System Operation European Stakeholder Committee

Materials for meeting 06 December 2021

entsoe

Reliable Sustainable Connected

Agenda

Topic	Timing	Presenter
1. Opening • Review of the agenda • Review and approval of minutes from previous meeting	13.30-13.45	ACER, Uros Gabrijel ENTSO-E, Cherry Yuen
2. Update on the implementation actions at pan-EU level	13.45-13.55	ENTSO-E, Cherry Yuen
3. Cybersecurity Network Code • Update on drafting process	13.55-14.15	ENTSO-E, Andrea Foschini
4. Report on CGM Program Implementation	14.15-14.25	ENTSO-E, Markus Besser
5. Assessment of frequency deviations linked to market-triggered disconnection of vRES generation • Status update	14.25-14.35	ENTSO-E, Walter Sattinger and Bernard Malfliet
6. Report on the 24 July 2021 system separation in Spain, Portugal and parts of France from CE synchronous area	14.35-14.55	ENTSO-E, Laurent Rosseel
7. Report on the 17 May 2021 local grid incident in Poland	14.55-15.15	ENTSO-E, Rafał Kuczyński
8. Tmin LER • Status update	15.15-15.25	ENTSO-E, Luca Ortolano
9. AOB • 2022 meetings	15.25-15.30	ACER, Uros Gabrijel

1. Review of actions

ENTSO-E, Cherry Yuen

1 Review of actions ESC

ACTION	ANSWER	STATUS
ENTSO-E will provide an update on 24 July system split event at the next SO ESC in December.	ENTSO-E will present in this SO ESC Meeting	Ongoing
ENTSO-E will propose an action plan on how to organise the discussion on the wind eclipse in the next SO ESC meeting.	ENTSO-E will provide update in this SO ESC Meeting	Ongoing

2. Update on the Implementation Actions

ENTSO-E, Cherry Yuen

Pan-European or regional deliverables 2021: SOGL

CSAm Amendments (Article 21 & 27)

Discussions with ACER and NRAs were finalised in May 2021, and amendments were approved in June 2021.

A dedicated workshop with CCRs is planned end of year 2021 to share information and awareness of those amendments and their impact on the regional implementation.

Operational Agreements

The Central SOR – Swissgrid Cooperation Agreement has been approved by the Central SOR JMB

Pan-European or regional deliverables 2021: SOGL

Transparency Platform

The Manual of Procedure (MoP) have been updated to version 3, release 3 (v3r3). The MoP v3r3 have been approved by MC in September. The MoP v3r3 is shared with ACER requesting their formal opinion.

The formal opinion from ACER is still pending.

3. Network Code Cybersecurity

ENTSO-E, Andrea Foschini

NETWORK CODE ON CYBERSECURITY

19TH SYSTEM OPERATION EUROPEAN STAKEHOLDER COMMITTEE MEETING (SO ESC), 6TH DECEMBER 2021

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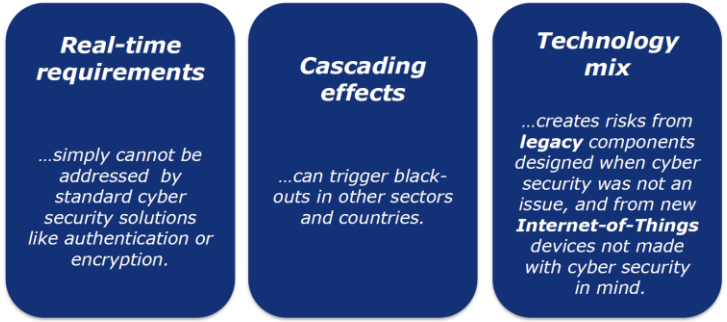
A NEW ASSOCIATION FOR THE EUROPEAN DISTRIBUTION SYSTEM OPERATORS (DSOS)

The EU DSO Entity

The EU DSO Entity has been formally established by the Electricity Regulation (EU) 2019/943 *"in order to increase efficiencies in the electricity distribution networks in the Union and to ensure close cooperation with transmission system operators and the ENTSO for Electricity."*

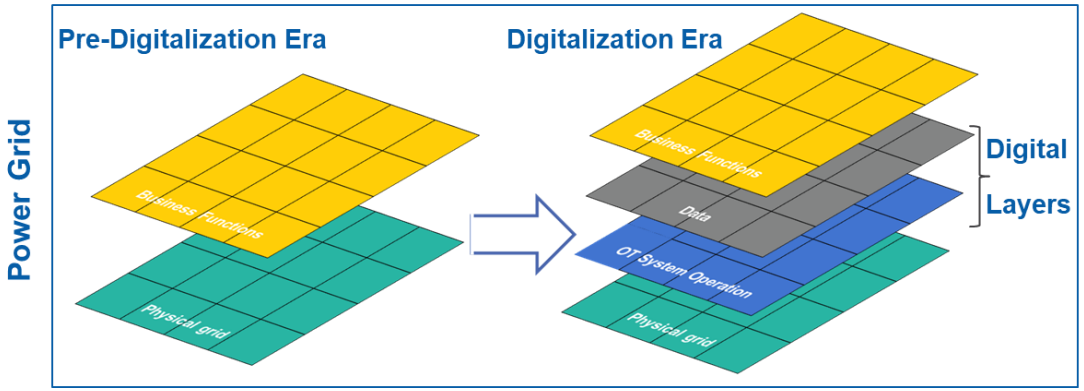
Why a Network Code on Cybersecurity for electricity sector

Electricity sector is not standard…



The global scenario of Cyber Threats is getting worse…

Energy Transition and associated Digitalization is enlarging the cyber attack surface…



What is a Network Code

Urgency to define of a EU-wide cybersecurity regulation for the Energy Sector:

Network Code on Cybersecurity of cross border electricity flows

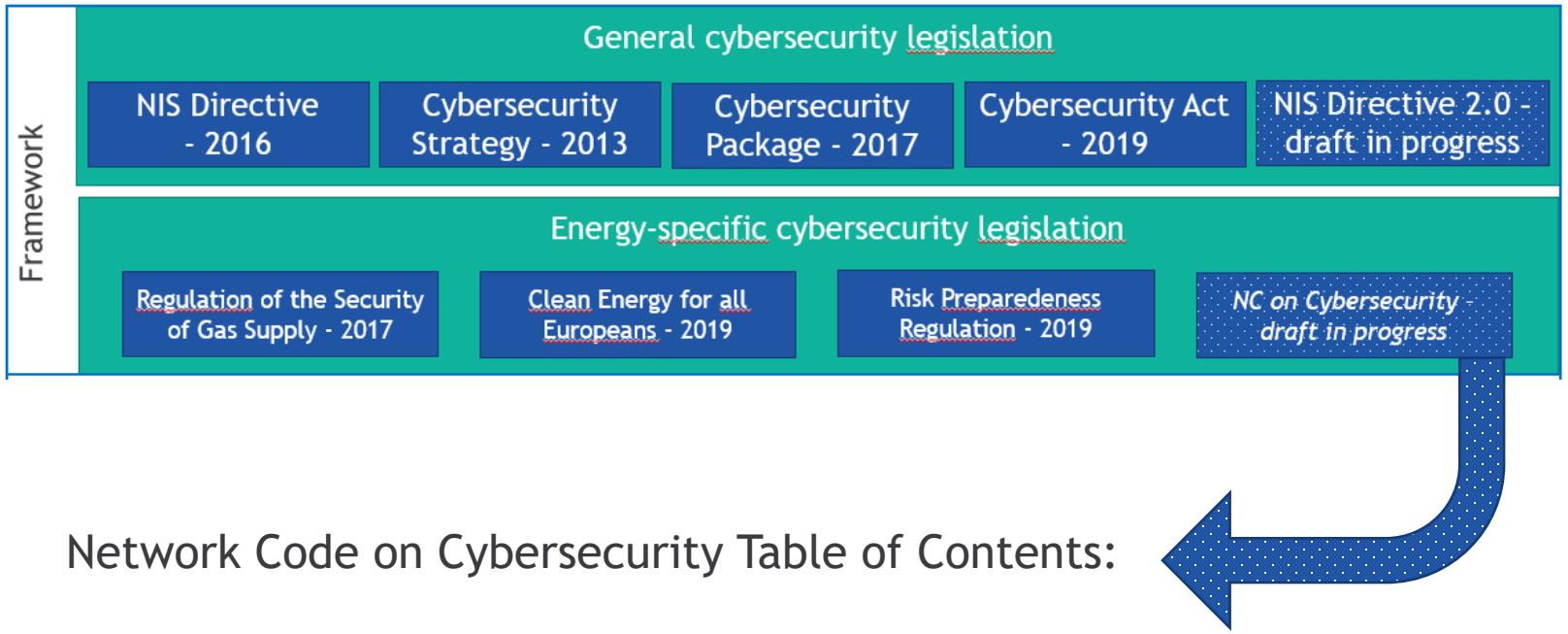
Drafting network codes follows Regulation 714/2009:

- Legally binding / Every entity within the scope will have to comply

- While they will not duplicate national regulation, national regulation have to be consistent. Hence, creating fit-for-purpose network codes is in everyone's interest.

- Stakeholder engagement is crucial.

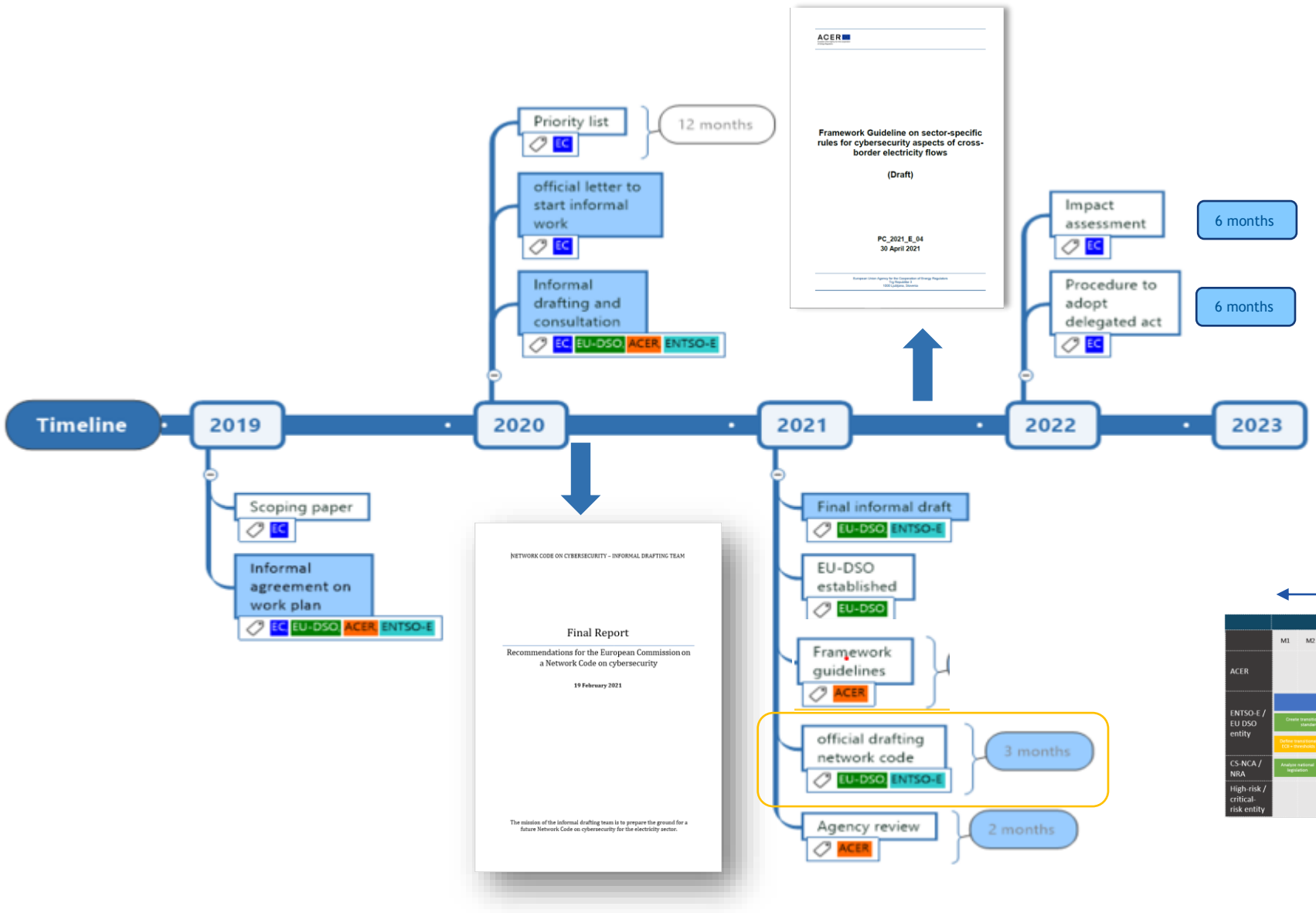
What is in the Network Code on Cyber?



Network Code on Cybersecurity Table of Contents:

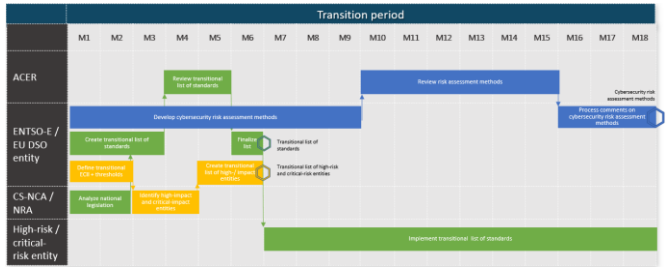
I. General provisions (monitoring & Benchmarking)
II. Governance for cybersecurity risk Management
III. Risk management at Union and regional level
IV. Common electricity cybersecurity Framework
V. Risk analysis at Member State Level
VI. Risk management at entity level
VII. Harmonising product and system requirements and verification
VIII. Essential information flows and Crisis Management
IX. Electricity cybersecurity exercise framework

The timeline (bird's view)



Implementation of the Network Code on Cybersecurity

TRANSITION PERIOD (18 MONTHS)

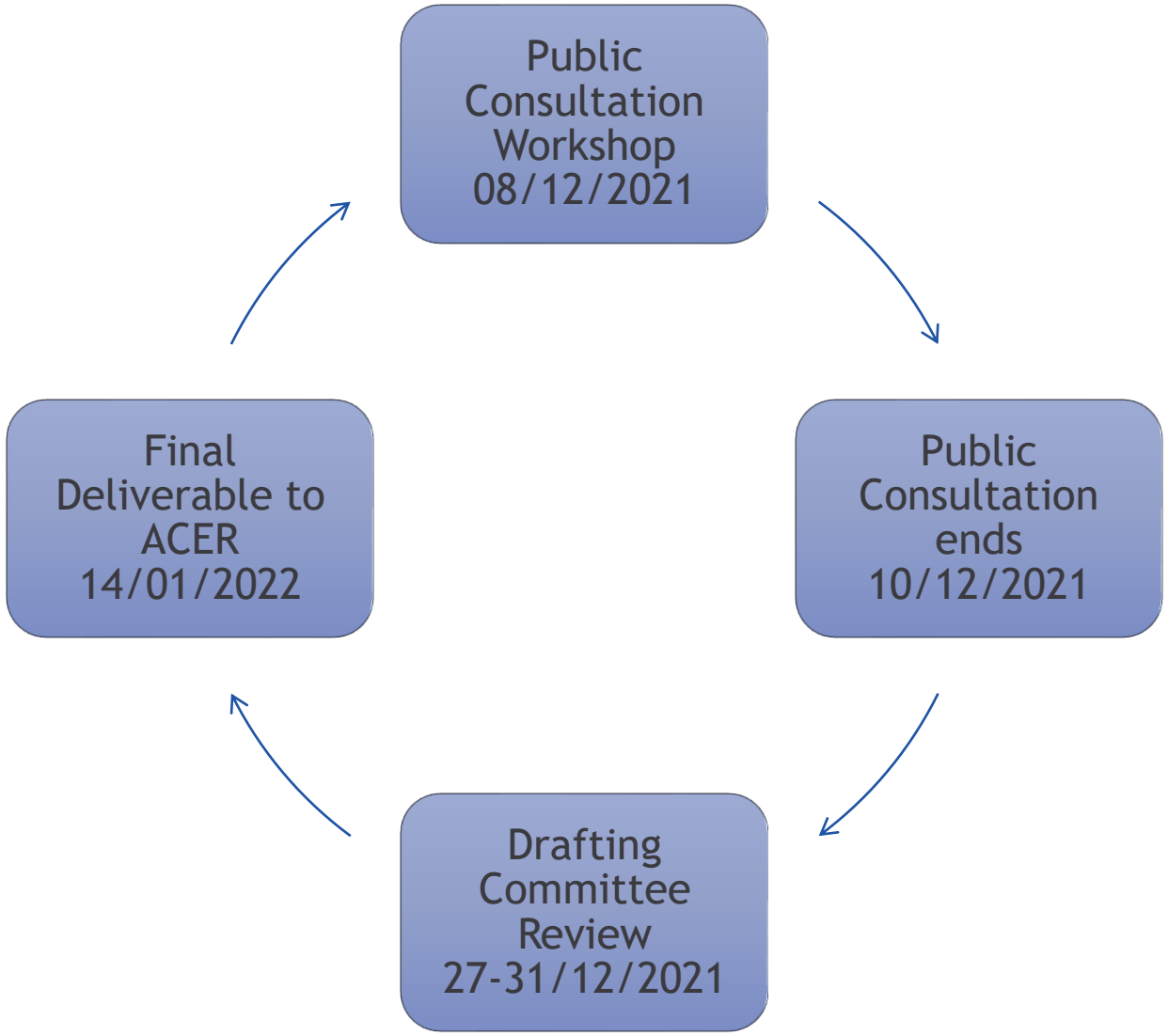


Full Enforcement

The Timeline… where we are now?

PROJECT	TASK	START	PLAN END
Phase 1 NC CS v1	Drafting NC CS Version 1 (DT) Drafting Committee review Transpose the NC CS v1 in legal text Deliver the revised NC CS v1 (DT)	27/07/2021	11/11/2021
Phase 2 NC CS public consultation	Stakeholders' updates NC CS public consultation Public Consultation Workshop 1 Public Consultation Workshop 2 (December 08°, 2021)	12/11/2021	10/12/2021
Phase 3 NC CS v2	Incorporate all comments from public consultation (DT) Deliver NC CS v2 (DT0 Drafting Committee' review Submit NC CS final to ACER	13/12/2021	14/01/2022

Next Steps



All the relevant information (including registration to the workshop) can be found here: [Cybersecurity (entsoe.eu)]

4. Report on CGM Programme Implementation

ENTSO-E, Markus Besser


Go-Live
08 December 2021

CGM Programme Go-Live in 2021, delivering significant benefits

- CGM Go-Live in 2021 delivers the legal mandate as set out in CGMM
- Although full RSC Services are not delivered yet, CGM MVS Go-Live has significant benefit from end 2021:

Proven data exchange platform (OPDE)

- *Flexible (legally mandated) exchange platform*
- *Provides base "platform services" (e.g. data storage, logging) for use in all future data exchanges*
- *CGM Go-Live enables OPDE to be proven day-to-day*

Operational, pan-European CGM service utilised in a manner that drives out issues

- *Operational experience (TSOs/RSCs), to build confidence*
- *Identify and resolve Issues based on "real" operations*

Active "stake in the ground" for RSC Service

Provides a first "stake in the ground" around which new services can test and be developed

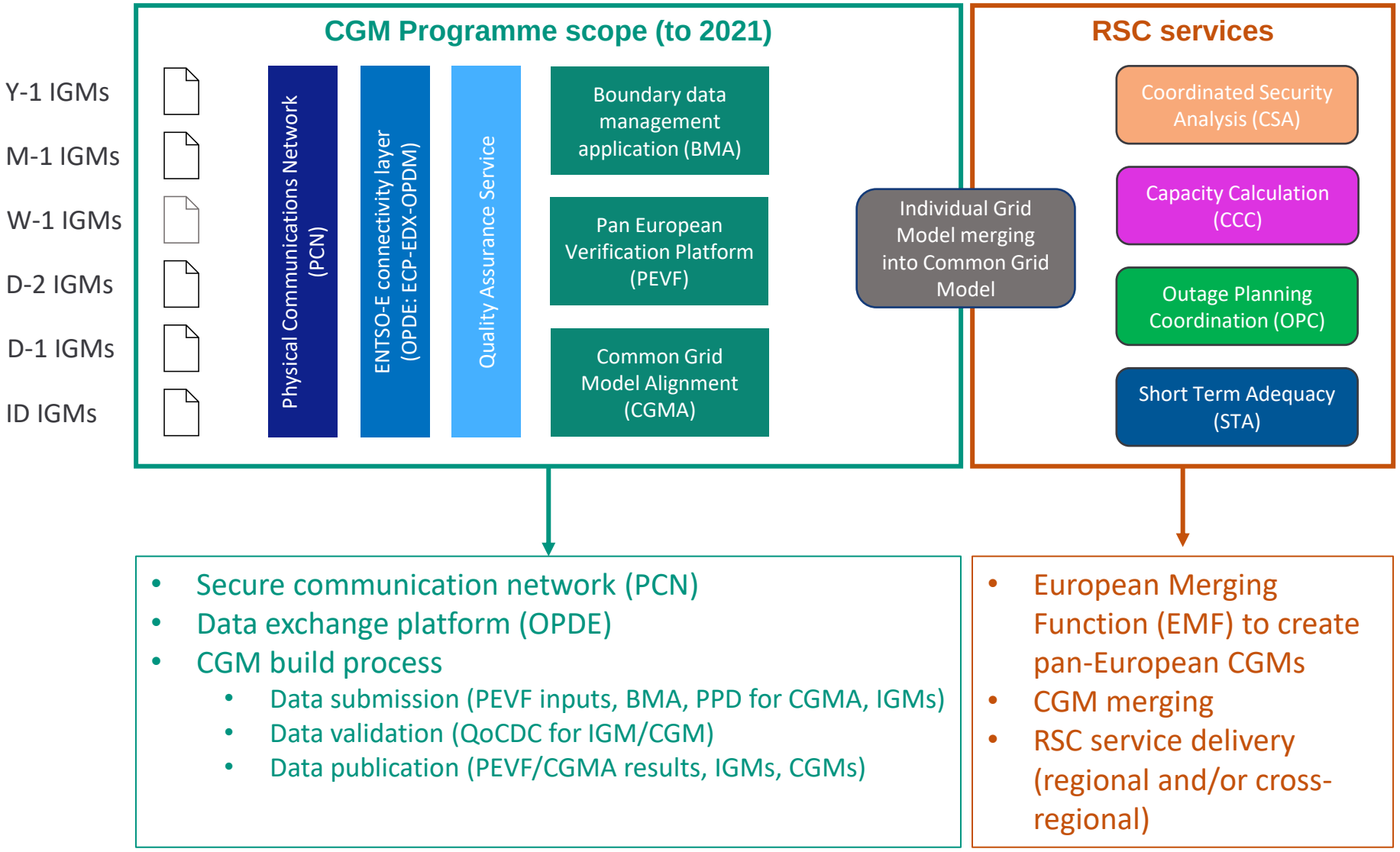
Baseline for model quality and standardisation

- *CGMs produced/exchanged for mandated timeframes*
- *Quality can be refined utilising a flexible validation mechanism*
- *Provides baseline quality, to drive incremental improvement*

Base data exchange flows, ready for additional datasets

- *CGM provides a significant number of "base" flows, upon which development can occur for other services*

Introduction - CGM Programme vs RSC delivery scope



- Secure communication network (PCN)
- Data exchange platform (OPDE)
- CGM build process
  - Data submission (PEVF inputs, BMA, PPD for CGMA, IGMs)
  - Data validation (QoCDC for IGM/CGM)
  - Data publication (PEVF/CGMA results, IGMs, CGMs)

- European Merging Function (EMF) to create pan-European CGMs
- CGM merging
- RSC service delivery (regional and/or cross-regional)

Key messages

1. CGM Programme is going live in 2021 with a delivery and change momentum

2. Delivery of RSC services (including transition to use of CGM/OPDE) will continue (migration phase)

3. Centralised, integrated planning across RSCs, CCRs, ENTSO-E and TSOs is critical to deliver benefits across the entire community and to avoid inefficiencies

4. During the migration phase, efforts should be focused on improving quality of models and proving effective use of CGM as an input to RSC Services

Questions?

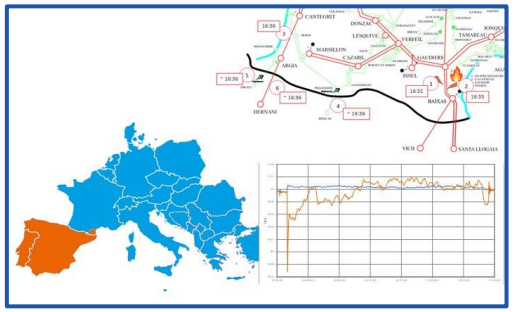
5. Assessment of frequency deviations linked to market-triggered disconnection of vRES generation

ENTSO-E, Bernard Malfiet & Walter Sattinger

6. Report on the 24 July 2021 system separation in Spain, Portugal and parts of France from CE synchronous area

ENTSO-E, Laurent Rosseel

Developments



Internal Task Force

- An **internal ENTSO-E Task Force** has been created
- Task Force focused its efforts on gathering necessary data and concluding technical analysis
- ENTSO-E has published a factual report prepared by the Task Force on 12th November 2021

Expert Panel

- Since it is an ICS Scale 2 incident, an **Expert Investigation Panel** consisting of TSOs, ACER and NRAs representatives has been established and the work commenced on 22nd October (press release)
- Expert Panel will prepare a final report on the incident, including recommendations and lessons learnt
- The interim report prepared by internal ENTSO-E Task Force will be the bases for Expert Panel's work
- The final report shall be published in **first quarter of 2022**

24 July
Day of the incident

26 July
Task Force first meeting

17 September
Completion of the technical analysis

22 October
Kick-off meeting of the Expert Panel

12 November
Publication of interim report

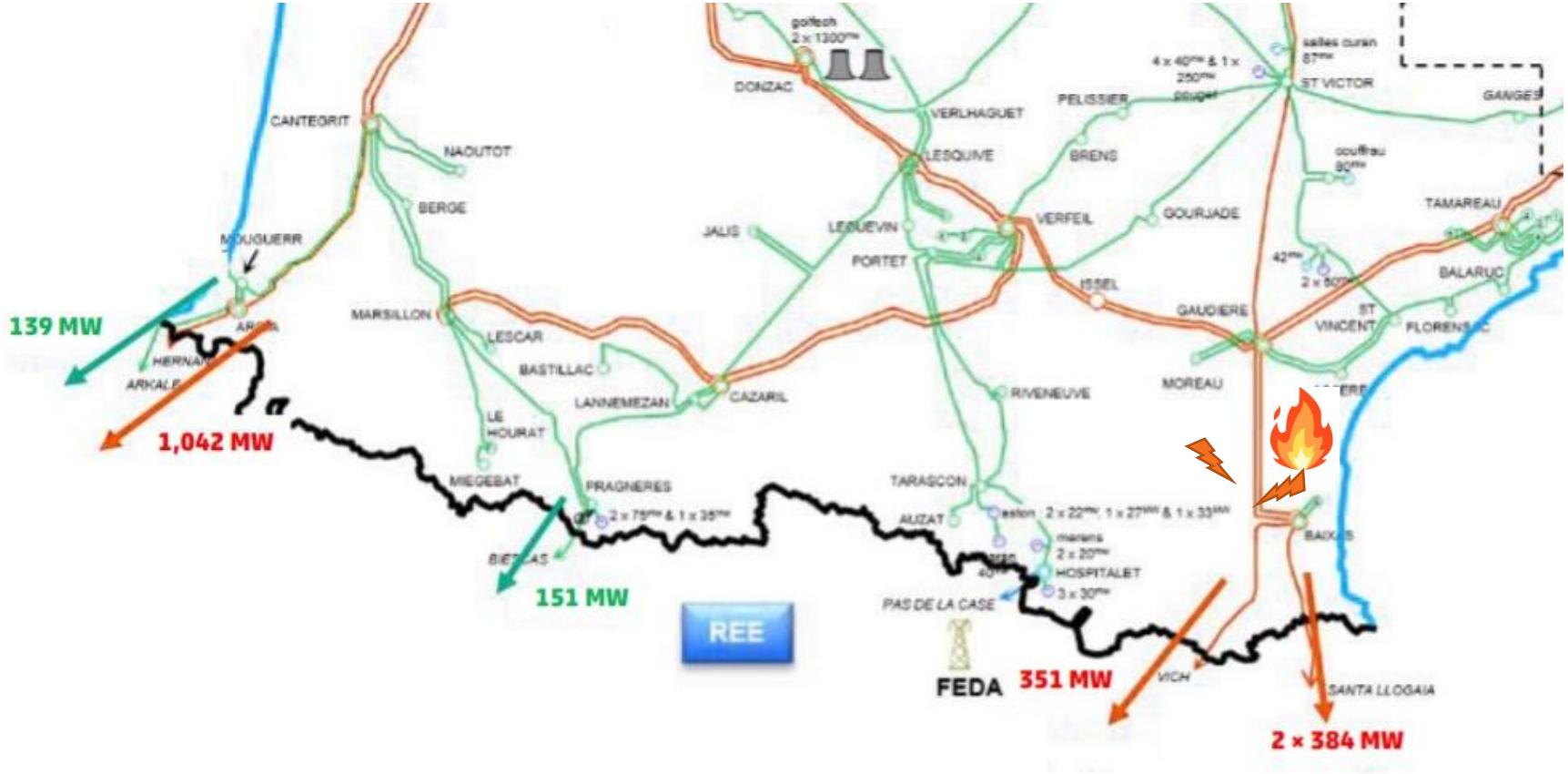
Q1 2022
Publication of final report

Summary of ENTSO-E Factual Report

System Disconnection of the Iberian Peninsula on 24 July 2021

SO ESC meeting of 6 December 2021

EVOLUTION OF THE SYSTEM CONDITIONS DURING THE EVENT



- Power was flowing from France (FR) to Spain (ES), in line with the day-ahead and intra-day market scheduled exchanges and well below the calculated net transfer capacities.
- At 16:30, physical exchanges between FR and ES reached 2,451MW from FR to ES, distributed across two 220kV interconnection lines, two 400kV and two HVDC links. The eastern interconnection accounted for 1,119MW.
- The power plan productions and the load consumptions matched the forecasted values. There were no planned outages or dangerous power flows in grid elements in the surrounding area.

- On 24 July 2021 ca. 13:30, a severe fire broke out in the South of France.
- At first, RTE was not informed about the fire.
- From the start of the fire to the first line trip, at 16:33, RTE was not aware of the fire.
  During this phase, the usual system operation rules were applied.

EVOLUTION OF THE SYSTEM CONDITIONS DURING THE EVENT

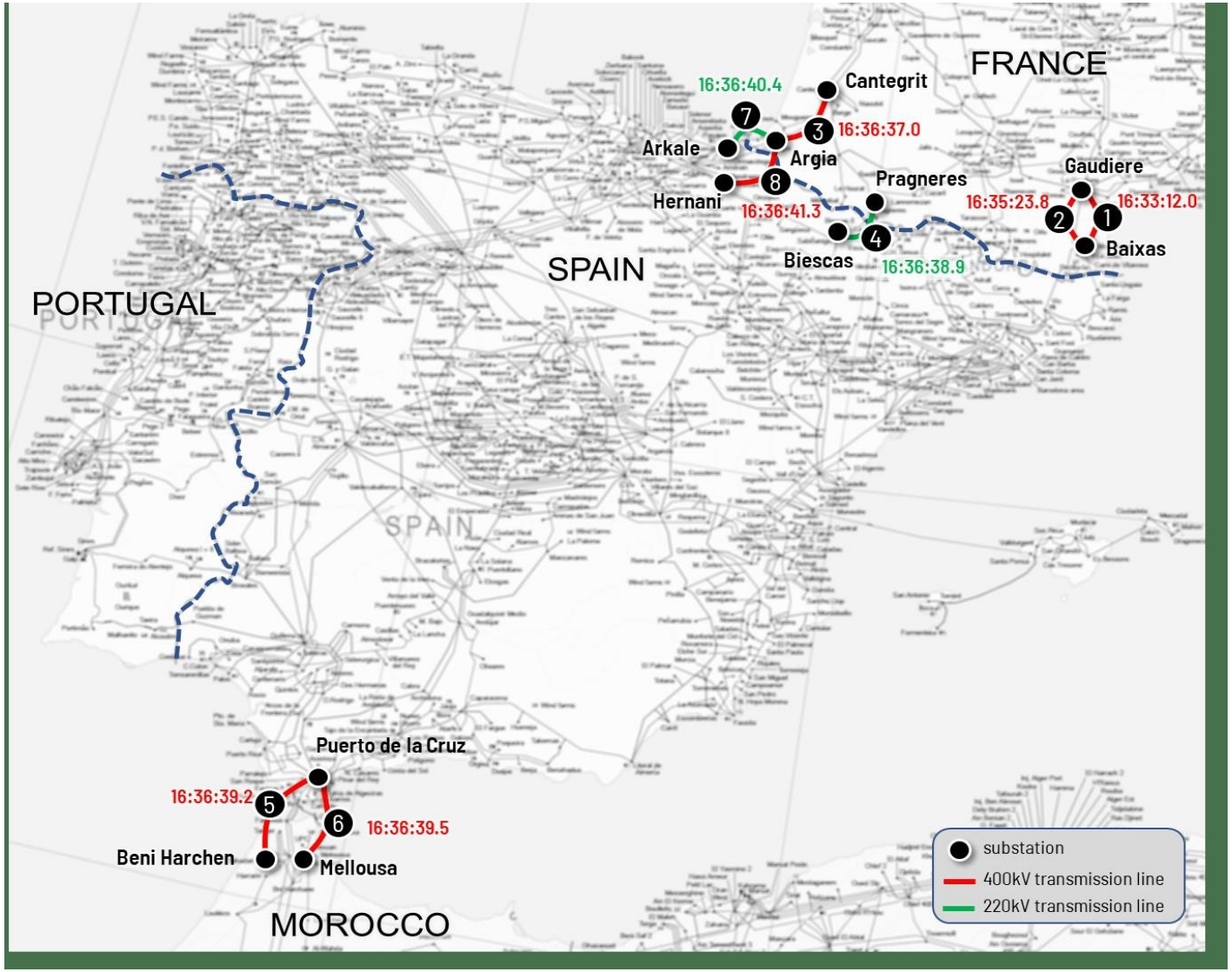
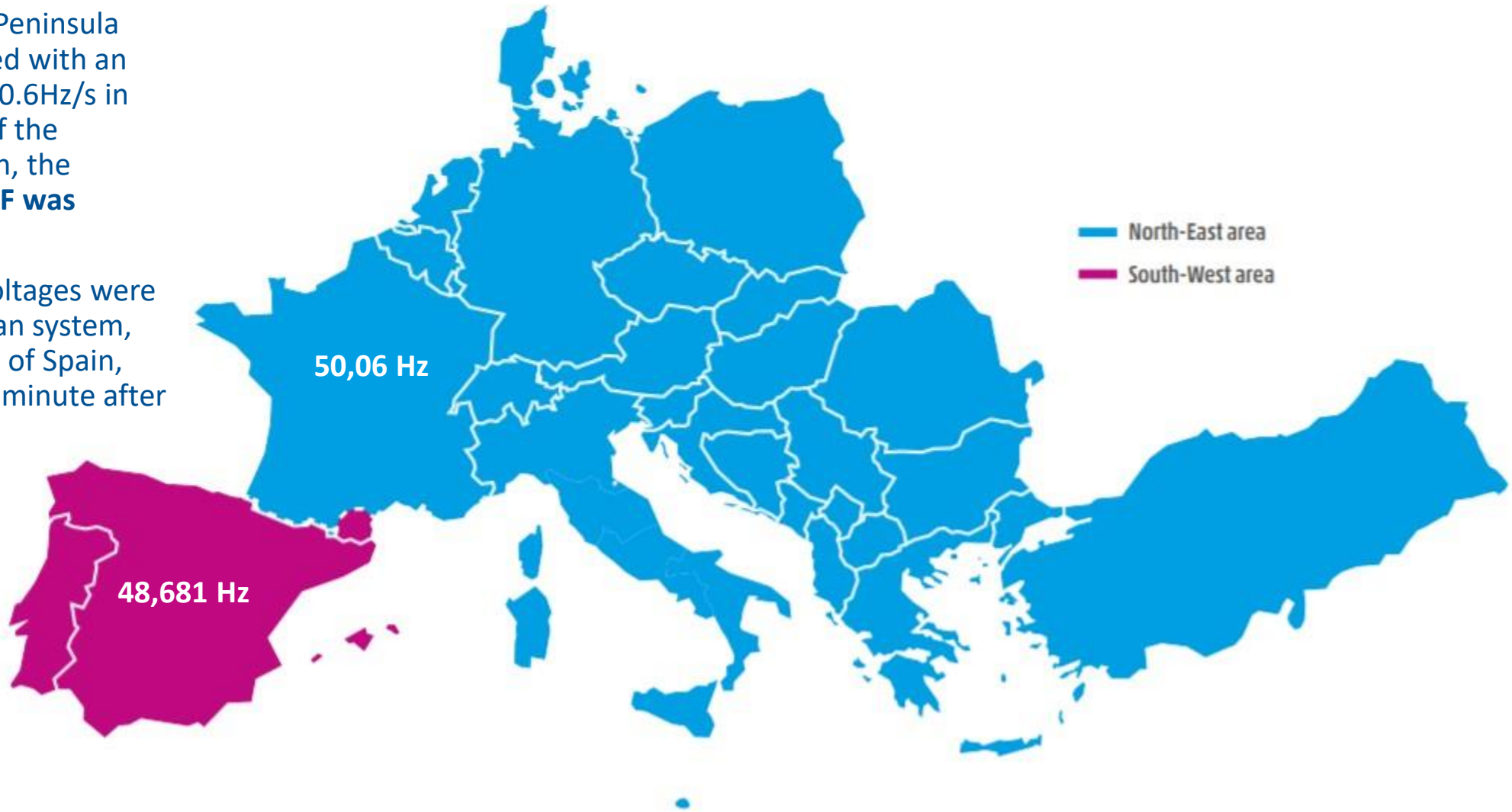


Figure 10: Geographical location of main tripped transmission system elements

- At 16:33:11 the wildfire caused a two-phase short circuit on circuit 2 of the 400kV Baixas-Gaudière line -> tripping of the line at 16:33:12.
- RTE and REE ordered a reduction of **exchange from 2,500 MW** to 1,200 MW at 16:34. The system split took place before the reduction became effective.
- At 16:35:23, circuit 1 experienced a similar fault and tripped. The eastern corridor was lost.
- The loss of the eastern corridor caused the western (400 kV Argia (FR)–Cantegrit (FR) line at 16:36:37) and central interconnection corridors to overload.
- The third tripping represents the point of no return that caused a loss of synchronism between the FR and ES systems, with the last line opening at 16:36:41.

EVOLUTION OF THE SYSTEM CONDITIONS DURING THE EVENT

- The lowest frequency in the middle of the Iberian Peninsula was **48.681 Hz**, reached with an estimated ROCOF of −0.6Hz/s in the centre of inertia of the underfrequency region, the **maximum local ROCOF was −1.03Hz/s**.
- After the split over-voltages were registered in the Iberian system, especially in the north of Spain, reaching 451.2kV one minute after the split.
- In Spain and Portugal, a total, **4,872 MW of loads were shed**, 2,302MW of pumps disconnected, and 3,764 MW of generators disconnected.



PERFORMANCE OF THE PROTECTION SYSTEM DURING THE INCIDENT

- An analysis was conducted for each line to describe the type of fault, the acting time of the protection, and the estimated location of the fault by dedicated fault location devices.
- The analysis proves that all **line protections** acted according to their settings and **demonstrated their correct behaviour**. Particular focus is given to the protection against loss of synchronism, as part of the defence protection scheme implemented by RTE and REE, that demonstrated the ability to protect the system, minimising the impact of disturbances.

FREQUENCY SUPPORT AND ANALYSIS

- The frequency deviation in the Iberian Peninsula was much higher than the predefined 200mHz**. Spain and Portugal activated the full amount of frequency containment reserve** within 30 seconds (380 MW and 50 MW, respectively).
- The activation of several manual frequency restoration reserves that took place only in Spain (REE is frequency leader), for a total requested power of 1,602 MW upward and 3,162 MW downward

COORDINATION ACTIVITIES BY THE REGIONAL SECURITY COORDINATOR

- The 5 services (CGM, OPC, STA, CCC and SA) were executed by Coreso in view of the incident with increasing timeliness of data without identifying any problems.
- No additional coordination or analysis services were provided by Coreso during or directly after the incident.
- The Critical Grid Situation Procedure was not triggered by TSOs.
- Some communication took place between Coreso, TSOs and RSCs regarding the frequency deviation and the resolution of the incident.

TSO-DSO COORDINATION – FREQUENCY PLAN AND LOAD SHEDDING

- The underfrequency condition on the Iberian Peninsula caused the activation of the first two load-shedding steps in Spain and Portugal, and the first load-shedding step in the southeast of France.
- To restore the generation – demand balance, **3,561 MW** were disconnected in Spain, **680 MW** in Portugal, and **65 MW** in France.
- Prior to the incident, **1,995 MW** of pumped storage were connected in Spain and **422 MW** in Portugal. Due to the underfrequency condition, all of them tripped (automatic disconnection) during the frequency drop.
- The details of the system defence plans of Portugal and Spain have been analysed, including **the unintentional loss of generation units** and loads.

RESYNCHRONISATION PROCESS

- The Iberian Peninsula frequency was gradually brought back close to 50 Hz by reconnecting loads previously disconnected in steps of 200 MW maximum each.
- **The reconnection was performed at 17:09 CET** by energizing the 400 kV Hernani (ES)–Argia (FR) line from Argia 400kV and synchronising from Hernani 400kV using its synchrocheck functionality.
- At the time of reconnection, the frequency difference was still large (218mHz), and therefore a power oscillation was observed for approximately 30 seconds with a frequency of 0.20Hz and an amplitude of 1,840 MW peak-to-peak.

N-1 SECURITY EVALUATION

- The analysis shows that the contingency analysis was rationally implemented and is well-tuned. **The N-1 security calculations performed by RTE, were in accordance to the valid legal framework (SO GL)**

COMMUNICATION OF COORDINATION CENTRES AND BETWEEN TSOs

- **Close coordination took place between RTE and REE.**
- Amprion (Germany) and Swissgrid (Switzerland) in their role as Coordination Centres North and South and in their role as Synchronous Area Monitor in Continental Europe were responsible for the procedures and coordinated countermeasures.
- They were **in contact with the affected TSOs** right after the separation and regularly throughout the entire event. They kept all other TSOs informed throughout the event.

7. Report on the 17 May 2021 local grid incident in Poland

ENTSO-E, Rafał Kuczyński

Polskie Sieci Elektroenergetyczne

Generation outage incident on 17.05.2021

Rafał Kuczyński| rafal.kuczynski@pse.pl | System Management Department

Konstancin-Jeziorna, 06th December, 2021

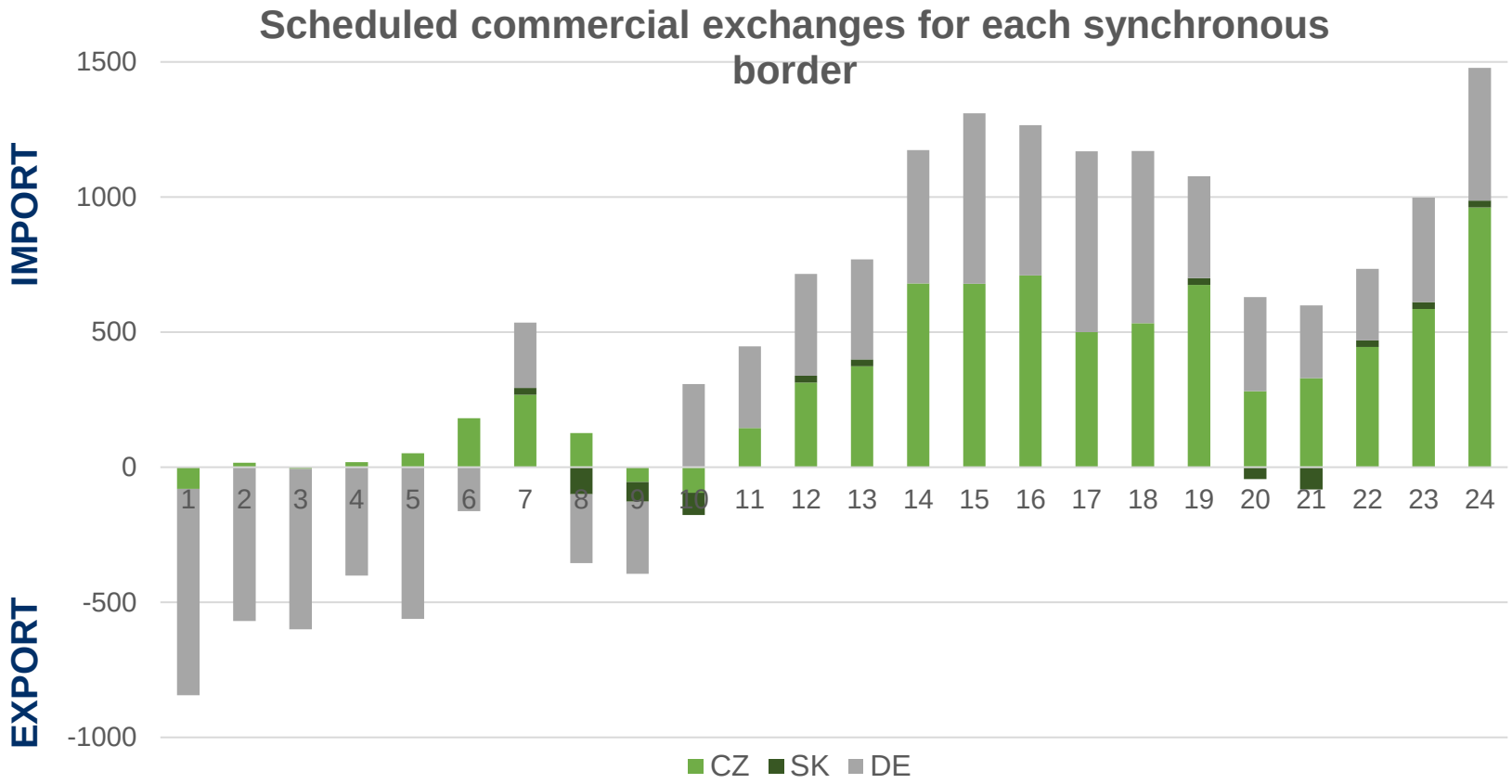
www.pse.pl

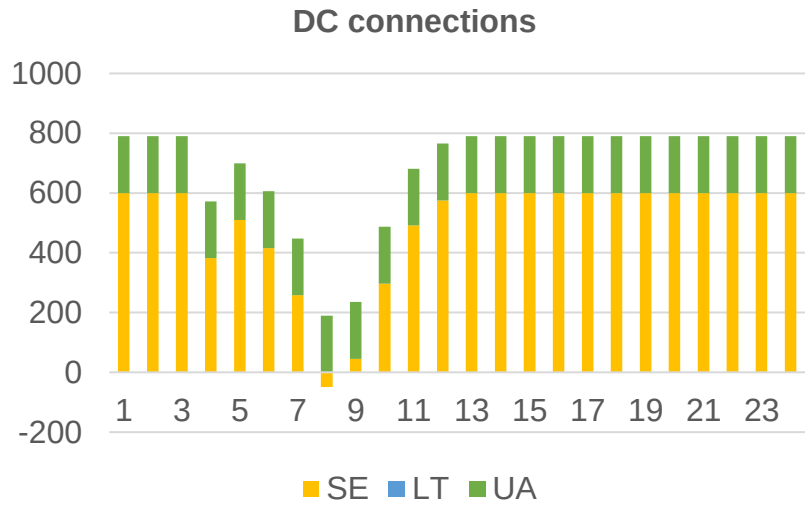
System state before the incident

Polskie Sieci Elektroenergetyczne

Network situation, balance situation, scheduled exchange

- Network - only scheduled outages; (no unplanned ones)
- Country power balance – available and disposable required reserves in full range

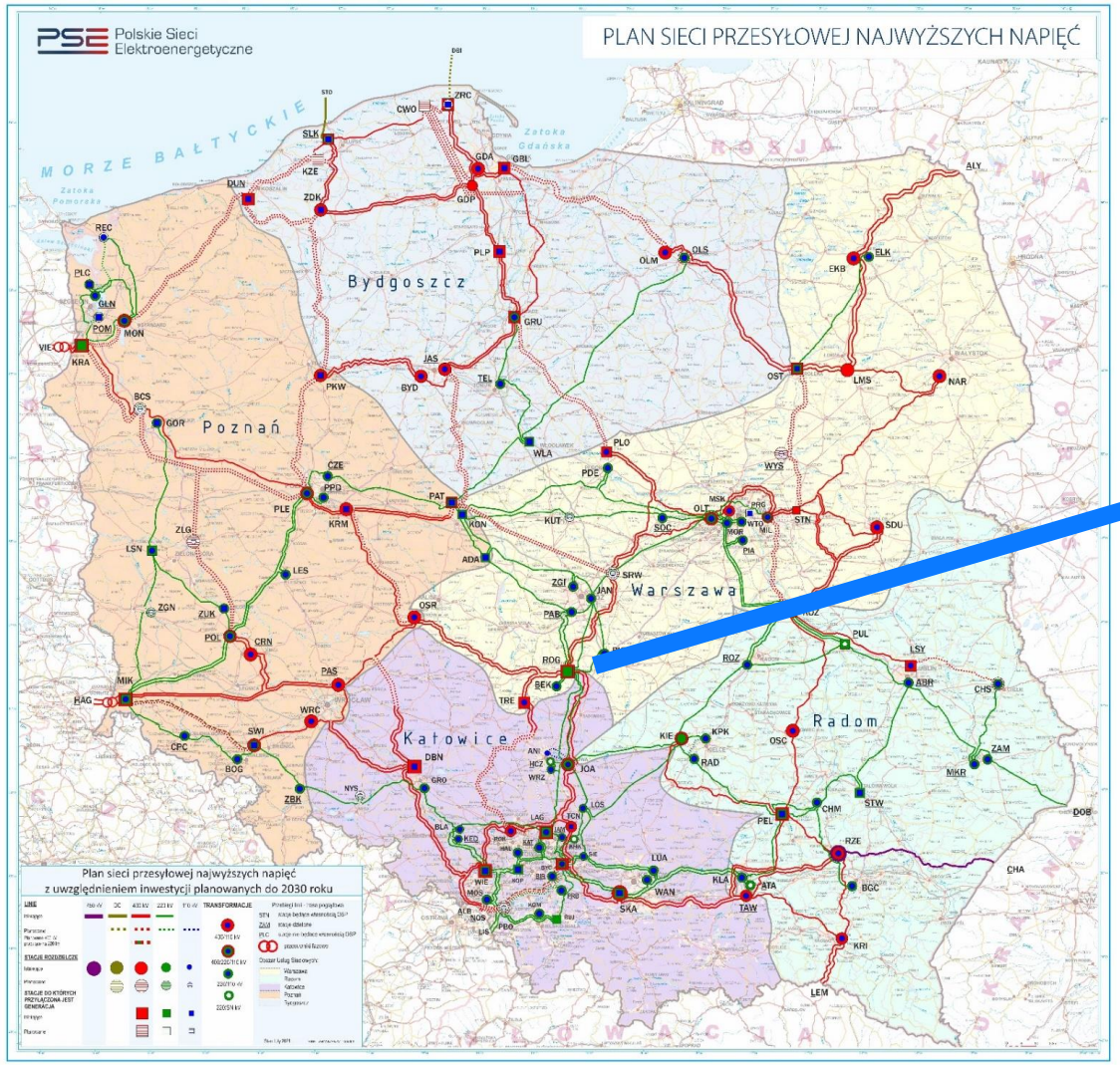


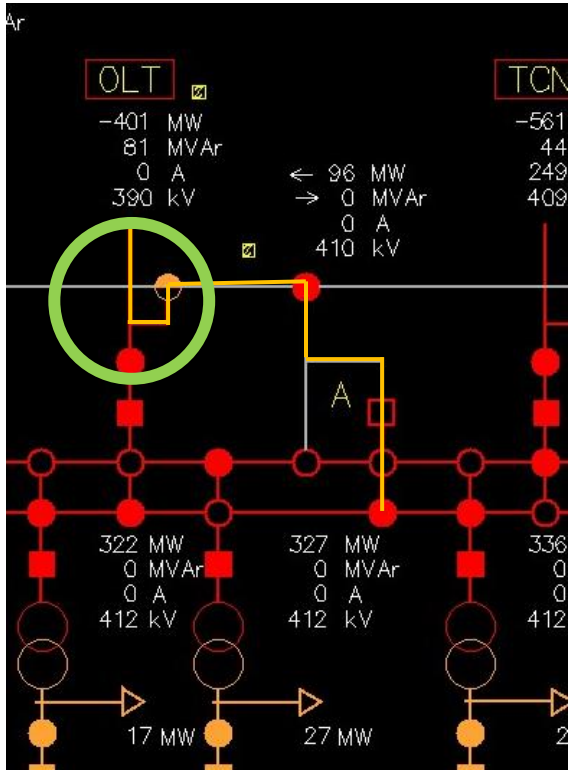


Triggering event and countermeasures taken by PSE

Polskie Sieci Elektroenergetyczne

Rogowiec 400kV at 16:34





Intended operation

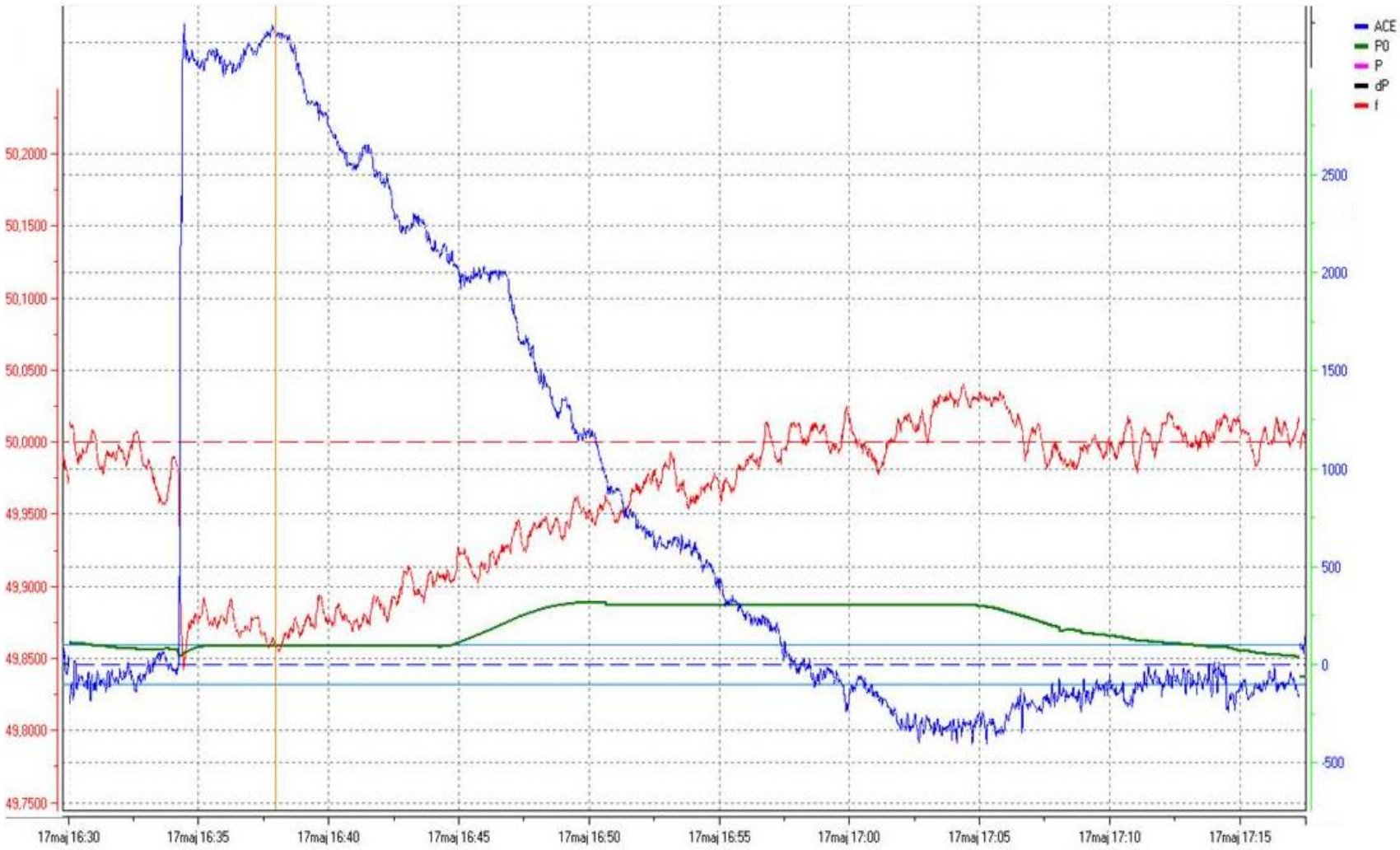
- Energized 400kV Rogowiec - Ołtarzew (OLT) line to be switched on auxiliary busbar (1) through the busbar coupler (A).
- Switch did not fully close and the operator attempted to close it manually.

Actual (unintended) operation

- Manual closing of the earthing switch, instead of auxiliary busbar disconnector

Cause: human error

ACE & frequency 16:35



ACE for PSE: over 3000 MW (for less than 3 minutes)

Δf: 158 mHz (for less than 3 seconds)

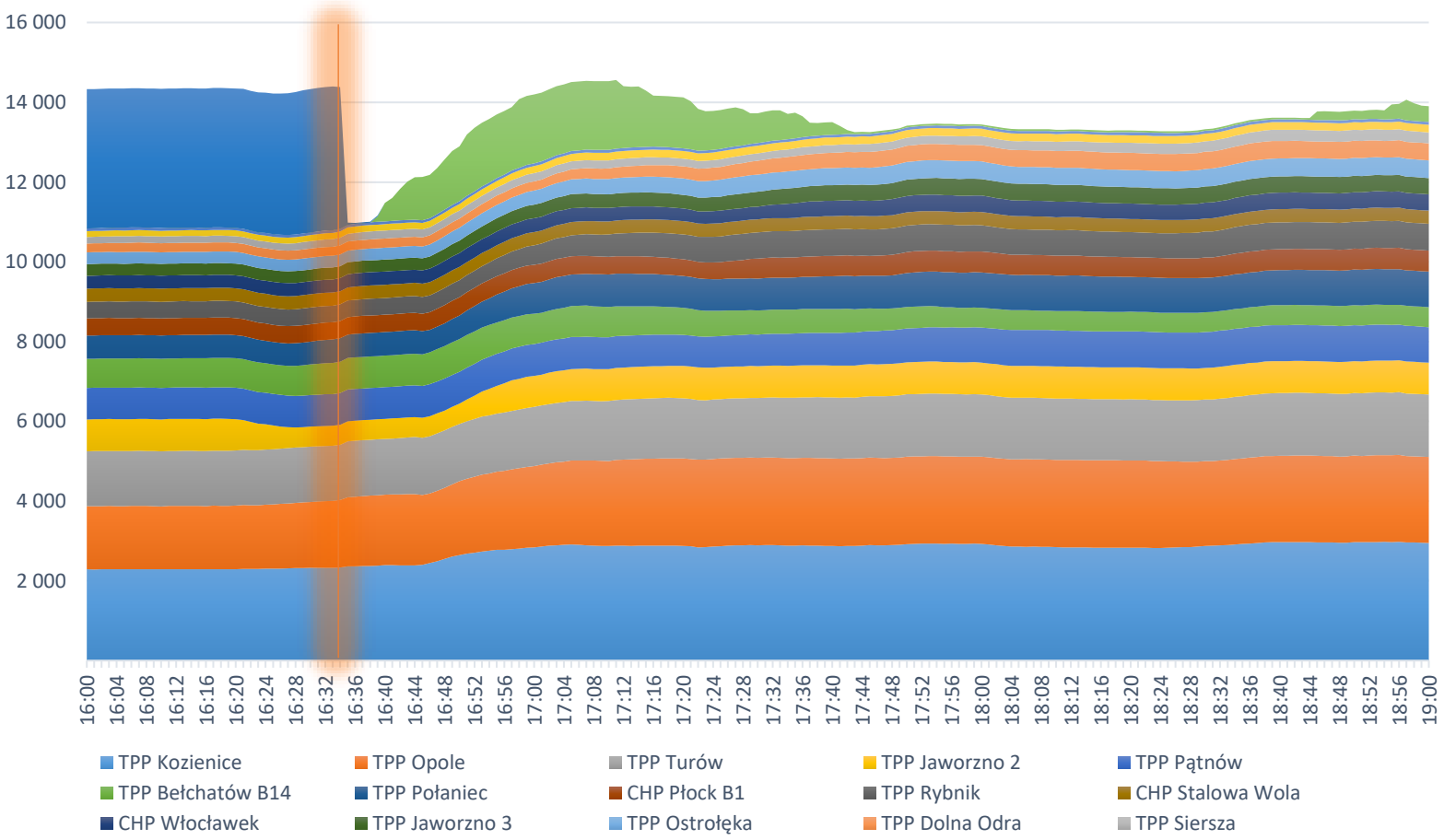
Increased flow on tie-lines:

- N criterion was fulfilled
- N-1 criterion was not fulfilled on PL-DE border for a limited time (less then 20 minutes) needed for implementing remedial actions (coordinated PSTs tapping)

No other TSOs reported degradation of system state in EAS

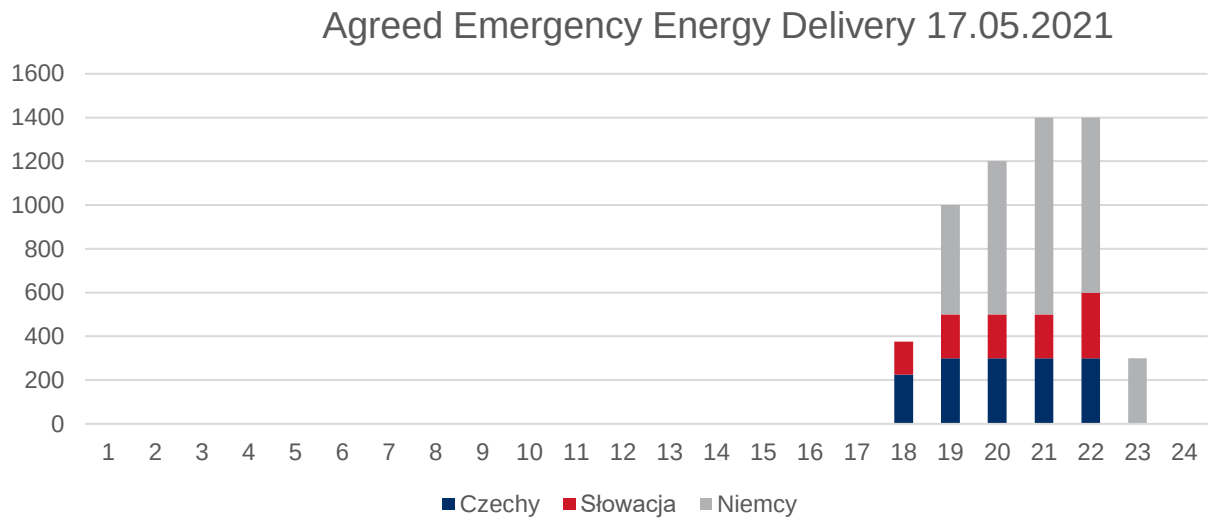
All TSOs compliant in ICS

Effects in the Belchatow power plant and internal countermeasures



- Tripping of 10 out of 11 PGMs operated in Bełchatów Power Plant.
- Total net generation lost: 3322 MW
- All available Hydro Power Plants activated into generation mode (1 700 MW within 20 minutes)
- All coal-fired power plants instructed to ramp up generation

Emergency support from TSOs and effect of all actions



- Activated Emergency Energy Delivery from 50Hertz, CEPS, SEPS in anticipation of the evening peak, (effective after the ACE and system frequency was restored)

Effect of remedial actions

- No overloadings in transmission grid
- Frequency deviation in RG CE reduced within 17 minutes
- Polish deviation of exchange reduced to +/- 500 MW within 20 minutes
- N-1 security criterion fulfilled within 20 minutes after incident, no cascading threat identified

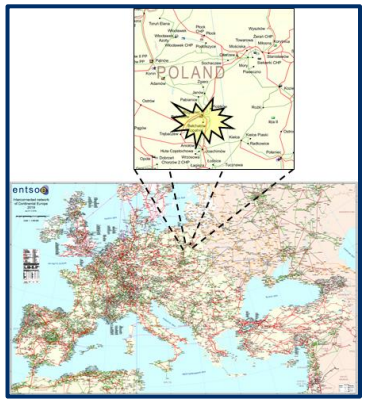
Investigation & Next steps

Polskie Sieci Elektroenergetyczne

PSE's investigation results summary

- The initiating cause of the incident was a human error. Incorrect switching of the line earthing switch led to a short circuit in the 400 kV Rogowiec. The construction of the grounding net differed fundamentally from the design, and thus was an immediate cause of an incident.
- Disconnection of the PGMs in Bełchatów PP occurred as a result of incorrect activation of some of the protections. The reason for the activation of protections and tripping of the circuit breakers were numerous undesirable impulses (interpreted by the protections as control signals), resulting from the occurring overvoltages, which were a consequence of the short-circuit current not absorbed by the damaged grounding net.
- The incident, which resulted in a loss of 3,322 MW (i.e. 3,556 MW gross generation, reduced by the Bełchatów PP auxiliary needs) **did not lead to any consumer load shedding** in the transmission and distribution networks. There were also **no negative effects on the operation of the synchronously connected systems of the Continental Europe**. Security limits for the connected systems were restored approximately 20 minutes after the incident.
- The incident has led to additional costs on the TSO side. Considering the zonal market model applied in Europe, **network problems within zone do not affect market functioning**, since internal congestion caused by network unavailability is not visible for market participants.

PSE & ENTSO-E developments



PSE's investigation

- Given the local type of the incident, no inter-TSO Task Force was created
- PSE conducted its own investigation and developed a report provided to Expert Panel
- The report has been complemented with pan-continental aspects of incident (frequency drop; market influence) and approved as factual report by 17th November 2021

Expert Panel

- Since it is an ICS Scale 2 incident, an **Expert Investigation Panel** consisting of TSOs, ACER and NRAs representatives has been established and the work commenced on 20nd October
- Expert Panel will publish a final report on the incident, including recommendations and lessons learnt
- The preliminary assumptions are that the report will be published in Q1 2022

17 May
Day of the incident

18 may
PSE begins the internal investigation

31 August
PSE provides the factual report

20 October
Kick-off meeting of the Expert Panel

4 November
Initiating a WVP for SOC to approve the interim report

17 November
Approval of interim report

Q1 2022
Publication of final report

Rafał Kuczyński| rafal.kuczynski@pse.pl | System Management Department

Konstancin-Jeziorna, 6th December, 2021

Polskie Sieci Elektroenergetyczne

8. Tmin LER

ENTSO-E, Luca Ortolano

FCR by LER

Main Updates

- The RG CE TSOs approved a proposal on the minimum time period for FCR providers with LER on the **6th of October**; the proposal has been sent by CE TSO to their respective NRAs;

- The main goal of the proposal is to **continue a dialogue** with the NRAs, that welcomed in their shadow opinion the possibility to further discuss the topic;

- TSOs and NRAs started a dialogue in order to, at first, agree on timing and content of the **workshop** to be held with the stakeholders

Minimum Time Period proposal

1. The minimum activation period required for frequency containment reserve providing units or groups with limited energy reservoirs to remain available during alert state is 30 minutes.

2. An interim period of at least 24 months following the entry into force of this Proposal is provided.

3. The requirement in Art. 3.1 shall apply to LER whose prequalification takes place after the end of the interim period.

4. LER prequalified before the end of the interim period are not subject to the requirement in Art. 3.1 and must ensure that they are able to fully activate FCR continuously, as of triggering the alert state and during the alert state, for a time period equal to the maximum amongst the two following:

   a) Time Period legally in force in their connecting area at the moment of the entry into force of the present regulation;

   b) Time Period for which they have been prequalified, whenever it is different from Time Period legally in force in their connecting area.

9. AOB

ACER, Uros Gabrijel

SO ESC meeting dates 2022

- 3 March
- 16 June
- 22 September
- 1 December