European Network of
Transmission System Operators
for Electricity

INCIDENTS CLASSIFICATION SCALE METHODOLOGY

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AD HOC TEAM INCIDENTS CLASSIFICATION SCALE
UNDER SYSTEM OPERATION COMMITTEE

Tables

Figures

Revisions

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

References and related documents

- [1] Operational Security Network Code
- [2] Load-Frequency Control and Reserve Network Code
- Incidents Classification Scale Guidelines

Change request

Each TSO can submit the proposal to change or supplement the Incidents Classification Scale Guidelines 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 could have to 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 end 2013, disturbances recording and reporting will be based on the use of 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**.

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 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.

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 Ranking rules overview

Disturbances ranking depends on the importance of the disturbance and could be divided into following steps.

- **Step 1: Identification of the various items defining the current event;**
- **Step 2: Classification of the event by choosing the most important one;**
- **Step 3: Recording in the Reporting tool by filling templates.**

2.4 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 have 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).

2.5 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, this final incident classification will only be possible after information collect between Transmission System Operators, incidents with affection to more than one TSO. 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). 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 6):

- **Scale 0** (normal state) for anomaly.
- **Scale 1** (alert state) for noteworthy disturbances.
- **Scale 2** (emergency state) for extensive incidents.
- **Scale 3** (blackout state) for widespread 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)**
#16	Events on load (L0)	**#8**	Events on load (L1)	**#2**	Events on load (L2)	#1 Black out (OB3)
#17	Disturbance leading to frequency degradation (F0)	**#9**	Disturbance leading to frequency degradation (F1)	**#3**	Disturbance leading to frequency degradation (F2)	
#18	Disturbance on Transmission Network equipments (T0)	**#10**	Disturbance on Transmission Network equipments (T1)	**#4**	Disturbance on Transmission Network equipments (T2)	
#19	Disturbances on generation facilities (G0)	**#11**	Disturbances on generation facilities (G1)	**#5**	Disturbances on generation facilities (G2)	
#20	Violation of standards on voltage (OV0)	**#12**	N-1 violation (ON1)	**#6**	Separation from the grid (RS2)	
		#13	Violation of standards on voltage (OV1)	**#7**	Emergency State (OE2)	
		#14	Lack of Reserve (OR1)			
		#15	Alert State (OA1)			

Table 1 - Incidents Classification Scale overview

3.2 Criteria prioritization

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

Lowest priority																			Highest priority
20	19	18	17	16	15	14	13	12	11	10	9	8	7	9	5	4	3	2	1
OV0	G0	T0	F0	L0	OA1	OR1	OV1	ON1	G1	T1	F1	L1	OE2	RS2	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 a normal state [1].

- Scale 0 counts five criteria.

- The following definitions are presented corresponding to scale 0 priority order.

3.3.1 Scale 0 criteria general overview

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 equipments**
G0	**4**	**Disturbances on generation 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 regions except isolated systems*: disconnection of load from 1 to 5% 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). The estimate of load disconnected (MW) is defined as :

$$\frac{\text{Energy Not Supplied (ENS)}}{\text{Event time duration}}$$

  - 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 equipments concerned by the primary failure (e.g.: 220kV circuit breakers, 330kV overhead lines, HVDC link, 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 [2] (see table below) must be reported and qualified as a Normal State :

  After *time to restore frequency*, if the frequency deviation is below the *maximum steady state frequency deviation range* mentioned in table 4, this event is not reported.

  After *time to restore frequency*, if the frequency deviation is in the *maximum steady state frequency deviation range* mentioned in table 4, this event must be reported in scale 0.

  After *time to restore frequency*, if the frequency deviation is above the *maximum steady state frequency deviation range* mentioned in table 4, this event must be reported in scale ≥1 (see § 3.4.3, table 10)

  - All steady-state frequency deviation 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 has to be reported by all Transmission System Operators even if the cause for the deviation is located on other Transmission System Operator Responsibility Area.
  - Deterministic Frequency Deviation [2] has to be reported.

Scale 0 - Normal state	Baltic	Cont.Europe	Gr.Britain	Ireland	Nordic	Isolated system
Standard frequency range	50mHz	50mHz	200mHz	200mHz	100mHz	100mHz
Maximum Steady State Frequency deviation range	50mHz to <100mHz	50mHz to <100mHz	200Mhz to <250mHz	200mHz to <250mHz	100mHz to <250mHz	100mHz to <250mHz
Time to restore frequency	15min	15min	10min	20min	20min	20min

Table 4 - Scale 0 ("normal state") frequency thresholds for steady-state frequency deviation

- 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 (± xx mHz) and, eventually, Time To Restore Nominal Frequency [2];
  - 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* range;
    - Generation disconnected at different time intervals (MW loss) and disconnection time duration;
    - Voltage excursions (deviation, duration);
  - General information regarding number and category of equipments concerned by the primary failure (e.g.: 220kV circuit breakers, 330kV overhead lines, HVDC link, 400kV tie-lines, transformers...).

- 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 equipments (T0)

- Description
  - Final tripping of grid equipment from Contingency List [1], 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 equipments concerned by the primary failure (e.g.: 220kV circuit breakers, 330kV overhead lines, HVDC link, 400kV tie-lines, transformers...);
  - Number of equipments 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* 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* 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 a 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 generation facilities (G0)

- Description
  - Unexpected reduction or Disconnection from the grid of power plant 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 with the thresholds defined for each synchronous area (from a minimal threshold defined specifically for each synchronous area to the tripping of the most important power station in the Transmissions System Operator area).

Scale 0 Normal state	Baltic	Continental Europe	Great Britain	Ireland	Nordic	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 plant has just to reduce scheduled feed-in or to stop it completely.
  - Failure of several power plants or generation units (in overlapping periods of time) is considered combined.
  - If a disturbance in a power plant 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* range;
    - Voltage excursions (deviation, duration)
    - Frequency response at different time intervals (deviation, duration) if it is not included in the scale 0 *Frequency thresholds* table.
  - General information regarding number and category of equipments 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 equipments* (T0).

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

- Description
  - *All regions except isolated systems*: After a grid disturbance, network node operated at steady-state voltage outside the range defined in the tables below [1] affecting 1 (one) Transmission System Operators within 15 minutes.

Scale 1 Alert state	Baltic	Continental Europe	Great Britain	Ireland	Nordic
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	Nordic
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 System: Network node operated at voltage exceeding voltage ±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* range;
    - Generation disconnected (MW loss) if it is not included in the scale 0 *Disturbances on generation facilities* range;
    - Frequency response at different time intervals (deviation, duration) if it is not included in the scale 0 *Frequency thresholds* table;
  - Eventually, general information regarding number and category of equipments concerned by the primary failure (e.g.: 220kV circuit breakers, 330kV overhead lines, HVDC link, 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 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 equipments* (T0);
    - *Disturbances on generation facilities* (G0).

3.4 Scale 1 definitions

- Scale 1 is assigned to events concerning one Responsibility Area due to noteworthy disturbances which are affecting more than one Transmission System Operator.
    - The primary failure may have high security influence and/or high market influence consequences or cause noticeable violation of standards 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 operational disturbance on other Transmission System Operator OR N-1 violation reported OR consequences on capability of exchange or leading to reliability degradation.

- After the incident occurs, the system is in “Alert State” [1].

- Scale 1 counts eight criteria.

- The following definitions are presented corresponding to scale 1 priority order.

3.4.1 Scale 1 Criteria general overview

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 equipments**
G1	**4**	**Disturbances on generation facilities**
ON1	**5**	**N-1 violation**
OV1	**6**	**Violation of standards on voltage**
OR1	**7**	**Lack of Reserve**
OA1	**8**	**Alert State**

Table 8 - Scale 1 Criteria general overview

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

- Description
  - *All regions except isolated systems*: 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). The estimate of load disconnected (MW) is defined as:

$$\frac{\text{Energy Not Supplied (ENS)}}{\text{Event time duration}}$$

  - *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);
    - Alert state time duration.
  - General information regarding number and category of equipments 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 others 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 10. (see table below) must be reported and qualified as an **Alert State**.

  After *time to restore frequency*, if the frequency deviation is below the *maximum steady state frequency deviation range* mentioned in table 10, see § 3.3.3 table 4.

  After *time to restore frequency*, if the frequency deviation is in the *maximum steady state frequency deviation range* mentioned in table 10, this event must be reported in scale 1.

  After *time to restore frequency*, if the frequency deviation is above the *maximum steady state frequency deviation range* mentioned in table 10, this event must be reported in scale ≥2 (see § 3.5.3, table 16)

  - 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
  - Deviation of frequency should be reported be all Transmission System Operators even if the cause for the deviation is located in other Transmission System Operator Responsibility Area.

Scale 1 / Alert state	Baltic	Continental Europe	Great Britain	Ireland	Nordic	Isolated system
Maximum steady state frequency deviation range	100mHz <200mHz	100mHz <200mHz	250mHz <500mHz	250mHz <500mHz	250mHz <500mHz	250mHz <500mHz
Time to restore frequency	15min	15min	10min	20min	20min	20min

Table 9 - Scale 1 ("alert state") frequency 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 (± xx mHz) and, eventually, Time To Restore Nominal Frequency [2];
  - Eventually, rough estimate:
    - Load disconnected (MW loss) and disconnection time duration if the figure is not included in the scale 1 *Events on load* range;
    - Generation disconnected at different time intervals (MW loss);
    - Voltage excursions (deviation, duration).
    - Alert state time duration;
    - Secondary reserve properties and time duration within which there was a lack of reserves identified.
  - General information regarding number and category of equipments 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 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 equipments (T1)

- Description
  - Final tripping of equipments with consequences on Responsibility Area or/and on capability of exchange (e.g. final tripping of tie-lines between Transmission System Operators or "internal" equipments of one Transmission System Operator limiting capacity for transits).
  - Final tripping of 2 (two) or more HVDC links between different synchronous areas OR inside synchronous area.
  - Operational disturbance on other Transmission System Operator with N-1 violation reported.

- 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 equipments concerned by the primary failure (e.g.: 220kV circuit breakers, 330kV overhead lines, HVDC link, 400kV tie-lines, transformers...);
  - Number of equipments 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* table) at different time intervals (MW loss) and disconnection time duration;
    - Voltage excursions (deviation, duration);
    - Alert state time duration;
    - Secondary reserve properties and time duration within which there was a lack of reserves identified;
    - Frequency response at different time intervals if it is not included in the scale 1 *Frequency thresholds* 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 generation facilities (G1)

- Description
  - Unexpected reduction or Disconnection from the grid of power plant facilities connected to transmission network representing an output more important than biggest power station output on time period of 30 minutes (see table below).

Scale 1 Alert state	Baltic	Continental Europe	Great Britain	Ireland	Nordic	Isolated system
Thresholds	from 450 MW to 900 MW	from 1500 MW to 3000 MW	from 1800 MW to 3000 MW	from 500 MW to 850 MW	from 1500 MW to 3000 MW	Larger than the biggest unit.

Table 10 - Thresholds for disturbances on generation facilities - Scale 1

  - If a disturbance in a power plant 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 1 *Events on load* range;
    - Secondary reserve properties and time duration within which there was a lack of reserves identified
    - Voltage excursions (deviation, duration);
    - Alert state time duration;
    - Frequency response at different time intervals if it is not included in the scale 1 *Frequency thresholds* table;
  - General information regarding number and category of equipments 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 equipments* (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.
  - The N-1 criterion on tie-lines according to N-1 definition [1] was not fulfilled within 15 minutes.
  - 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 equipments concerned, remedial actions, identification of out of range contingencies...).
  - Eventually, rough estimate of
    - Generation disconnected (if not included in the scale 1 *Events on generation facilities* table) and/or load disconnected (if not included in the scale 1 *Events on load* 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* table;
    - Voltage excursions (deviation, duration);
    - Alert state time duration;
    - Secondary reserve properties and time duration within which there was a lack of reserves identified
  - General information regarding number and category of equipments 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.

- 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 equipments (T1),*
    - *Disturbances on generation 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 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	Continental Europe	Great Britain	Ireland	Nordic
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	Continental Europe	Great Britain	Ireland	Nordic
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 equipments concerned, remedial actions).
  - Eventually, rough estimate of
    - Generation disconnected (if not included in the scale 1 *Events on generation facilities* table) and/or load disconnected (if not included in the scale 1 *Events on load* table) at different time intervals (MW loss) and disconnection time duration;
    - Voltage excursions (deviation, duration).
    - Alert state time duration;
    - Secondary reserve properties and time duration within which there was a lack of reserves identified.
    - Frequency response at different time intervals (deviation, duration) if the figure is not included in the scale 1 Frequency thresholds table;
    - Secondary reserve properties and time duration within which there was a lack of reserves identified.
  - General information regarding number and category of equipments 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 equipments (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 reserve capacity [2] (Frequency Restoration Reserve [2] are considered combined) on a control area for at least 30 minutes for all areas.
  - 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 secondary reserve properties and time duration within which there was a lack of reserves identified ;
    - Eventually, rough estimate of
      - Rough estimate of Generation (if not included in the scale 1 *Events on generation facilities* table) and/or load (if not included in the scale 1 *Events on load* 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* table;
      - Voltage excursions (deviation, duration);
      - Alert state time duration;
      - Secondary reserve properties and time duration within which there was a lack of reserves identified
  - General information regarding number and category of equipments 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 ;

- 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 equipments (T1),*
    - *Disturbances on generation facilities (G1),*
    - *N-1 violation (ON1),*
    - *Voltage (OV1).*

3.4.9 Scale 1 Criteria #8 – Degradation in operational conditions –Alert State (OA1)

- Description
    - The TSO declared an Alert State [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:
    - Alert state time duration;
    - Eventually, rough estimate of
        - Generation disconnected (if not included in the scale 1 *Events on generation facilities* table) and/or load disconnected (if not included in the scale 1 *Events on load* 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* table;
        - Voltage excursions (deviation, duration);
        - Alert state time duration;
        - Secondary reserve properties and time duration within which there was a lack of reserves identified
    - General information regarding number and category of equipments 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.

- 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 equipments (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 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.
- After the incident occurs, the system is in “Emergency State” [1].
- Scale 1 counts six criteria.
- The following definitions are presented corresponding to scale 2 priority order.

3.5.1 Scale 2 Criteria general overview

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 equipments**
G2	**4**	**Disturbances on generation facilities**
RS2	**5**	**Separation from the grid**
OE2	**6**	**Emergency State**

Table 13 - Scale 2 Criteria general overview

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

- Description
  - *All regions except isolated systems*: 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). The estimate of load disconnected (MW) is defined as:

$$\frac{\text{Energy Not Supplied (ENS)}}{\text{Event time duration}}$$

  - *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);
      - Secondary reserve properties and time duration within which there was a lack of reserves identified;
      - Voltage excursions (deviation, duration);
      - *Emergency* state time duration;
    - General information regarding number and category of equipments 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 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 [2]. (see table below) must be reported and qualified as a **Emergency State**.

  After *time to restore frequency*, if the frequency deviation is below the *maximum steady state frequency deviation range* mentioned in table 16, see § 3.4.3 table 10.

  After *time to restore frequency*, if the frequency deviation is above the *maximum steady state frequency deviation range* mentioned in table 16, 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.
  - Deviation of frequency should be reported be all Transmission System Operators even if the cause for the deviation is located in other Transmission System Operator Responsibility Area.

Scale 2 / Emergency state	Baltic	Continental Europe	Great Britain	Ireland	Nordic	Isolated system
Maximum steady state frequency deviation range	>200mHz	>200mHz	>500mHz	>500mHz	>500mHz	>500mHz
Time to restore frequency	15min	15min	10min	20min	20min	20min

Table 14 - Scale 2 ("emergency state") steady-state frequency 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 (± xx mHz) and, eventually, Time To Restore Nominal Frequency [2];
  - 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* range) disconnected (MW loss) and disconnection time duration;
    - Secondary reserve properties and time duration within which there was a lack of reserves identified.
    - Emergency state time duration;
    - Voltage excursions (deviation, duration);
  - General information regarding number and category of equipments 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 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 equipments (T2)

- Description
  - Final tripping of equipments (including HVDC links) with consequences on regional area (i.e. beyond both Responsibility and national areas) 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 equipments concerned by the primary failure (e.g.: 220kV circuit breakers, 330kV overhead lines, HVDC link, 400kV tie-lines, transformers...);
    - Number of equipments 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
    - Eventually, rough estimate of
      - Generation and / or load (if the figure is not included in the scale 2 *Events on load* range) disconnected (MW loss) and disconnection time duration;
      - Voltage excursions (deviation, duration);
      - Emergency state time duration;
      - Secondary reserve properties and time duration within which there was a lack of reserves identified;
      - Frequency response at different time intervals if it is not included in the scale 2 *Frequency thresholds* 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 1 criteria:
    - *Events on load* (L2),
    - *Disturbance leading to frequency degradation (F2).*

3.5.5 Scale 2 Criteria #4 – Disturbances on generation facilities (G2)

- Description
  - Unexpected reduction or Disconnection from the grid of power plant facilities connected to transmission network representing an output more important than biggest power station output on time period of 30 minutes leading to degradation of system adequacy.

Scale 2 Emergency state	Baltic	Continental Europe	Great Britain	Ireland	Nordic	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* 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* table;
    - Secondary reserve properties and time duration within which there was a lack of reserves identified;
  - General information regarding number and category of equipments 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 2 criteria:
    - *Events on load (L1),*
    - *Disturbance leading to frequency degradation (F1),*
    - *Disturbance on Transmission Network equipments (T1).*

3.5.6 Scale 2 Criteria #5 – 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* 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* table;
        - Secondary reserve properties and time duration within which there was a lack of reserves identified
        - Voltage excursions (deviation, duration);
    - General information regarding number and category of equipments 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 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 equipments (T2).*
        - *Disturbances on generation facilities (G2).*

3.5.7 Scale 2 Criteria #6 – Degradation in operational conditions – Emergency State (OE2)

- Description
  - The TSO declared an Emergency State [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:
  - Emergency state time duration;
  - List of System Defence Plan measures which have been activated to cope with the disturbance.
  - 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* 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* table;
    - Secondary reserve properties and time duration within which there was a lack of reserves identified
    - Voltage excursions (deviation, duration);
  - General information regarding number and category of equipments 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 equipments (T2).*
    - *Disturbances on generation facilities (G2),*
    - *Separation from the grid (RS2).*

3.6 Scale 3 definitions

- Scale 3 is assigned to major 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 black out state [1]
    - This criterion does not apply to isolated systems.

OR

    - *All regions except isolated systems*: 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 secondary reserve properties and time duration within which there was a lack of reserves identified.
        - Blackout state time duration;
        - Eventually, general information regarding number and category of equipments 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);
    - 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 to draw up reports:

Each year, an annual report is done, with figures and qualitative analysis to produce an overview of the system operation performance. It will represent a real opportunity for Synchronous Areas 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 according thresholds of levels 1-3:
  - Number of tripped transmission system elements;
  - Number of tripped Generation Facilities per year;
  - Energy [MWh] of disconnected Demand Facilities per year;
  - Time of being in Operational States other than Normal State (Alert, Emergency, Blackout);
  - Time duration within which there was a lack of reserves identified;
  - Voltage deviation exceeding the thresholds for Emergency State;
  - Frequency deviation per Synchronous Area;
  - Number of system-split separations and / or local blackouts;
  - Number of regional blackouts involving two or more Transmissions System Operators;
  - Explanation of reasons of incidents at the Operational Security Ranking levels 2 and 3 according to Article 30(3);

- Statistical analysis of “events on loads” (MW loss, duration);

- Statistical analysis of frequency deviations (deviation, duration) including the metrics described above;

- Statistical analysis of voltage deviations, excursions of voltage outside the normal limits for a time period longer than a certain threshold (deviation, duration).

The publishing principles are defined by ENTSO-E.

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 equipments concerned by the primary failure while recording a *scale 0 events on load,* 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 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 equipments in substation (behaviour of protections + actions of SPS, automation, PMU WAMS...),
- Phone calls, translated in English (depending on legal or confidentiality barriers),
- …

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 equipments (thanks 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

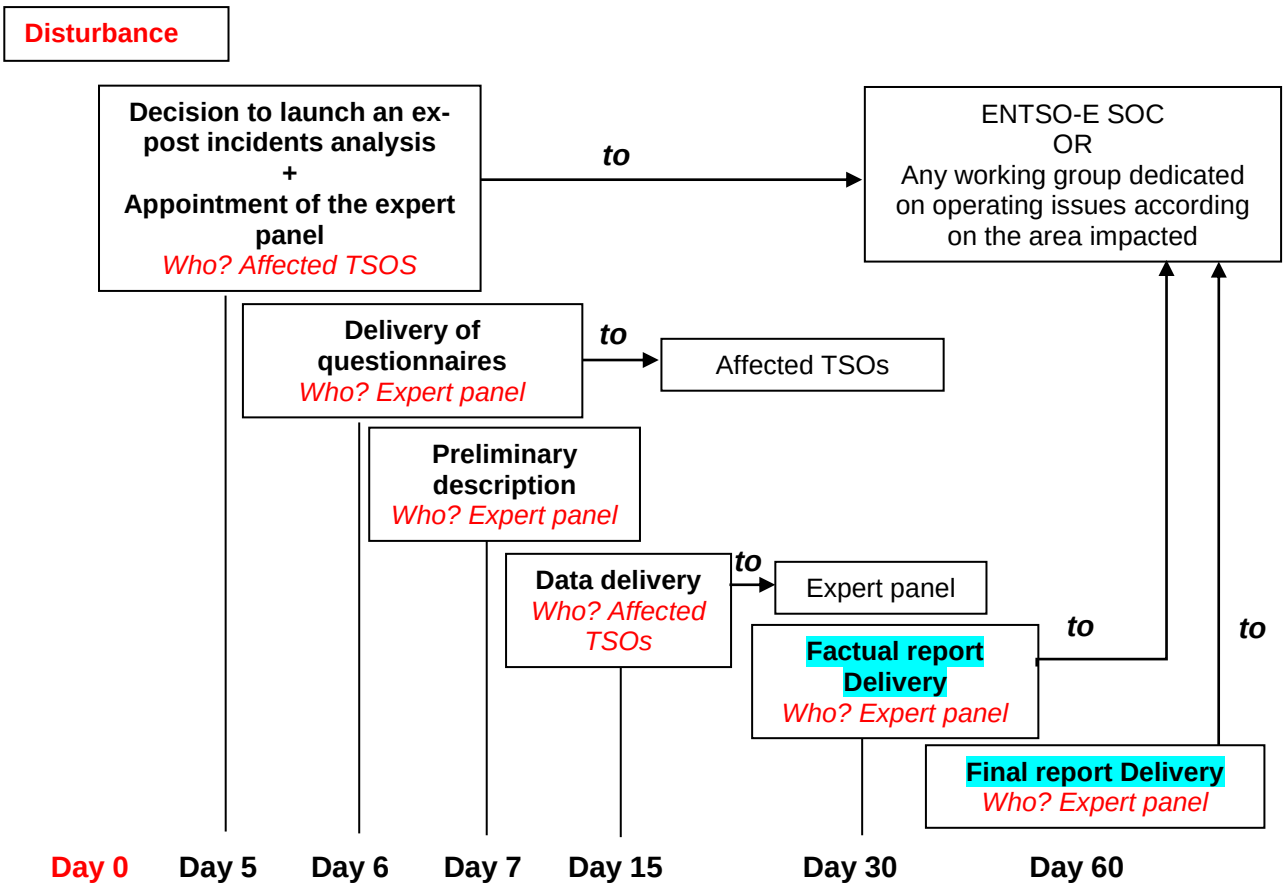

Figure 1 - Investigation procedure

The following planning gives 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.

6. Reporting tool overview

6.1 Original file

The blank reporting file has to be downloaded from ENTSO-E extranet. The pathway to access the blank file is:

⇒ System Operations Committee

⇒ 39 Ad hoc Teams

⇒ Incidents Classification Scale

⇒ Reports of the Incidents

⇒ Reporting tool

⇒ **ICS Reporting form v1 2013 – Excel 20xx.xlsm**

Each Transmission System Operator will have to use this file to report disturbances till the end of 2013.

6.2 Main Menu

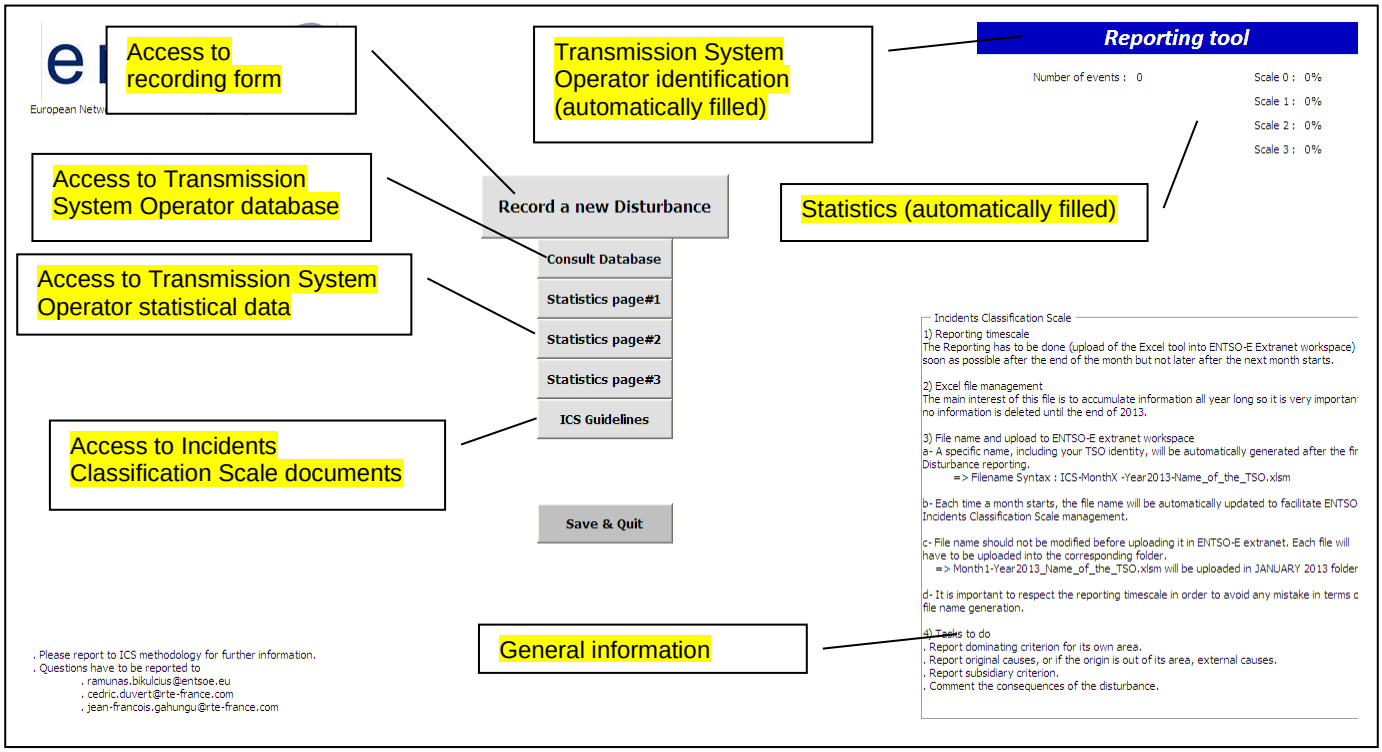

Figure 2 - Reporting tool Main menu

6.3 Database and statistics

No information should be modified or erased in the database and statistics sheets all year long.

6.4 Recording in the Reporting tool by filling templates

Each template will have to be filled before the effective disturbance recording:

- The title will have to be as factual as possible. It is important to be able to well identify the type of disturbance by only reading the title;
- Disturbance date and time (24h00 format);
  - As a disturbance could be in different time zones, Transmission System Operators will report according the Central Europe Time;
  - Disturbances time duration will be used for statistics purposes.
- The characterization of dominating criterion is based on an examination of disturbances consequences;
  - In case of gravity scale equality, the dominating criterion is the most important resulting the comparison of all criteria identified. Information can be consulted by pressing the "*HELP: Criteria Prioritization*" button;
  - The thresholds definitions can be verified by pressing the "*HELP: Thresholds definitions*" button.

- Concerning the "origin fault" template:

  The Transmission System Operator will identify if the original disturbance is internal or external. Due to the events are measured in terms of consequences, it's possible that the Transmission System Operator have to report consequences which are originated by external causes, out of its own Responsibility Area.

- Concerning the "Comments" template:

  Additional information (e.g.: Rough estimate of load/generation disconnected, frequency deviation time duration...) should be included the "Comments" template to complete the event description. Matters of a speculative nature may be reduced if they do not bring any specific learning.

Figure 3 - Reporting form