- Number of power sources having islanding or houseload capabilities:
 - Questionnaire sent out to producers of type C and D
 - Distinction between houseload capability with
 - Only resynchronization capability
 - Re-energization and resynchronisation capability

NEW

Frequency management procedure of the Restoration Plan (art 28-31)

- Objectives:
 - Coordinate the restoration of the System Frequency of a Synchronous Area back to the Nominal System Frequency
 - Determination of the amount of load and generation to be reconnected, taking into account the available Active Power Reserves within the Synchronised Region in order to avoid major Frequency Deviations
- The frequency management procedure contains the following set of measures
 - Definition of target Frequency in case of Bottom-up Re-energisation Strategy (e.g. 51 Hz)
 - Frequency management after Frequency Deviation (without system split)
 - Appointment of frequency leader for whole synchronous area, who will manage frequency
 - All other TSOs suspend automatic activation of reserves and follow instructions of F-leader
 - Frequency management after Synchronous Area split.
 - Appointment of frequency leader in each synchronous region
 - All other TSOs suspend automatic activation of reserves and follow instructions of F-leader



Lack of coordination + high flows

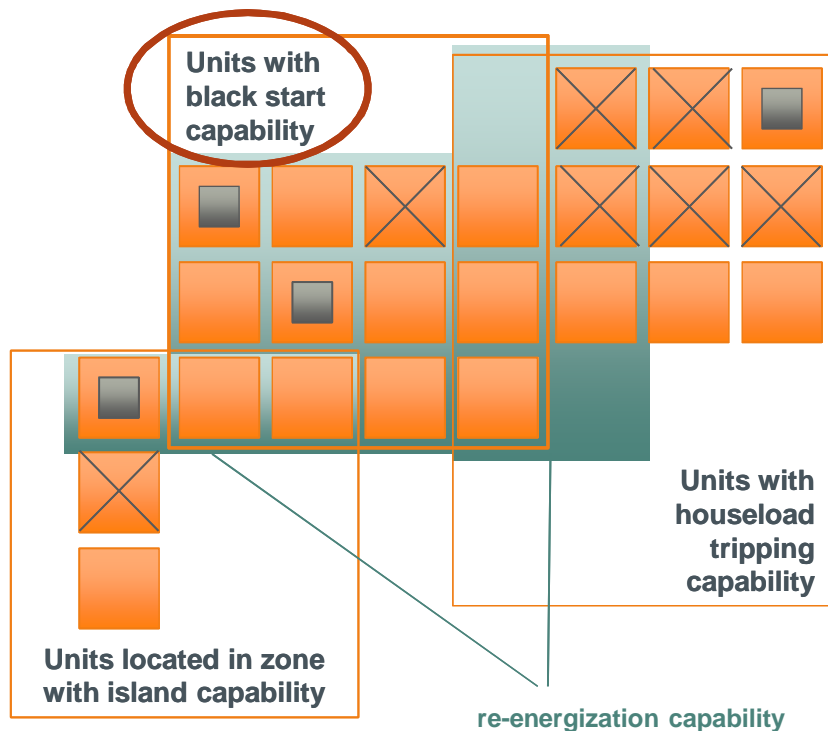
NEW

Resynchronization procedure (art 32-34)

- Stepwise process, in which the resynchronisation takes place between pairs of synchronised Regions until the whole Synchronous Area has been resynchronised.
- Appointment of a resynchronisation leader for pairs of synchronous regions, who must be able to
 - Control a substation equipped with a parallel switching device on the border between the two regions
 - Measure the frequencies and voltages in both regions.
 - Control the voltage at the resynchronisation point.
- The Resynchronisation Leader shall define the allowable limits for the frequency difference between the two Synchronised Regions, for the active and reactive power exchange, and the settings for the automatic activation of reserves within the Synchronised Regions

7. Terms and Conditions for Restoration Service Providers

Available and reliable services at the moment of a Black Out



Re-synchronization versus re-energization

- The 1st phase in the restoration plan focuses on re-energization, i.e. putting (part of) the at that moment dead grid back under voltage:

'Restoration services' limited to re-energization capabilities

- The next phase in the restoration plan also makes use of productions & islands to re-synchronize with the grid in order to gradually restore the load in the system.

At the moment of a black out: assess availability of re-energization capabilities

- - Units with re-energization capabilities may be unavailable due to planned or unplanned outage
- ✗ - Units with household capabilities may not have been in operation at the time of the blackout and therefore by default they are unavailable for re-energization (if no black start capabilities)
- ✗ - Units with household capabilities may not have succeeded in islanding/household tripping and are thereby unavailable for re-energization (if no black start capabilities)
- ✗ - Units with black start capabilities may fail in their black start.

⇒ Contracting Restoration Services to focus on re-energization capabilities with highest probability of availability when needed:
(see also Benchmark results)

Relatively controllable

Depends on market opportunity

Difficult to control



Contracted Restoration Services
=
Black start / Brown start services

○ = contracted ancillary service ■ = unavailable (maintenance)

✗ = unable to execute capability at Black Out

The role of Restoration Service Provider (RSP)

[art. 3] 'restoration service provider' means a legal entity with a legal or contractual obligation to provide a service contributing to one or several measures of the restoration plan;

⇒ Black start capabilities:

- Either voluntary provision: contractual obligation
- Technical capability may be imposed by the Member State (case-by-case) (RfG art. 15.5.a) implying also availability for the service ('legal obligation')

⇒ ELIA implementation for NC E&R compliance :

- Technical requirements for re-energization will be described in T&C RSP, valid for entities regardless of whether the concerned technical capability is present due to a legal or a contractual obligation.



Restoration services to be offered and provided by a 'restoration service provider'.
Not all assets have by default a restoration service provider: ad hoc restoration services offered/delivered by the Grid User or by a third party in agreement with the Grid User.



[art. 2.4] Type A and type B power generating modules referred to in paragraph 3 [i.e., non SGU], demand facilities and closed distribution systems providing demand response may fulfil the requirements of this Regulation either directly or indirectly through a third party, under the terms and conditions set in accordance with Article 4(4) [i.e i.e., "The terms and conditions to act as defence service provider and as restoration service provider ...].

⇒ RSP role:

- No requirements for RSP in NC E&R
- NC E&R allows 3rd party delegation: according to interpretation of 'NC E&R supporting document', delegation is mentioned to keep options open for and facilitate future participation of smaller non-SGU to defence and restoration service, but not with the intent to block the delegation for other parties.

⇒ ELIA implementation for NC E&R compliance :

- During execution of the restoration plan: coordination of ELIA with the parties having control over the unit when in blackout/restoration state.
- To be determined by the Grid User who takes on the role of RSP: Grid User or 3rd party.
- Also included as such in the proposal for the new Federal Grid Code (art. 253 §3)

Interdependencies between RSP and other roles

⇒ During execution of the Restoration Plan, most responsibilities are suspended and ELIA centrally dispatches production and load to restore the system.

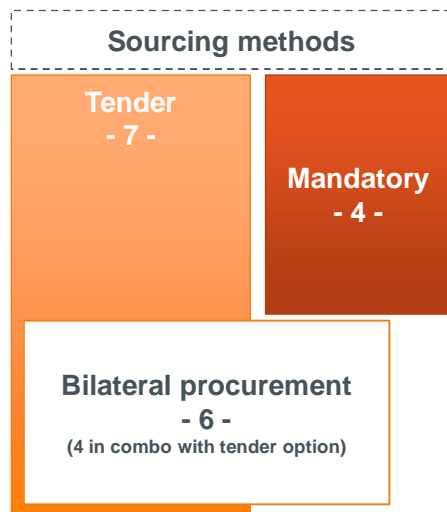
This is described in:

- Rules for market suspension and restoration
- Restoration Plan

There are no critical interdependencies or conflicts between roles that require a definition by ELIA of specific criteria for the delegation of the RSP role to a 3rd party.

BRP	No BRP balancing responsibility when restoration plan is activated. <i>During test: unit not available for self/reactive balancing. Impact on BRP perimeter is limited: no correction by ELIA.</i>
BSP	In Restoration State (during activation of the restoration plan) there are no balancing activations, but flexibility may be used for system & load restoration (measures of the restoration plan). <i>During test: unit not available for balancing</i>
Outage Planning Agent	Availability status determines availability of the restoration service. <i>During test: no impact. Status remains available during tests organized by ELIA. Prequalification tests organized by the provider can be indicated with the status "Testing".</i>
Scheduling Agent	No role in DA/ID scheduling as DA/ID markets are suspended during execution of the restoration plan ('central dispatch'). No role for the Scheduling Agent while the RSP is executing a re-energization procedure. <i>During test: no schedule or redispatching bids</i>
Voltage Service Provider	'Central dispatch' during execution of the re-energization procedure. <i>During test: unit not available for voltage services.</i>
DSP	DSP active during execution of the Defence Plan, not during execution of the Restoration Plan. <i>No tests when defence plan is activated. DSP not active during tests.</i>

Conclusions Benchmark Study



- Different sourcing methods used
- Many long-term contracts:

10 years (GB, NL), 15 year (NL),
lifetime duration (FR, GE)

- Restoration Plan to include a dimensioning of the needs for restoration services.
- T&C RSP to include target geographic distribution of the restoration services.

Lifetime contracts are appealing given more certainty on reservation of the service, for both ELIA and providers

but lifetime contracts do not stimulate potential new providers.



Sourcing method should allow:

- to make a selection among potential providers
- long contract durations without blocking new entrants

To improve the tendering procedure

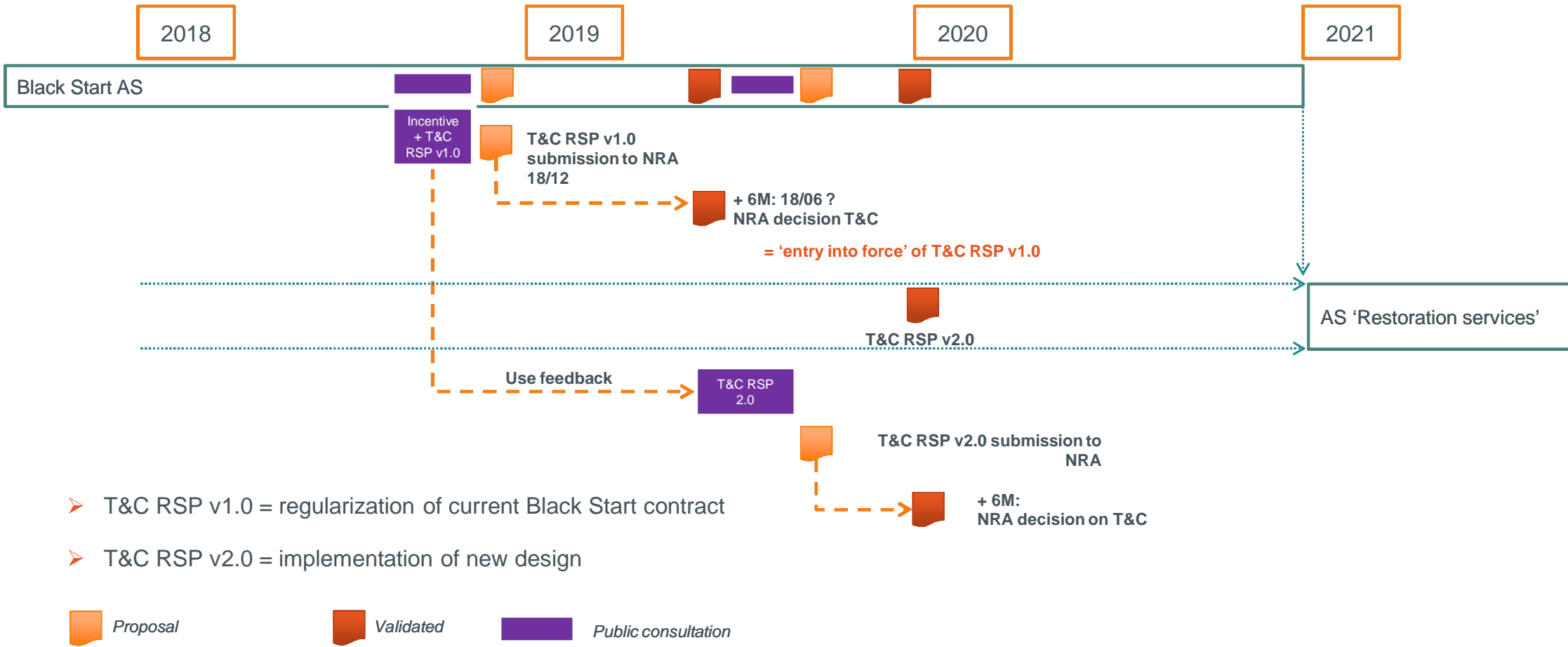
AS IS evaluation & possible improvements

- Default contract period of 5 years ; 1-2 years in case of Royal Decree.
- Last years contract periods were rather short in practice.
- Lack of new providers; the service remained provided on the same units.
- Little competition due to
 - technical requirements
 - tendering frequency, which currently does not allow sufficient time for preparation of implementation or for writing off investments

Possible improvements to the tender procedure can solve current lack of :

- Contract period of 5 years:
 - no fundamental reason for change?
- Time between call for candidates – contract award – start of service delivery?
 - Minimum 1 year – maximum 3 years?
- Allow offers and negotiations for start/end dates of the contract period different than the default dates if combination of different services allows ELIA to cover the contract period in a technically satisfying and cost efficient way.

Timing T&C Restoration Service Provider



- T&C RSP v1.0 = regularization of current Black Start contract
- T&C RSP v2.0 = implementation of new design

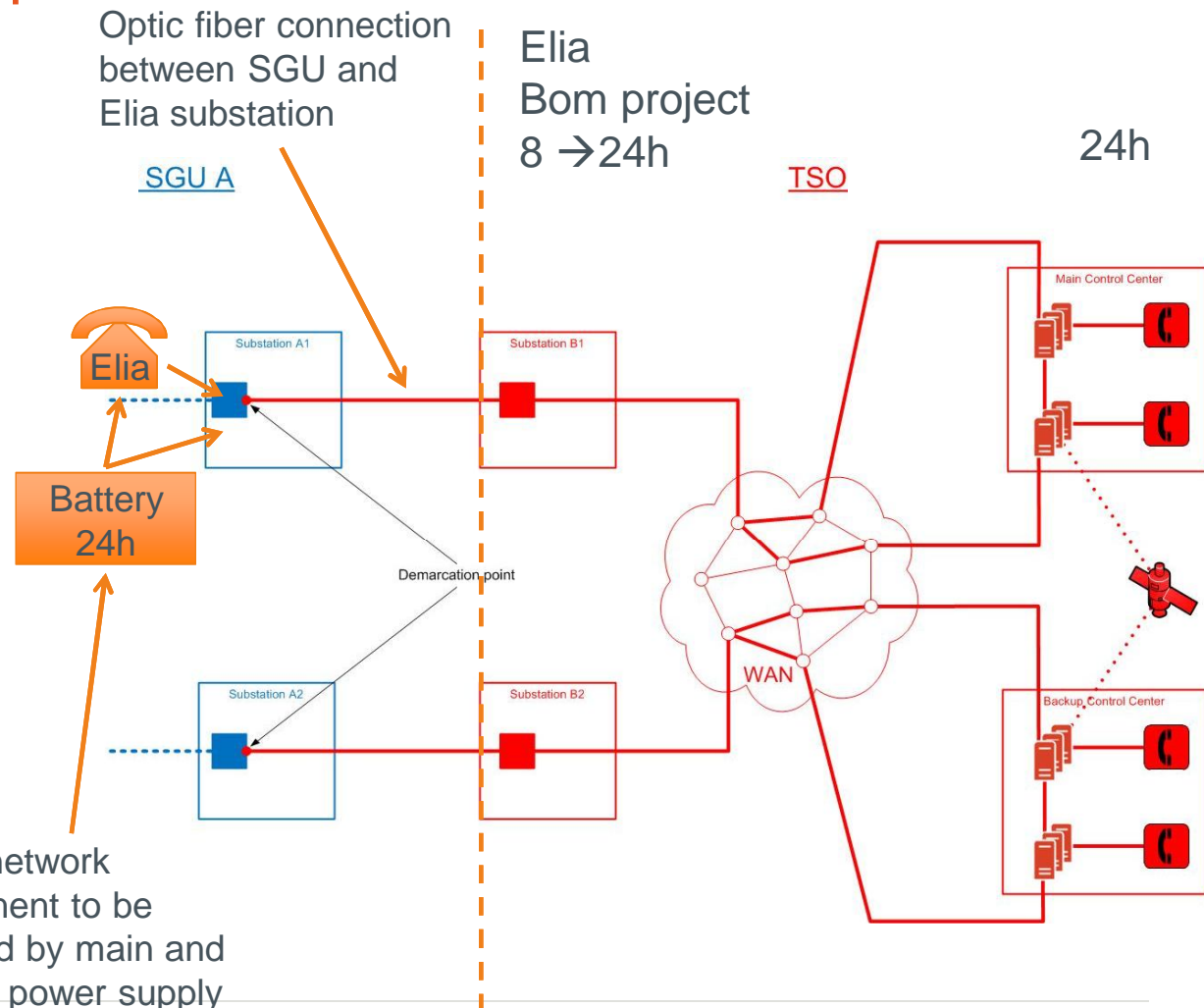
8. Technical requirements for voice communication systems

Communication systems Art 41

Each TSO, DSO, SGU identified ~art 23(4), and RSP shall have a voice 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.

Ensure the availability 24/7 of an operator with appropriate skills and “responsibility level” to guarantee that incoming calls from the TSO can be identified, answered immediately and will lead to the appropriate actions.

Every network component to be supplied by main and backup power supply



9. Status on Creg incentive for Black start

Black start incentive study CREG

- Benchmark of sourcing methods in other EU countries → done
- Required number of black start unit, geographical and electrical dispersion → under study
- Capability for houseload operation of units connected to Elia grid → questionnaires sent to producers type C and D
- Participation of intermittent sources to restoration → under study
- Conceptual ideas for new Black start mechanism
 - Try to achieve more liquidity
 - Decouple the provision of a black start source (diesel/battery) from the provision to re-energize the grid (large plant). One Restoration Service Provider offers the entire service to Elia
 - Enable to have black start source (diesel/battery) and re-energizing plant (e.g. large Gas Turbine) on different sites, making use of the Elia grid to connect both (after feasibility check by Elia) and owned by different entities.
- Further consultation in September 2018

10. Market interactions

Market interactions

- **What?**
 - Rules concerning the suspension and restoration of market activities. [Art 36(1)]
 - Rules for imbalance settlement [Art 39(1)]
- **Feedback Workshop of 14 June 2018**
 - Some high level principles were proposed by ELIA
 - Good open discussion with the stakeholders
 - Preferences were indicated
 - Additional questions popped up
 - In coming weeks, Elia will further discuss internally and with other TSOs
- **Next steps**
 - New workshop with stakeholders: 12 September 2018
 - Start consultation : 1 October 2018
 - Submission to CREG : 18 December 2018