



European Network of
Transmission System Operators
for Electricity

INCIDENTS CLASSIFICATION SCALE (ICS)

METHODOLOGY 2013

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WG INCIDENTS CLASSIFICATION SCALE UNDER
SYSTEM OPERATION COMMITTEE

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Revisions

<i>Version</i>	<i>Date</i>	<i>Author</i>	<i>Summary of Changes</i>	<i>Changed Chapters</i>
<v0.1>	<17-01-2013>	<i>C DUVERT JF GAHUNGU</i>	<i>Classification Scale overview Criteria definitions Incident analysis</i>	<i>All</i>
<v0.2>	<31-01-2013>	<i>AdHoc Team ICS</i>	<i>Classification Scale overview Criteria definitions Incident analysis</i>	<i>4.3 to 4.6</i>
<v0.3>	<13-11-2013>	<i>WG ICS</i>	<i>Incidents Classification Scale overview</i>	<i>All</i>

References and related documents

- [1] Operational Security Network Code
- [2] Load-Frequency Control and Reserve Network Code
- [3] Operational Planning and Scheduling Network Code

Change request

Each TSO can submit the proposal to change or supplement the Incidents Classification Scale to the SOC for further consideration.

1. Overview

1.1 Objectives

This document describes the Incidents Classification Scale (ICS) methodology:

- Incidents Classification Scale has to be used by each Transmission System Operator (TSO) of the ENTSO-E area.
- Each Transmission System Operator will have to report grid and system disturbances on a **four degrees scale (0 to 3)** corresponding to incidents of growing seriousness up to a general Europe-wide incident.
- Each Transmission System Operator has to define its own internal organization to use the Incidents Classification Scale.
- Depending on the type of disturbance, Transmission System Operators should agree bilaterally with whom will have to report and which information they need to exchange.
- On a general way, reporting will have to be done by the Transmission System Operator in whose system the disturbance has occurred.
- ENTSO-E Incidents Classification Scale (ICS) Scale 2 and Scale 3 define the starting point of Crisis Communication Tool (in case a major disturbance occurs on the European grid, affecting several control areas, with severe consequences outside the area of origin of the disturbance).

1.2 Tasks to be done

From January 2013 till December 2013, TSOs will record and report the disturbances on the basis of the ICS methodology validated by SOC on 7 February 2013 and use Excel tool as reporting file:

- Each Transmission System Operator will have to download the blank version of the Excel tool from ENTSO-E extranet workspace.
- To record a disturbance into the tool database, each Transmission System Operator will have to fill templates and, eventually, to add comments about the disturbance and its consequences.
- The disturbances will have to be reported to ENTSO-E monthly.
 - This reporting must be done as soon as possible after the end of the month but not later after the next month starts.
 - To make this reporting, each Transmission System Operator will upload its completed version of the Excel tool into ENTSO-E extranet workspace.
 - As one of the main interests of such a classification is to accumulate information all year long, it is very important **no information is deleted from each Transmission System Operator own database until the end of 2013.**

By the end of 2013 the WG ICS will update the ICS methodology on the basis of requirements of the System Operation Network Codes and submit to SOC for validation for using from January to December 2014.

2. Reporting rules overview

2.1 Due date for reporting to ENTSO-E

All events should be reported **within one month after they occurred**. Therefore, each month, each Transmission System Operator will report to ENTSO-E previous month disturbances. It means that all events should be reported within one month after they occurred by uploading the reporting file in ENTSO-E extranet workspace.

Each TSO shall report in one file from the beginning of the year. Reporting starts on January and finishes in December. So the report of January includes incidents of January only, report of February includes incidents of January and February; report of March includes incidents of January, February and March, etc.

Each time the tool starts, a reminder will indicate next due date to upload the current file to ENTSO-E extranet.

The following planning gives milestones for reporting.

- **T0:** the disturbance occurs;
- **Between T0 and T0 + 1month :** disturbance recording in the reporting tool;
- **T0 + 1 month:** Reporting to ENTSO-E by uploading reporting tool to ENSTO-E extranet workspace.

Remark #1: As time scales are very different between disturbances reporting and crisis communication, those processes will be linked in the future to identify common ways of information sharing between t0 and t0+1 month.

Remark #2: The due date will be anticipated in case an ex-post analysis is needed. Actually if a Scale 2 or Scale 3 event occurs (if necessary a Scale 1 event), the reporting file upload will have to be done before Day 5 after the disturbance (see Investigation Procedure for details).

2.2 Fundamental principles and responsibilities

The reporting has to be done by the Transmission System Operator in whose system the disturbance has occurred.

The specificity of the frequency deviations needs to be reported by an ad hoc organisation. Thus, frequency deviations in Synchronous Areas and Baltic Region have to be reported by:

- Amprion for Synchronous Area Continental Europe (CE);
- National Grid for Synchronous Area Great Britain (GB);
- Eirgrid for Synchronous Area Ireland;
- Svenska Kraftnät for Synchronous Area Northern Europe (NE);
- Augstsprieguma tīkls for Baltic Region.

Each Transmission System Operator shall only focus on its own Responsibility Area and report if the causes or consequences of the incidents are covered by the criteria and are in the range of thresholds.

It is obligatory to report the Scale 0 incidents. They will be used for the internal analysis and are not intended for reporting annually.

2.3 Identification of the different criteria related to a single disturbance

Each Transmission System Operator will have to perform following actions:

- To identify, for a single disturbance, the different events and corresponding criteria related to the consequences which have appeared on its own area.
- To identify if the original disturbance is internal or external. Due to the events are measured in terms of consequences, it is possible that the Transmission System Operator has to report consequences which are originated by external causes, out of its own Responsibility Area.
- If the original cause is the failure of an interconnected line, this failure may be considered how an internal cause for the two Transmission System Operators involved.
- To characterize the main consequences on its own Responsibility Area.
- Eventually (for events ranked on Scale 2 and 3), to collect information related to the situation before, during and after the disturbance occurs (measurements, chronological data, snapshots, performance of protections relays, manual actions, other information of people involved, etc).

2.4 Characterization of dominating criterion

Each Transmission System Operator will have to perform following actions:

- Characterization of dominating criterion in terms of consequence. A priority order has been defined to identify the criterion to use for ranking.
- The 2nd criterion will be identified as subsidiary criterion.
- In some cases of incidents with affection to more than one TSO, this final incident classification will only be possible after information collect between Transmission System Operators. In those cases, the dominating criterion will be chosen comparing the most important criteria for each Transmission System Operator and ordering these criteria according with prioritization principles.

There is a need of integration in case of the incidents have affection on regional area (i.e. synchronous area), incidents with a gravity Scale 2 or 3. In these cases, the final integration will be done in a coordinated way by impacted Transmissions System Operators during the investigation phases described in this document.

3. Incidents Classification Scale: description and definitions

Criteria have been defined by using definitions from ENTSO-E network codes and IEC standards.

Definitions used for purposes of this ICS:

Baltic Region means the TSOs of Lithuania, Latvia and Estonia.

Each criterion describes “factually” an event or a situation which is observable. Only significant events are recorded and classified at their right Scale of gravity.

Incidents Classification Scale counts 4 Scales of gravity corresponding to incidents of growing seriousness up to a general Europe wide incident. It is compliant with System States definitions from the Operational Security network code ([1], chapter 2, article 8):

- **Scale 0** (Normal State) for anomaly Local incidents.
- **Scale 1** (Alert State) for noteworthy Local disturbances, probability of Wide Area incidents.
- **Scale 2** (Emergency State) for extensive Wide Area incidents.
- **Scale 3** (Blackout State) for Wide Area incident or major incident on one Transmission System Operator.

3.1 Incidents Classification Scale general overview

Scale 0 Anomaly		Scale 1 Noteworthy disturbance		Scale 2 Extensive incidents		Scale 3 Widespread incident or major incident / 1 TSO	
Priority / Short definition (Criterion short code)		Priority - Short definition (Criterion short code)		Priority - Short definition (Criterion short code)		Short definition (Criterion short code)	
#17	Events on load (L0)	#9	Events on load (L1)	#2	Events on load (L2)	#1	Black out (OB3)
#18	Disturbance leading to frequency degradation (F0)	#10	Disturbance leading to frequency degradation (F1)	#3	Disturbance leading to frequency degradation (F2)		
#19	Disturbance on transmission network equipment (T0)	#11	Disturbance on transmission network equipment (T1)	#4	Disturbance on transmission network equipment (T2)		
#20	Disturbances on Power Generating Facilities (G0)	#12	Disturbances on Power Generating Facilities (G1)	#5	Disturbances on Power Generating Facilities (G2)		
#21	Violation of standards on voltage (OV0)	#13	N-1 violation (ON1)	#6	N violation (ON2)		
		#14	Violation of standards on voltage (OV1)	#7	Separation from the grid (RS2)		
		#15	Lack of reserve (OR1)	#8	Loss of tools and facilities (LT2)		
		#16	Loss of tools and facilities (LT1)				

Table 1 - Incidents Classification Scale overview

3.2 Criteria prioritization

The following table 2 represents criteria terms of growing seriousness (from left to right). A single criterion dominates all criteria placed on its left.

Lowest priority					Highest priority															
21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
OV0	G0	T0	F0	L0	LT1	OR1	OV1	ON1	G1	T1	F1	L1	LT2	RS2	ON2	G2	T2	F2	L2	OB3

Table 2 - Criteria Prioritization Table

3.3 Scale 0 definitions

Scale 0 (anomaly) is assigned to Local events with low effect on reliability:

- The primary failure may have low security influence and/or low market influence consequences.
- After the incident, the system is still in Normal State [1].

Scale 0 counts five criteria.

3.3.1 Scale 0 criteria general overview

The following definitions are presented corresponding to Scale 0 priority order.

Criterion short code	Priority	Criteria short definition
L0	1	Events on load
F0	2	Disturbance leading to frequency degradation
T0	3	Disturbance on transmission network equipment
G0	4	Disturbances on Power Generating Facilities
OV0	5	Violation of standards on voltage

Table 3 - Scale 0 criteria general overview

3.3.2 Scale 0 Criteria #1 – Events on load (L0)

Description

- All Synchronous Areas and Baltic region: disconnection of load from 1 to 5% of actual load of TSO before the time of the incident (MW) for at least 3 (three) minutes if initiating faults are in the transmission grid (220 kV and above) – Energy Not Supplied (ENS).
- Isolated systems: if frequency remains 49,5 Hz – 49,0 Hz for at least 5 minutes and/or load shedding is < 5%.

General remarks concerning reporting and incident analysis

Following information should be included in the reporting form to allow the elaboration of pan-European statistics. Those statistics will be used to produce an overview of the System Operation performance:

- Rough estimate of load disconnected (MW loss) and disconnection time duration.
- Eventually, rough estimate of
 - Generation disconnected at different time intervals (MW loss) and disconnection time duration;
 - Voltage excursions (deviation, duration) if the figure is less than 10% upward/downward;
 - Frequency response at different time intervals (deviation, duration).
- Eventually, general information regarding number and category of equipment concerned by the primary failure (e.g.: 220kV circuit breakers, 330kV overhead lines, HVDC links, 400kV tie-lines, transformers...).

Prioritization for dominating criterion characterization

- This criterion is defined on priority number 1 in case more than one criterion on Scale 0 is identified for a same disturbance.
- This criterion will always dominate others Scale 0 criteria.

3.3.3 Scale 0 Criteria #2 – Disturbance leading to frequency degradation (F0)

Description

Steady State Frequency Deviation: All events included in the range of the table 4 (see table below) [2] must be reported:

After Time to Restore Frequency, if the frequency remains in the Standard Frequency Range mentioned in table 4, this event is not reported.

After Time to Restore Frequency, if the frequency deviation is no larger than 50% of the Maximum Steady State Frequency Deviation mentioned in table 4, this event must be reported in Scale 0.

After Time to Restore Frequency, if the frequency deviation is larger than 50% of the Maximum Steady State Frequency Deviation mentioned in table 4, this event must be reported in Scale ≥ 1 (see § 3.4.3)

After Alert State Trigger Time, if the frequency deviation \in [50% Maximum Steady State Frequency deviation, Maximum Steady State Frequency Deviation], this event must be reported in Scale 0.

After Alert State Trigger Time, if the frequency deviation is larger than the Maximum Steady State Frequency Deviation, but shorter than Time to Restore Frequency, this event must be reported in Scale ≥ 1 (see § 3.4.3).

- All Steady State Frequency Deviation should be reported, even if there is no loss of generation. There could be other reasons, which should be reported, e.g. driven by market activities, RES, forecasts, etc. Deviation above the threshold is already an incident.
- Steady State Frequency Deviation in Synchronous Areas and Baltic Region has to be reported by:
 - Amprion for Synchronous Area Continental Europe (CE);
 - National Grid for Synchronous Area Great Britain (GB);
 - Eirgrid for Synchronous Area Ireland;
 - Svenska Kraftnät for Synchronous Area Northern Europe (NE);
 - Augstsprieguma tīkls for Baltic Region.

- Deterministic Frequency Deviation [2] has to be reported.

Scale 0 - Normal State	Baltic Region	Continental Europe	Great Britain	Ireland	Northern Europe	Isolated system
Standard Frequency Range	50mHz	50mHz	200mHz	200mHz	100mHz	100mHz
50% of Maximum Steady State Frequency Deviation	200mHz	100mHz	250mHz	250mHz	250mHz	250mHz
Maximum Steady State Frequency Deviation	400mHz	200mHz	500mHz	500mHz	500mHz	500mHz
Time to Restore Frequency	15min	15min	10min	20min	15min	20min
Alert State Trigger Time	10min	5min	10min	10min	5min	10min

Table 4 - Scale 0 (Normal State) Steady State Frequency Deviation thresholds

General remarks concerning reporting and incident analysis

Following information should be included in the reporting form to allow the elaboration of pan-European statistics. Those statistics will be used to produce an overview of the System Operation performance:

- Frequency deviation in the range of the Scale 0 table 4 (\pm xx mHz) and, eventually, the time needed to restore frequency within the Standard Frequency Range:
 - If there is quick degradation of the imbalance which causes a discontinuity fluctuation of the frequency (e.g. trip of generation, HVDC, etc.) – the counting of time starts from a moment of incident;
 - If there is slow degradation of the imbalance which causes a continuous degradation of the frequency (load fluctuation for example) – the counting of time starts after frequency violates limits of Standard Frequency Range.
- Eventually, rough estimate of:
 - Load disconnected (MW loss) and disconnection time duration if the figure is not included in the Scale 0 Events on load (L0) range;
 - Generation disconnected at different time intervals (MW loss) and disconnection time duration;
 - Voltage excursions (deviation, duration).
- General information regarding number and category of equipment concerned by the primary failure (e.g.: 220kV circuit breakers, 330kV overhead lines, HVDC link, 400kV tie-lines, transformers...).
- The analysis of the incidents will be managed by:
 - Subgroup System Frequency (SG SF) for CE;
 - National Grid for GB;
 - Eirgrid for Ireland;
 - Svenska Kraftnät for Synchronous Area Northern Europe (NE);
 - Augstsprieguma tīkls for Baltic Region.

Prioritization for dominating criterion characterization

- This criterion is defined on priority number 2 in case more than one criterion on Scale 0 is identified for a same disturbance.
- This criterion will always be dominated by Events on load (L0) criterion.

3.3.4 Scale 0 Criteria #3 – Disturbance on transmission network equipment (T0)

Description

- Final tripping of grid equipment from Contingency List [1], other Exceptional Contingencies and Out-of-Range Contingencies (to be indicated in the report) if the Operational Security remains within the Operational Security Limits after effects of Remedial Actions.
- Final tripping of 1 (one) HVDC link between different Synchronous Areas OR inside Synchronous Area have both to be reported.
- Tripping of the highest transmission voltage lines with automatic re-closure is NOT reported.
- Tripping of the highest transmission voltage lines with the designed manual connection (instead of automatic for security reasons) is NOT reported.
- Planned emergency manual disconnection of the highest transmission voltage lines is NOT reported.
- A failure which doesn't lead to automatic and final disconnection or shutdown of the equipment immediately, but allows to disconnect the equipment manually, is NOT supposed to be reported as "final tripping of equipment". This also applies for automatic reconnecting of equipment after automatic shutdown.

General remarks concerning reporting and incident analysis

Following information should be included in the reporting form to allow the elaboration of pan-European statistics. Those statistics will be used to produce an overview of the System Operation performance:

- General information regarding equipment concerned by the primary failure (e.g.: 220kV circuit breakers, 330kV overhead lines, HVDC link, 400kV tie-lines, transformers...);
- Number of equipment concerned by the primary failure and final tripping time duration;
- Eventually, rough estimate of:
 - Load disconnected (MW loss) and disconnection time duration if the figure is not included in the Scale 0 Events on load (L0) range;
 - Generation disconnected (MW loss) and reserve properties;
 - Voltage excursions (deviation, duration);
 - Frequency response at different time intervals (deviation, duration) if it is not included in the Scale 0 Frequency thresholds (F0) table;

Prioritization for dominating criterion characterization

- This criterion is defined on priority number 3 in case more than one criterion on Scale 0 is identified for the same disturbance.
- This criterion will always be dominated by following Scale 0 criteria:
 - Events on load (L0);
 - Disturbance leading to frequency degradation (F0).

3.3.5 Scale 0 Criteria #4 – Disturbances on Power Generating Facilities (G0)

Description

- Unexpected reduction or disconnection from the grid of Power Generating Facilities connected to transmission network representing an output less important than biggest power station output in time period of maximal 30 minutes.
- Hereby, the table 5 with the thresholds defined for each Synchronous Area, Baltic Region and isolated systems (from a minimal threshold defined specifically for each Synchronous

Area, Baltic Region and isolated systems to the tripping of the most important power station in the Transmissions System Operator area).

Scale 0 Normal State	Baltic Region	Continental Europe	Great Britain	Ireland	Northern Europe	Isolated system
Thresholds	from 200 MW to 450 MW	from 600 MW to 1500 MW	from 1320 MW to 1800 MW	from 200 MW to 500 MW	from 1200 MW to 1500 MW	Biggest unit in system

Table 5 - Thresholds for disturbances on generation facilities - Scale 0

- It is not important if a Power Generating Facility has just to reduce scheduled feed-in or to stop it completely.
- Failure of several Power Generating Facilities or Power Generating Modules (in overlapping periods of time) is considered combined.
- If a disturbance in a Power Generating Facility forces it to reduce feed-in into the transmission network by a certain percentage (<100%) of the momentarily scheduled feed-in, this event will have to be reported if the power thresholds are reached. Actually, this kind of generation reduction needs the same containment and restoration reserves, so it has to be treated as disconnection of certain capacity.
- If in 30 minutes the loss of generation reaches the criteria it should be reported. If the criteria is reached immediately it should be reported even if it lasted shorter than 30 minutes.

General remarks concerning reporting and incident analysis

Following information should be included in the reporting form to allow the elaboration of pan-European statistics. Those statistics will be used to produce an overview of the system operation performance:

- Rough estimate of generation disconnected at different time intervals (MW loss) and disconnection time duration;
- Eventually, rough estimate of:
 - Load disconnected (MW loss) and disconnection time duration if the figure is not included in the Scale 0 Events on load (L0) range;
 - Voltage excursions (deviation, duration);
 - Frequency response at different time intervals (deviation, duration) if it is not included in the Scale 0 Frequency thresholds (F0) table.
- General information regarding number and category of equipment concerned by the primary failure.

Prioritization for dominating criterion characterization

- This criterion is defined on priority number 4 in case more than one criterion on Scale 0 is identified for a same disturbance.
- This criterion will always be dominated by following Scale 0 criteria:
 - Events on load (L0);
 - Disturbance leading to frequency degradation (F0);
 - Disturbance on transmission network equipment (T0).

3.3.6 Scale 0 Criteria #5 – Degradation in operational conditions – Voltage (OV0)

Description

- All Synchronous Areas and Baltic Region: network node operated at steady state voltage outside the range defined in the tables 6 and 7 below [1] affecting 1 (one) Transmission System Operator within 15 minutes.

Scale 1 Alert State	Baltic Region	Continental Europe	Great Britain	Ireland	Northern Europe
Thresholds	0.90 pu – 1.12 pu	0.90 pu – 1.118 pu	0.90 pu – 1.10 pu	0.90 pu – 1.118 pu	0.90 pu – 1.05 pu
Time duration	Unlimited				

Table 6 - Voltage ranges for reference voltages between 110 kV to 300 kV (excluding)

Scale 1 Alert State	Baltic	Continental Europe	Great Britain	Ireland	Northern Europe
Thresholds	0.90 pu – 1.10 pu	0.90 pu – 1.05 pu			
Time duration	Unlimited				

Table 7 - Voltage ranges for reference voltages between 300 kV to 400 kV (excluding)

- Isolated systems: network node operated at voltage exceeding voltage $\pm 10\%$ of the pre-fault level (downward or upward) within 15 minutes.

General remarks concerning reporting and incident analysis

Following information should be included in the reporting form to allow the elaboration of pan-European statistics. Those statistics will be used to produce an overview of the System Operation performance:

- Description of voltage excursions (deviation, duration);
- Eventually, rough estimate of:
 - Load disconnected (MW loss) and disconnection time duration if the figure is not included in the Scale 0 Events on load (L0) range;
 - Generation disconnected (MW loss) if it is not included in the Scale 0 disturbances on Power Generating Facilities range;
 - Frequency response at different time intervals (deviation, duration) if it is not included in the Scale 0 Frequency thresholds (F0) table;
- Eventually, general information regarding number and category of equipment concerned by the primary failure (e.g.: 220kV circuit breakers, 330kV overhead lines, HVDC links, 400kV tie-lines, transformers...).

Prioritization for dominating criterion characterization

- This criterion is defined on priority number 5 in case more than one criterion on Scale 0 is identified for the same disturbance.
- This criterion will always be dominated by following Scale 0 criteria:
 - Events on load (L0);
 - Disturbance leading to frequency degradation (F0);
 - Disturbance on transmission network equipment (T0);
 - Disturbances on Power Generating Facilities (G0).

3.4 Scale 1 definitions

Scale 1 is assigned to noteworthy events and Wide Area disturbances which are affecting more than one Transmission System Operator and could lead to Emergency State.

- The primary failure may have high security influence and/or high market influence or cause violation of standard thresholds.
- In the case of isolated systems, Scale 1 applies to incidents that lead to load shedding activation or serious degradation of operational conditions.
- Those disturbances may eventually lead to operational disturbance on other Transmission System Operator, OR N-1 violation reported, OR consequences on capability of exchange, OR leading to reliability degradation.

If TSO announces the Alert State [1], it should be based on any criteria in Scale 1. But not all incidents of Scale 1 must lead to the Alert State.

Scale 1 counts eight criteria.

3.4.1 Scale 1 Criteria general overview

The following definitions are presented in table 8 corresponding to Scale 1 priority order.

Criterion short code	Priority	Criteria short definition
L1	1	Events on load
F1	2	Disturbance leading to frequency degradation
T1	3	Disturbance on transmission network equipment
G1	4	Disturbances on Power Generating Facilities
ON1	5	N-1 violation
OV1	6	Violation of standards on voltage
OR1	7	Lack of reserve
LT1	8	Loss of tools and facilities

Table 8 - Scale 1 Criteria general overview

3.4.2 Scale 1 Criteria #1 – Events on load (L1)

Description

- All Synchronous Areas and Baltic Region: disconnection of load representing from 5 to 10% of actual load before the time of the incident (MW) for at least 3 (three) minutes if reasons are in the transmission grid (220 kV and above). Energy not supplied (ENS).
- Isolated systems: load shedding from 5% to 15% of load at the time of the incident. There is no minimal time duration of disconnection.

General remarks concerning reporting and incident analysis

Following information should be included in the reporting form to allow the elaboration of pan-European statistics. Those statistics will be used to produce an overview of the System Operation performance:

- Rough estimate of load disconnected (MW loss) and disconnection time duration;
- Eventually, rough estimate of:
 - Generation disconnected at different time intervals (MW loss) and disconnection time duration;
 - Frequency response at different time intervals (deviation, duration);
 - Secondary reserve properties and time duration within which there was a lack of reserves identified;
 - Voltage excursions (deviation, duration);
 - If Alert State was declared and time duration.
- General information regarding number and category of equipment concerned by the primary failure (e.g.: 220kV circuit breakers, 330kV overhead lines, HVDC link, 400kV tie-lines, transformers...);
- Global description at different time intervals of cross-border transfer capacity impact and/or consequences on market operation (capacity calculation, security assessment, etc).

Prioritization for dominating criterion characterization

- This criterion is defined on priority number 1 in case more than one criterion on Scale 1 is identified for a same disturbance.
- This criterion will always dominate other Scale 1 criteria.

3.4.3 Scale 1 Criteria #2 – Disturbance leading to frequency degradation (F1)Description

Steady State Frequency deviation: All events included in the range of the table 9 (see table below) must be reported and qualified as an **Alert State**.

After Time to Restore Frequency, if the Steady State Frequency Deviation is within half Maximum Steady State Frequency Deviation range and the Maximum Steady State Frequency Deviation mentioned in table 9, this event must be reported in Scale 1.

After Time to Restore Frequency, if the Steady State Frequency Deviation is above the Maximum Steady State Frequency Deviation mentioned in table 9, this event must be reported in Scale ≥ 2 (see § 3.5.3).

After Alert State Trigger Time, if the frequency deviation is larger than the Maximum Steady State Frequency Deviation, this event must be reported in Scale 1 (see § 3.4.3).

- Deterministic Frequency Deviation [2] has to be reported.
- All deviations of the frequency should be reported, even if there is no loss of generation. There could be the other reasons, e.g. driven by market activities, etc. deviation above the threshold is already an incident.
- Steady State Frequency Deviation in Synchronous Areas and Baltic Region has to be reported by:
 - Amprion for Synchronous Area Continental Europe (CE);
 - National Grid for Synchronous Area Great Britain (GB);
 - Eirgrid for Synchronous Area Ireland;
 - Svenska Kraftnät for Synchronous Area Northern Europe (NE);

- Augstsprieguma tīkls for Baltic Region.

Scale 0 - Normal State	Baltic Region	Continental Europe	Great Britain	Ireland	Northern Europe	Isolated system
Standard Frequency Range	50mHz	50mHz	200mHz	200mHz	100mHz	100mHz
50% of Maximum Steady State Frequency Deviation	200mHz	100mHz	250mHz	250mHz	250mHz	250mHz
Maximum Steady State Frequency Deviation	400mHz	200mHz	500mHz	500mHz	500mHz	500mHz
Time to Restore Frequency	15min	15min	10min	20min	15min	20min
Alert State Trigger Time	10min	5min	10min	10min	5min	10min

Table 9 - Scale 1 (Alert State) Steady State Frequency Deviation thresholds

General remarks concerning reporting and incident analysis

Following information should be included in the reporting form to allow the elaboration of pan-European statistics. Those statistics will be used to produce an overview of the System Operation performance:

- Frequency deviation in the range of the Scale 1 table 9 (\pm xx mHz) and, eventually, Time to Restore Frequency [2]:
 - If there is quick development of the imbalance which causes a discontinuity fluctuation of the frequency (e.g. trip of generation, HVDC, etc.) – the counting of time starts from a moment of incident;
 - If there is slow development of the imbalance which causes a continuous degradation of the frequency (load fluctuation for example) – the counting of time starts after frequency violates limits of Standard Frequency Range.
- Eventually, rough estimate:
 - Load disconnected (MW loss) and disconnection time duration if the figure is not included in the Scale 1 Events on load (L1) range;
 - Generation disconnected at different time intervals (MW loss);
 - Voltage excursions (deviation, duration);
 - Alert State time duration;
 - Frequency Restoration Reserve properties and time duration within which there was a lack of FRR identified.
- General information regarding number and category of equipment concerned by the primary failure;
- Global description at different time intervals of cross-border transfer capacity impact and/or consequences on market operation;
- The analysis of the incidents will be managed by:
 - SG SF for CE;
 - National Grid for GB;
 - Eirgrid for Ireland;
 - Svenska Kraftnät for NE;
 - Augstsprieguma tīkls for Baltic Region.

Prioritization for dominating criterion characterization

- This criterion is defined on priority number 2 in case more than one criterion on Scale 1 is identified for a same disturbance.

- This criterion will always be dominated by Events on load (L1) criterion.

3.4.4 Scale 1 Criteria #3 – Disturbance on transmission network equipment (T1)

Description

- Final tripping of grid equipment from Contingency List [1], other Exceptional Contingencies and Out-of-Range Contingencies (to be indicated in the report) with consequences on Responsibility Area or/and on capability of exchange (e.g. final tripping of tie-lines between Transmission System Operators or “internal” equipment of one Transmission System Operator limiting capacity for transits).

General remarks concerning reporting and incident analysis

Following information should be included in the reporting form to allow the elaboration of pan-European statistics. Those statistics will be used to produce an overview of the System Operation performance:

- General information regarding equipment concerned by the primary failure (e.g.: 220kV circuit breakers, 330kV overhead lines, HVDC link, 400kV tie-lines, transformers...);
- Number of equipment concerned by the primary failure and final tripping time duration;
- Eventually, rough estimate of
 - Generation disconnected and/or load disconnected (if not included in the Scale 1 Events on load (L1) table) at different time intervals (MW loss) and disconnection time duration;
 - Voltage excursions (deviation, duration);
 - If Alert State was declared and time duration;
 - Frequency Restoration Reserve properties and time duration within which there was a lack of FRR identified;
 - Frequency response at different time intervals if it is not included in the Scale 1 Frequency thresholds (F1) table.
- Global description at different time intervals of cross-border transfer capacity impact and/or consequences on market operation.

Prioritization for dominating criterion characterization

- This criterion is defined on priority number 3 in case more than one criterion on Scale 1 is identified for a same disturbance.
- This criterion will always be dominated by following Scale 1 criteria:
 - Events on load (L1),
 - Disturbance leading to frequency degradation (F1).

3.4.5 Scale 1 Criteria #4 – Disturbances on Power Generating Facilities (G1)

Description

- Unexpected reduction or disconnection from the grid of Power Generating Facilities connected to transmission network representing an output more important than biggest Power Generating Facility output on time period of 30 minutes (see table 10 below).

Scale 1 Alert State	Baltic Region	Continental Europe	Great Britain	Ireland	Northern Europe	Isolated system
Thresholds	from 450 MW	from 1500 MW	from 1800 MW	from 500 MW	from 1500 MW	Larger than the

	to 900 MW	to 3000 MW	to 3000 MW	to 850 MW	to 3000 MW	biggest unit.
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Table 10 - Thresholds for disturbances on Power Generating Facilities - Scale 1

- If a disturbance in a Power Generating Facility forces it to reduce feed-in into the transmission network by a certain percentage (<100%) of the momentarily scheduled feed-in, this event will have to be reported if the power thresholds are reached. Actually, this kind of generation reduction needs the same Frequency Containment Reserves and Frequency Restoration Reserves, so it has to be treated as disconnection of certain capacity.
- If in 30 minutes the loss of generation reaches the criteria it should be reported. If the criteria is reached immediately it should be reported even if it lasted shorter than 30 minutes.

General remarks concerning reporting and incident analysis

Following information should be included in the reporting form to allow the elaboration of pan-European statistics. Those statistics will be used to produce an overview of the system operation performance:

- Rough estimate of generation disconnected at different time intervals (MW loss) and disconnection time duration;
- Eventually, rough estimate of:
 - Load disconnected (MW loss) and disconnection time duration if the figure is not included in the Scale 1 Events on load (L1) range;
 - Frequency restoration Reserve properties and time duration within which there was a lack of FRR identified;
 - Voltage excursions (deviation, duration);
 - If Alert State was declared and time duration;
 - Frequency response at different time intervals if it is not included in the Scale 1 Frequency thresholds (F1) table.
- General information regarding number and category of equipment concerned by the primary failure;
- Global description at different time intervals of cross-border transfer capacity impact and/or consequences on market operation.

Prioritization for dominating criterion characterization

- This criterion is defined on priority number 4 in case more than one criterion on Scale 1 is identified for a same disturbance.
- This criterion will always be dominated by following Scale 1 criteria:
 - Events on load (L1),
 - Disturbance leading to frequency degradation (F1),
 - Disturbance on transmission network equipment (T1).

3.4.6 Scale 1 Criteria #5 – Degradation in operational conditions – N-1 violation (ON1)

Description

- At least one Contingency from the Contingency List can lead to deviations from Operational Security Limits, even after effects of Remedial Actions
- If after a Contingency the Transmission System is not compliant with the (N-1)-Criterion, the TSO shall initiate Remedial Actions to recover compliance with the (N-1)-Criterion as

soon as reasonably practicable. If there is a risk of a post-Contingency Disturbance propagation involving interconnected TSOs, the TSO shall initiate Remedial Actions as soon as possible. Non-compliance with the (N-1)-Criterion is acceptable:

- during switching sequences;
- as long as there are only Local consequences within the TSO's Responsibility Area; or
- during the time period required to activate the Remedial Actions.
- This criterion does not apply to isolated systems.

General remarks concerning reporting and incident analysis

Following information should be included in the reporting form to allow the elaboration of pan-European statistics. Those statistics will be used to produce an overview of the system operation performance:

- Description of the N-1 situation (transmission equipment concerned, Remedial Actions, identification of Out-of-Range Contingencies, etc.).
- Eventually, rough estimate of
 - Generation disconnected, if not included in the Scale 1 Events on Power Generating Facilities (G1) table) and/or load disconnected, if not included in the Scale 1 Events on load (L1) table at different time intervals (MW loss) and disconnection time duration;
 - Frequency response at different time intervals if it is not included in the Scale 1 Frequency thresholds (F1) table;
 - Voltage excursions (deviation, duration);
 - Alert State time duration;
 - Frequency Restoration Reserve properties and time duration within which there was a lack of FRR identified.
- General information regarding number and category of transmission equipment concerned by the primary failure (e.g.: 220kV circuit breakers, 330kV overhead lines, HVDC links, 400kV tie-lines, transformers, etc.);
- Global description at different time intervals of cross-border transfer capacity impact and/or consequences on market operation.

Prioritization for dominating criterion characterization

- This criterion is defined on priority number 5 in case more than one criterion on Scale 1 is identified for a same disturbance.
- This criterion will always be dominated by following Scale 1 criteria:
 - Events on load (L1),
 - Disturbance leading to frequency degradation (F1),
 - Disturbance on transmission network equipment (T1),
 - Disturbances on Power Generating Facilities (G1).

3.4.7 Scale 1 Criteria #6 – Degradation in operational conditions – Voltage (OV1)

Description

- After a grid disturbance, network node operated at steady state voltage outside the range defined in the tables 11 and 12 below [1] affecting at least 2 (two) Transmission System Operators within 15 minutes with the necessity to apply coordinated measures.
- This criterion does not apply to isolated systems.

Scale 1 Alert State	Baltic Region	Continental Europe	Great Britain	Ireland	Northern Europe
Thresholds	0.90 pu – 1.12 pu	0.90 pu – 1.118 pu	0.90 pu – 1.10 pu	0.90 pu – 1.118 pu	0.90 pu – 1.05 pu
Time duration	Unlimited				

Table 11 - Voltage ranges for reference voltages between 110 kV to 300 kV (excluding)

Scale 1 Alert state	Baltic Region	Continental Europe	Great Britain	Ireland	Northern Europe
Thresholds	0.90 pu – 1.10 pu	0.90 pu – 1.05 pu			
Time duration	Unlimited				

Table 12 - Voltage ranges for reference voltages between 300 kV to 400 kV (excluding)General remarks concerning reporting and incident analysis

- Description of the situation (transmission equipment concerned, Remedial Actions).
- Eventually, rough estimate of:
 - Generation disconnected, if not included in the Scale 1 Events on Power generating Facilities (G1) table and/or load disconnected, if not included in the Scale 1 Events on load (L1) table at different time intervals (MW loss) and disconnection time duration;
 - Voltage excursions (deviation, duration).
 - If Alert State was declared and time duration;
 - Frequency Restoration Reserve properties and time duration within which there was a lack of FRR identified;
 - Frequency response at different time intervals (deviation, duration) if the figure is not included in the Scale 1 Frequency thresholds (F1) table.
- General information regarding number and category of transmission equipment concerned by the primary failure;
- Global description at different time intervals of cross-border transfer capacity impact and/or consequences on market operation.

Prioritization for dominating criterion characterization

- This criterion is defined on priority number 6 in case more than one criterion on Scale 1 is identified for a same disturbance.
- This criterion will always be dominated by following Scale 1 criteria:
 - Events on load (L1),
 - Disturbance leading to frequency degradation (F1),
 - Disturbance on transmission network equipment (T1),
 - Disturbances on generation facilities (G1),
 - N-1 violation (ON1).

3.4.8 Scale 1 Criteria #7 – Degradation in operational conditions – Lack of reserve (OR1)Description

- Lack of more than 20% of Frequency Restoration Reserve capacity [2] on a control area for at least 30 minutes for all areas.

- The number of events leading to degradation in system operation conditions due to lack of Active Power Reserves (Indicator OPS 3 [3]).
- It is assumed that the evaluation of the lack of reserves could constitute an issue in itself because the reserves are restored after some time after the incident and during that time the Transmission System Operators do not have enough reserves. To report those events, Transmission System Operators will act according the existing rules (regional, national grid codes or agreements) and if the reserves are restored according the existing rules, Transmission System Operators don't have to report the temporal lack of reserves.

General remarks concerning reporting and incident analysis

Following information should be included in the reporting form to allow the elaboration of pan-European statistics. Those statistics will be used to produce an overview of the system operation performance:

- Rough estimate of Frequency Restoration Reserve properties and time duration within which there was a lack of reserves identified;
- Eventually, rough estimate of:
 - Rough estimate of loss of generation, if not included in the Scale 1 Events on generation facilities (G1) table, and/or load, if not included in the Scale 1 Events on load (L1) table disconnected at different time intervals (MW loss) and disconnection time duration;
 - Frequency response at different time intervals if it is not included in the Scale 1 Frequency thresholds (F1) table;
 - Voltage excursions (deviation, duration);
 - Alert state time duration;
 - Frequency Restoration Reserve properties and time duration within which there was a lack of FRR identified.
- General information regarding number and category of transmission equipment concerned by the primary failure (e.g.: 220kV circuit breakers, 330kV overhead lines, HVDC links, 400kV tie-lines, transformers, etc.);
- Global description at different time intervals of cross-border transfer capacity impact and/or consequences on market operation.

Prioritization for dominating criterion characterization

- This criterion is defined on priority number 7 in case more than one criterion on Scale 1 is identified for a same disturbance.
- This criterion will always be dominated by following Scale 1 criteria:
 - Events on load (L1),
 - Disturbance leading to frequency degradation (F1),
 - Disturbance on transmission network equipment (T1),
 - Disturbances on generation facilities (G1),
 - N-1 violation (ON1),
 - Voltage (OV1).

3.4.9 Scale 1 Criteria #8 – Degradation in operational conditions – Loss of tools and facilities (LT1)

Description

- The TSO has a complete loss of one or more tools and facilities for more than 30 minutes. If all the tools and facilities are lost, this event must be reported in Scale 2 criteria 7 (paragraph 3.5.8). The referred tools and facilities are:
 - Facilities for monitoring the system State of the Transmission System, including State Estimation applications;
 - Means for controlling switches;
 - Means of communication with control centres of other TSOs;
 - Tools for Operational Security Analysis.

General remarks concerning reporting and incident analysis

Following information should be included in the reporting form to allow the elaboration of pan-European statistics. Those statistics will be used to produce an overview of the System Operation performance:

- If Alert State was declared and time duration;
- Origin of the fault (software bug, hardware failure, loss of data lines, ...);
- List of measures which have been activated to cope with the disturbance;
- General information regarding number and category of equipment concerned by the primary failure;
- Global description at different time intervals of cross-border transfer capacity impact and/or consequences on market operation.

Prioritization for dominating criterion characterization

- This criterion is defined on priority number 8 in case more than one criterion on Scale 1 is identified for a same disturbance.
- This criterion will always be dominated by following Scale 1 criteria:
 - Events on load (L1),
 - Disturbance leading to frequency degradation (F1),
 - Disturbance on transmission network equipment (T1),
 - Disturbances on generation facilities (G1),
 - N-1 violation (ON1),
 - Voltage (OV1),
 - Lack of reserve (OR1).

3.5 Scale 2 definitions

Scale 2 (extensive incidents) is assigned to Wide Area regional events (beyond both responsibility and national areas) due to extensive incidents. The primary failure may lead to:

- Degradation of system Adequacy with the necessity to activate at least one measure of the System Defence Plan [1].
- Operational disturbance on a regional scale with N-1 violation or load shedding reported on two Transmission System Operators or more.

If TSO announces the Emergency State [1], it should be based on any criteria in Scale 2.

Scale 2 counts seven criteria.

3.5.1 Scale 2 Criteria general overview

The following definitions are presented corresponding to Scale 2 priority order.

Criterion short code	Priority	Criteria short definition
L2	1	Events on load
F2	2	Disturbance leading to frequency degradation
T2	3	Disturbance on transmission network equipment
G2	4	Disturbances on Power Generating Facilities
ON2	5	N violation
RS2	6	Separation from the grid
LT2	7	Loss of tools and facilities

Table 13 - Scale 2 Criteria general overview

3.5.2 Scale 2 Criteria #1 – Events on load (L2)

Description

- All Synchronous Areas and Baltic Region: disconnection of load representing from 10 to 50% of actual load before the time of the incident (MW) for at least 3 (three) minutes if reasons are in the transmission grid (220 kV and above). Energy not supplied (ENS).
- Isolated systems: load shedding from 15% to 70% of load at the time of the incident. There is no minimal time duration of disconnection.

General remarks concerning reporting and incident analysis

Following information should be included in the reporting form to allow the elaboration of pan-European statistics. Those statistics will be used to produce an overview of the System Operation performance:

- Rough estimate of load disconnected (MW loss) and disconnection time duration;

- List of System Defence Plan measures which have been activated to cope with the disturbance;
- Eventually, rough estimate of:
 - Generation disconnected at different time intervals (MW loss) and disconnection time duration;
 - Frequency response at different time intervals (deviation, duration);
 - Frequency Restoration Reserve properties and time duration within which there was a lack of FRR identified;
 - Voltage excursions (deviation, duration);
 - Emergency State time duration.
- General information regarding number and category of transmission equipment concerned by the primary failure (e.g.: 220kV circuit breakers, 330kV overhead lines, HVDC link, 400kV tie-lines, transformers, etc.);
- Global description at different time intervals of cross-border transfer capacity impact and/or consequences on market operation (capacity calculation, security assessment, etc).

Prioritization for dominating criterion characterization

- This criterion is defined on priority number 1 in case more than one criterion on Scale 2 is identified for a same disturbance.
- This criterion will always dominate others Scale 2 criteria.

3.5.3 Scale 2 Criteria #2 – Disturbance leading to frequency degradation (F2)

Description

Steady State Frequency Deviation: all events included in the range of the table 14 [2] must be reported.

After Time to Restore Frequency: if the frequency deviation is above the Maximum Steady State Frequency Deviation range mentioned in table 14, this event must be reported in Scale 2:

- Deterministic frequency deviation [2] has to be reported.
- All deviations of the frequency should be reported, even if there is no loss of generation. There could be the other reasons, e.g. driven by market activities, etc. deviation above the threshold is already an incident.
- Steady State Frequency Deviation in Synchronous Areas and Baltic Region has to be reported by:
 - Amprion for Synchronous Area Continental Europe (CE);
 - National Grid for Synchronous Area Great Britain (GB);
 - Eirgrid for Synchronous Area Ireland;
 - Svenska Kraftnät for Synchronous Area Northern Europe (NE);
 - Augstsprieguma tīkls for Baltic Region.

Scale 2 / Emergency State	Baltic Region	Continental Europe	Great Britain	Ireland	Northern Europe	Isolated system
Maximum Steady State Frequency Deviation range	>400mHz	>200mHz	>500mHz	>500mHz	>500mHz	>500mHz
Time to Restore Frequency	15min	15min	10min	20min	15min	20min

Table 14 - Scale 2 (Emergency State) Steady State Frequency Deviation thresholds

General remarks concerning reporting and incident analysis

Following information should be included in the reporting form to allow the elaboration of pan-European statistics. Those statistics will be used to produce an overview of the system operation performance:

- Frequency deviation in the range of the Scale 2 table 14 ($\pm xx$ mHz) and, eventually, Time to Restore Frequency [2]:
 - If there is quick development of the imbalance which causes a discontinuity fluctuation of the frequency (e.g. trip of generation, HVDC, etc.) – the counting of time starts from a moment of incident;
 - If there is slow development of the imbalance which causes a continuous degradation of the frequency (load fluctuation for example) – the counting of time starts after frequency violates limits of Standard Frequency Range.
- List of System Defence Plan measures which have been activated.
- Eventually, rough estimate of:
 - Generation and/or load, if the figure is not included in the Scale 2 Events on load (L2) or Events on Power Generating Facilities (G2), disconnected (MW loss) and disconnection time duration;
 - Frequency Restoration Reserve properties and time duration within which there was a lack of FRR identified;
 - Emergency State time duration;
 - Voltage excursions (deviation, duration).
- General information regarding number and category of transmission equipment concerned by the primary failure;
- Global description at different time intervals of cross-border transfer capacity impact and/or consequences on market operation;
- The analysis of the incidents will be managed by:
 - SG SF for CE;
 - National Grid for GB;
 - Eirgrid for Ireland;
 - Svenska Kraftnät for NE;
 - Augstsprieguma tīkls for Baltic Region.

Prioritization for dominating criterion characterization

- This criterion is defined on priority number 2 in case more than one criterion on Scale 2 is identified for a same disturbance.
- This criterion will always be dominated by Events on load (L2) criterion.

3.5.4 Scale 2 Criteria #3 – Disturbance on transmission network equipment (T2)

Description

- Final tripping of grid equipment (including HVDC links) from Contingency List [1], other Exceptional Contingencies and Out-of-Range Contingencies (to be indicated in the report) with Wide Area consequences on regional level (i.e. beyond both Responsibility Area and national) with necessity to activate at least one measure of the System Defence Plan [1].
- This criterion does not apply to isolated systems.

General remarks concerning reporting and incident analysis

Following information should be included in the reporting form to allow the elaboration of pan-European statistics. Those statistics will be used to produce an overview of the system operation performance:

- General information regarding transmission equipment concerned by the primary failure (e.g.: 220kV circuit breakers, 330kV overhead lines, HVDC link, 400kV tie-lines, transformers, etc.);
- Number of transmission equipment concerned by the primary failure and final tripping time duration;
- List of System Defence Plan measures which have been activated to cope with the disturbance;
- Eventually, rough estimate of:
 - Generation and/or load, if the figure is not included in the Scale 2 Events on load (L2) or Events on Power Generating Facilities (G3), disconnected (MW loss) and disconnection time duration;
 - Voltage excursions (deviation, duration);
 - Emergency State time duration;
 - Frequency Restoration Reserve properties and time duration within which there was a lack of FRR identified;
 - Frequency response at different time intervals if it is not included in the Scale 2 Frequency thresholds (F2) table.
- Global description at different time intervals of cross-border transfer capacity impact and/or consequences on market operation.

Prioritization for dominating criterion characterization

- This criterion is defined on priority number 3 in case more than one criterion on Scale 2 is identified for a same disturbance.
- This criterion will always be dominated by following Scale 2 criteria:
 - Events on load (L2),
 - Disturbance leading to frequency degradation (F2).

3.5.5 Scale 2 Criteria #4 – Disturbances on Power Generating Facilities (G2)

Description

- Unexpected reduction or disconnection from the grid of Power Generating Facilities connected to transmission network representing an output more important than biggest Power Generating Facility output on time period of 30 minutes leading to degradation of system Adequacy.

Scale 2 Emergency State	Baltic Region	Continental Europe	Great Britain	Ireland	Northern Europe	Isolated system
Thresholds	> 900 MW	> 3000 MW	> 3000 MW	> 850 MW	> 3000 MW	power plant with the biggest units in the system

Table 15 - Thresholds for disturbances on generation facilities - Scale 2

General remarks concerning reporting and incident analysis

Following information should be included in the reporting form to allow the elaboration of pan-European statistics. Those statistics will be used to produce an overview of the system operation performance:

- Rough estimate of generation disconnected at different time intervals (MW loss) and disconnection time duration;
- List of System Defence Plan measures which have been activated to cope with the disturbance;
- Eventually, rough estimate of:
 - Load disconnected (MW loss) and disconnection time duration if the figure is not included in the Scale 2 Events on load (L2) range;
 - Emergency State time duration;
 - Voltage excursions (deviation, duration);
 - Frequency response at different time intervals if it is not included in the Scale 2 Frequency thresholds (F2) table;
 - Frequency Restoration Reserve properties and time duration within which there was a lack of FRR identified.
- General information regarding number and category of transmission equipment concerned by the primary failure;
- Global description at different time intervals of cross-border transfer capacity impact and/or consequences on market operation.

Prioritization for dominating criterion characterization

- This criterion is defined on priority number 4 in case more than one criterion on Scale 2 is identified for a same disturbance.
- This criterion will always be dominated by following Scale 2 criteria:
 - Events on load (L2),
 - Disturbance leading to frequency degradation (F2),
 - Disturbance on transmission network equipment (T2).

3.5.6 Scale 2 Criteria #5 – Degradation in operational conditions – N violation (ON2)

Description

- There is at least one Wide Area deviation from Operational Security Limits after effects of Remedial Actions.
- This criterion does not apply to isolated systems.

General remarks concerning reporting and incident analysis

Following information should be included in the reporting form to allow the elaboration of pan-European statistics. Those statistics will be used to produce an overview of the system operation performance:

- Description of the N situation (transmission equipment concerned, Remedial Actions, identification of Out of Range Contingencies, etc.).
- Eventually, rough estimate of:
 - Generation disconnected, if not included in the Scale 2 Events on Power Generating Facilities (G2) table, and/or load disconnected, if not included in the Scale 2 Events on load (L2) table, at different time intervals (MW loss) and disconnection time duration;
 - Frequency response at different time intervals, if it is not included in the Scale 2 Frequency thresholds (F2) table;
 - Voltage excursions (deviation, duration);
 - Emergency State time duration;

- Frequency Restoration Reserve properties and time duration within which there was a lack of FRR identified.
- General information regarding number and category of transmission equipment concerned by the primary failure (e.g.: 220kV circuit breakers, 330kV overhead lines, HVDC links, 400kV tie-lines, transformers, etc.).
- Global description at different time intervals of cross-border transfer capacity impact and/or consequences on market operation.

Prioritization for dominating criterion characterization

- This criterion is defined on priority number 5 in case more than one criterion on Scale 2 is identified for a same disturbance.
- This criterion will always be dominated by following Scale 2 criteria:
 - Events on load (L2),
 - Disturbance leading to frequency degradation (F2),
 - Disturbance on transmission network equipment (T2),
 - Disturbances on Power Generating Facilities (G2).

3.5.7 Scale 2 Criteria #6 – Reliability Degradation – Separation from the grid (RS2)

Description

- System disturbance leading to separation of a significant part from the grid representing at least one Transmission System Operator Responsibility Area.
- This criterion does not apply to isolated systems.

General remarks concerning reporting and incident analysis

Following information should be included in the reporting form to allow the elaboration of pan-European statistics. Those statistics will be used to produce an overview of the System Operation performance:

- Description of the grid separation (number of substations, rough estimate of load/generation separated (MW)).
- List of System Defence Plan measures which have been activated to cope with the disturbance.
- Eventually, rough estimate of:
 - Load, if the figure is not included in the Scale 2 Events on load (L2) range, disconnected (MW loss) and disconnection time duration;
 - Emergency State time duration;
 - Frequency response at different time intervals if it is not included in the Scale 2 Frequency thresholds (F2) table;
 - Frequency Restoration Reserve properties and time duration within which there was a lack of FRR identified;
 - Voltage excursions (deviation, duration).
- General information regarding number and category of transmission equipment concerned by the primary failure;
- Global description at different time intervals of cross-border transfer capacity impact and/or consequences on market operation.

Prioritization for dominating criterion characterization

- This criterion is defined on priority number 6 in case more than one criterion on Scale 2 is identified for a same disturbance.
- This criterion will always be dominated by following Scale 2 criteria:
 - Events on load (L2),
 - Disturbance leading to frequency degradation (F2),
 - Disturbance on transmission network equipment (T2),
 - Disturbances on Power Generating Facilities (G2),
 - N violation (ON2).

3.5.8 Scale 2 Criteria #7 – Loss of tools and Facilities (LT2)

Description

- The TSO has a complete loss of all tools and facilities for more than 30 minutes. The referred tools and facilities are:
 - Facilities for monitoring the system State of the Transmission System, including State Estimation applications;
 - Means for controlling switches;
 - Means of communication with control centres of other TSOs;
 - Tools for Operational security Analysis.

General remarks concerning reporting and incident analysis

Following information should be included in the reporting form to allow the elaboration of pan-European statistics. Those statistics will be used to produce an overview of the System Operation performance:

- Emergency State time duration;
- Origin of the fault (software bug, hardware failure, loss of data lines, ...);
- List of System Defence Plan measures which have been activated to cope with the disturbance;
- Eventually, rough estimate of:
 - Load, if the figure is not included in the Scale 2 Events on load (L2) range, disconnected (MW loss) and disconnection time duration;
 - Frequency response at different time intervals if it is not included in the Scale 2 Frequency thresholds (F2) table;
 - Frequency Restoration Reserve properties and time duration within which there was a lack of FRR identified;
 - Voltage excursions (deviation, duration).
- General information regarding number and category of transmission equipment concerned by the primary failure;
- Global description at different time intervals of cross-border transfer capacity impact and/or consequences on market operation.

Prioritization for dominating criterion characterization

- This criterion is defined on priority number 7 in case more than one criterion on Scale 2 is identified for a same disturbance.
- This criterion will always be dominated by following Scale 2 criteria:
 - Events on load (L2),
 - Disturbance leading to frequency degradation (F2),

- Disturbance on transmission network equipment (T2),
- Disturbances on Power Generating Facilities (G2),
- N violation (ON2),
- Separation from the grid (RS2).

3.6 Scale 3 definitions

Scale 3 is assigned to major Wide Area events.

After the incident occurs, the system is in Blackout State [1].

Scale 3 counts only one criterion which is Blackout (OB3).

Description

- At least one TSO declares a Blackout State [1];
- This criterion does not apply to isolated systems.

OR

- All Synchronous Areas and Baltic Region: loss of more than 50% of load at the time of the incident or total absence of voltage for at least 3 minutes in the system and triggering restoration plans.
- For isolated systems: 70% of load (load-shedding) at the time of the incident or total shut down.

General remarks concerning reporting and incident analysis

Following information should be included in the reporting form to allow the elaboration of pan-European statistics. Those statistics will be used to produce an overview of the system operation performance:

- Description of the grid collapse (number of substations, rough estimate of load/generation disconnected (MW));
- List of System Defence Plan measures which have been activated to cope with the disturbance;
- Eventually:
 - If data available, rough estimate of Frequency Restoration Reserve properties and time duration within which there was a lack of FRR identified;
 - Blackout State time duration;
 - General information regarding number and category of transmission equipment concerned by the primary failure (e.g.: 220kV circuit breakers, 330kV overhead lines, HVDC links, 400kV tie-lines, transformers, etc.);
 - Global description at different time intervals of cross-border transfer capacity impact and/or consequences on market operation (capacity calculation, security assessment, etc);
- Overview of the system response:
 - Description of frequency response at different time intervals before collapse (deviation, duration);
 - Description of voltage excursions before collapse (deviation, duration);
 - If data available, rough estimate of generation disconnected at different time intervals (MW loss).

4. Pan-European reports

The European-wide Incidents Classification Scale will allow ENTSO-E and Transmission System Operators each year to draw up an ICS Annual Report, with figures and qualitative analysis, producing an overview of the system operation performance. It will represent a real opportunity for Synchronous Areas, Baltic Region and isolated systems to characterize main issues and to identify ways of progress. Therefore, the ENTSO-E annual report shall, at least, contain the following information:

- Operational Security Performance Indicators per Synchronous Area, Baltic Region, isolated systems, or any other geographical region according thresholds of levels 1-3:
 - Number of tripped transmission system elements;
 - Number of tripped Power Generating Facilities per year;
 - Energy [MWh] of disconnected Demand Facilities per year;
 - Time duration of being in Operational States other than Normal State (Alert, Emergency, Blackout);
 - Time duration and number of events (indicator OPS 3 [3]) within which there was a lack of reserves identified;
 - Voltage deviation exceeding the voltage thresholds for Emergency State;
 - Frequency deviation per Synchronous Area;
 - Number of system-split separations or local blackouts;
 - Number of blackouts involving two or more TSOs.
- Explanation of reasons of incidents at the Operational Security Ranking Scales 2 and 3;
- A number of events in which an incident contained in the Contingency List [1] led to a degradation of system operation conditions (Indicator OPS 1A [3]);
- A number of events counted by indicator OPS 1A in which a degradation of system operation conditions occurred as a result of unexpected discrepancies of demand or Generation forecasts (indicator OPS 1B [3]);
- A number of events in which there was a degradation in system operation conditions due to an Out-of-Range Contingency (Indicator OPS 2A [3]);
- A number of events counted by indicator OPS 2A in which a degradation of system operation conditions occurred as a result of unexpected discrepancies of demand or Generation forecasts (indicator OPS 2B [3]).

5. Incident analysis

5.1 Use of information included in the reporting form

Each time a new disturbance is recorded (no matter its scale of gravity), it is important to provide the available information that should lead to a quick evaluation of the system response.

For instance, if the Transmission System Operator is able to provide general comments about category of equipment concerned by the primary failure while recording Scale 0 event on load (L0), then, it will be possible to elaborate pan-European statistics about availability of transmission system elements and its consequences on massive disconnections of load.

The information provided by the Transmission System Operator by filling “Comments” and “Origin Fault” templates will be used to elaborate pan-European statistics. Then, while producing the annual pan-European report, ENTSO-E will use those statistics to produce an overview of the system operation performance:

In the future, ENTSO-E will accumulate enough lessons to bring decisive improvements for any activities conducted by Transmission System Operators prior to real time operation:

- Classification of both high and low impact disturbances to isolate key issues;
- Communication among Transmission System Operators with the definition of a proper organization to pave the way for incorporating key lessons in processes;
- Incorporation of lessons learnt into process assets and feedbacks.

5.2 Ex-post analysis and detailed reports

We can assume that the information recorded in the reporting form won't always be sufficient to perform a correct evaluation of the system response.

Consequently, it is very important to determine the right Scale to launch ex-post disturbance analysis. The main objective is to ensure that all the incidents which significantly have affected the integrity of interconnected system operations are analyzed.

The investigation procedure aims at defining:

- Agreed criteria to decide specific ex-post analysis;
- The data needed to run ex-post analysis;
- The items to be dealt with;
- The organization to perform ex-post analysis;
- Main milestones about the realization of ex-post analysis.

5.2.1 Scale 0 events

The events related to Scale 0 have very low effect on reliability (the primary failure may have very low security influence and/or low market influence consequences) so there is no obligation to run specific analysis on those events.

This Scale 0 was created to allow ENTSO-E to run statistic analysis and Transmission System Operators to report events for internal purposes.

5.2.2 Scale 1 events

The events related to Scale 1 don't affect significantly the integrity of interconnected system operations so there is no obligation to perform ex-post analysis.

Ex-post analysis will only be realized in case of decision of TSO, Coordinated System Operation or any type of working group dedicated on operating issues, Regional Group or SOC. For those types of disturbances investigation procedures and information sharing have been simplified:

- Relevant information will be shared among Transmission System Operators by using the reporting tool.
- In case of decision to launch ex-post analysis is taken by Transmission System Operators, a shortened Report (one A4 sheet describing factual, actions, anomalies and learning) will be prepared by impacted Transmission System Operators to join the yearly report.

5.2.3 Scale 2 and Scale 3 events

All the incidents ranked **on Scale 2 and 3** have to be analyzed following the following procedure: A typically detailed report will be prepared by expert panel composed of impacted Transmission System Operators representatives.

5.3 Investigation procedure for detailed reports production

5.3.1 Expert panel appointment

An expert panel is appointed to perform the ex-post analysis, based on a Transmission System Operators (or working group dedicated on operating issues) proposal, and approved by Transmission System Operators representatives according to the area impacted.

In case Transmission System Operators are asked for quick answers from their regulator or stakeholders, they will report the ENTSO-E System Operation Committee this need to accelerate the process of expert panel definition.

- This expert panel will have to include people from Transmission System Operators impacted by the disturbance.
- The leadership of the expert panel will have to include to be given to a Transmission System Operator which is not involved in the disturbance, to ensure a neutral leadership.

5.3.2 Data collection

To perform relevant analysis, the expert panel will have to collect data. A questionnaire, prepared by the expert panel will be delivered to concerned Transmission System Operators to require all the information needed:

- Ex-ante data (DACF, D2CF...),
- Real time snapshots,
- Measurements from SCADA or equipment in substation (behaviour of protections + actions of SPS, automation, PMU WAMS...),
- Phone calls, translated in English (depending on legal or confidentiality barriers),
- Other related data and information.

5.3.3 Factual report

After collecting the data, the expert panel realizes a **factual (or preliminary) report**. This factual report aims at providing a very clear understanding of main causes a clear description of disturbance (situation ahead and after), preliminary evaluation of activities of dispatchers and functioning of equipment (according to interviews of people involved).

All the parties involved must approve this report, before performing analysis and proposing actions plan (analysis report).

5.3.4 Final report

The **analysis (or final) report** will include conclusions and recommendations (actions plan, lesson learned) related both to technical and “human behaviour” aspects. The method used to analyze disturbances should be based on well-known method such as “causes tree” method. This final report is approved by each Transmission System Operator then presented to ENTSO-E System Operation Committee.

5.3.5 Publication

Any information should not be communicated out of ENTSO-E prior to agreement. Publication issues will be dealt with ENTSO-E System Operation Committee.

5.3.6 Incidents analysis planning overview

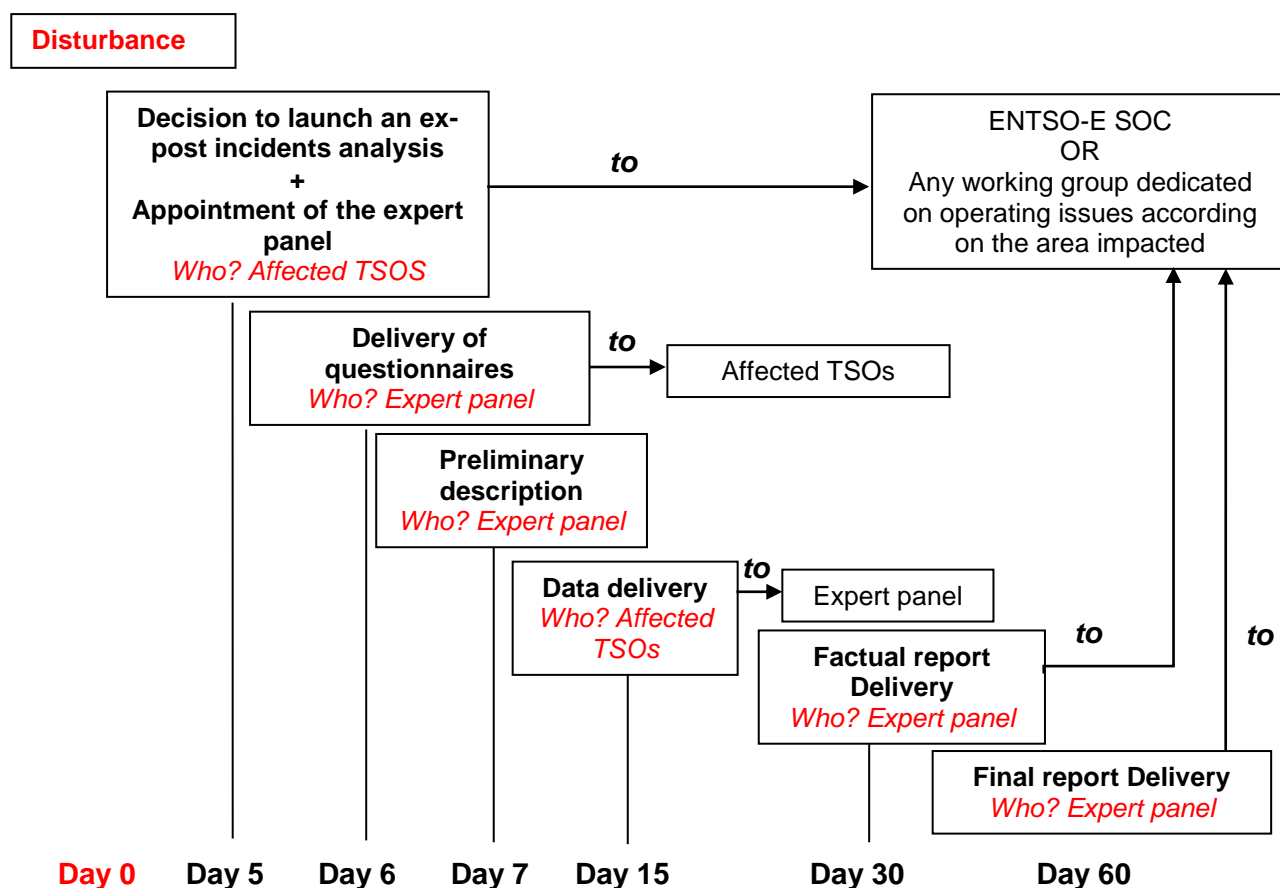


Figure 1 - Investigation procedure

The following planning gives guidelines for setting milestones in case ex-post analysis is needed:

- **Day 0 : The disturbance occurs**

As soon as possible a short report is sent by e-mail by each affected Transmission System Operators to ENTSO-E System Operation Committee or any working group dedicated on operating issues according on the area impacted.

- **Between Day 1 and Day 5: Official decision to launch an ex-post incidents analysis and appointment of the expert panel (including the leader)**

- Each affected Transmission System Operators send its proposal to ENTSO-E System Operation Committee or any working group dedicated on operating issues according on the area impacted.
- In the same time, each affected Transmission System Operator record the disturbance in the reporting tool.
- On this occasion, as an ex-post analysis is needed, the due date for reporting has to be anticipated. Therefore, each affected Transmission System Operator upload will upload the reporting file into ENTSO-E extranet workspace before Day 5 after the disturbance.

- **Between Day 1 and Day 6: Delivery of questionnaires**

The questionnaires are sent by the Expert panel to each impacted Transmission System Operators.

- **Between Day 1 and Day 7: Preliminary description of the incident prepared**

By using the reporting files uploaded by impacted Transmission System Operators, the expert panel prepares a preliminary description.

- **Between Day 1 and Day 15: additional data and information, asked by the expert panel, are delivered by requested Transmission System Operators.**

- **Between Day 1 and Day 30 (1 month) after the disturbance: Factual report Delivery**

The factual report (which identifies original faults) is delivered to Transmission System Operators, ENTSO-E System Operation Committee or/and any working group dedicated on operating issues according on the area impacted for approval and further decision.

- **Between Day 1 and Day 60 (2 months) after the disturbance: Final report delivery**

The final report is delivered to Transmission System Operators, ENTSO-E System Operation Committee or/and any working group dedicated on operating issues according on the area impacted for approval.