

3<sup>rd</sup> iTesla / UMBRELLA open Workshop

# Common recommendations to ENTSO-E regarding TSO & RSCI rules for business processes and data exchange

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**iTesla**  
Innovative Tools for Electrical System  
Security within Large Areas



**Umbrella Project**

# Agenda “Common recommendations to ENTSO-E”

## I. Objectives and Overview

## II. Common recommendations

## III. Conclusions

## IV. Discussion

# I. Objectives and Overview

**Goal:** Based in the progress of iTesla and UMBRELLA Toolboxes, identify needs for further harmonisation of operational requirements in TSO cooperation rules regarding business processes and data exchange

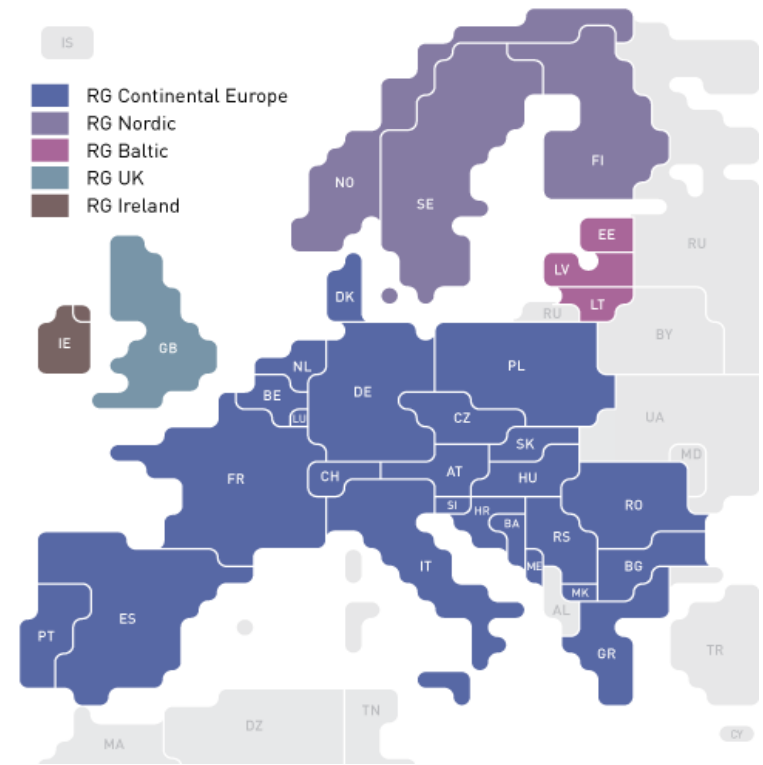


Figure 1: ENTSO-E regional groups. [Reference: ENTSO-E Website]

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## II. Common recommendations

UCTE DEF format, currently in operation for several processes, is no longer suitable for tackling challenges with the grid.

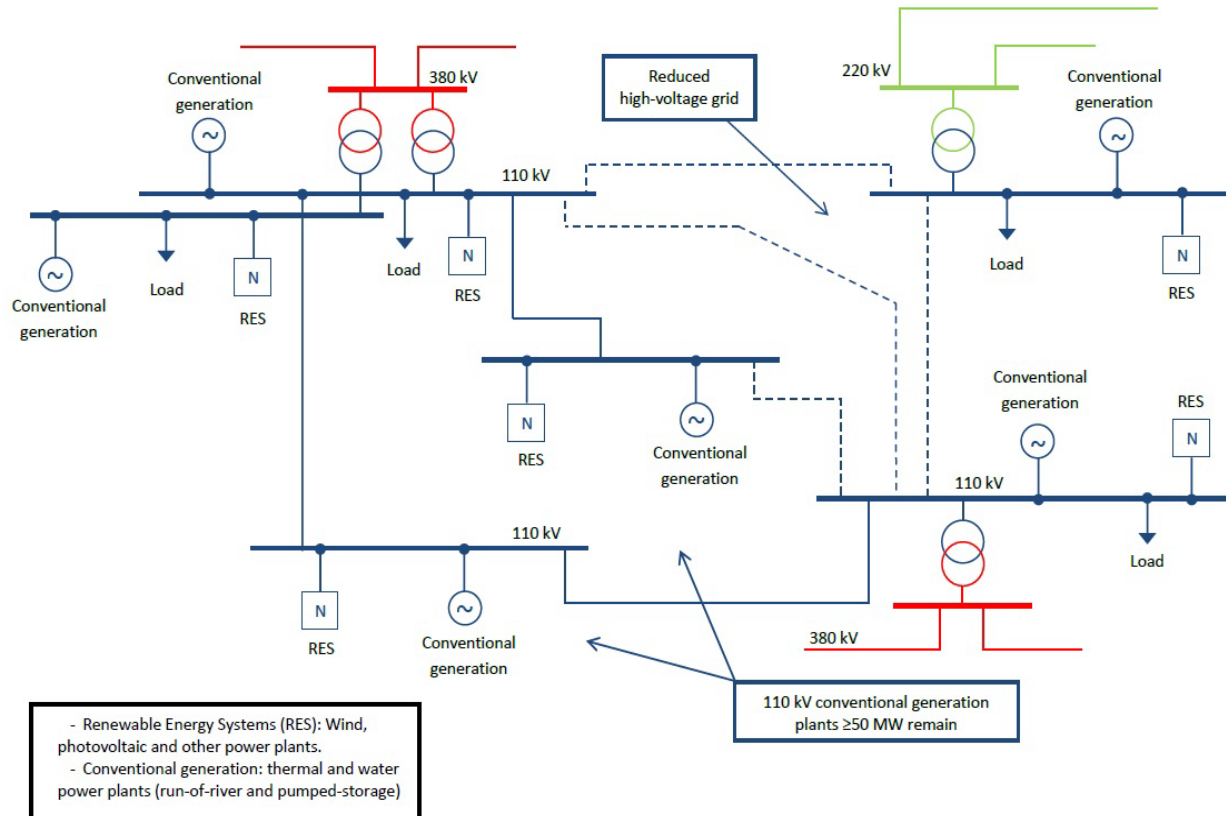
After investigations the Common Grid Model Exchange Standard (CGMES) format was selected as the future format for the ENTSO-E RG CE.

### **Recommendation 1: Exchange of stationary data in CGMES format**

“European TSOs should exchange **stationary data** of their respective system in **CGMES** format as soon as possible. **Identifiers** of network elements should be **unique and persistent** across the datasets in order to be able to perform an **advance security assessment.**”

## II. Common recommendations

### Recommendation 2: Enhanced data format and network modelling



**Figure 2: Example for modelling a subordinate DSO grid with high RES penetration and generation units (>50 MW).**

## II. Common recommendations

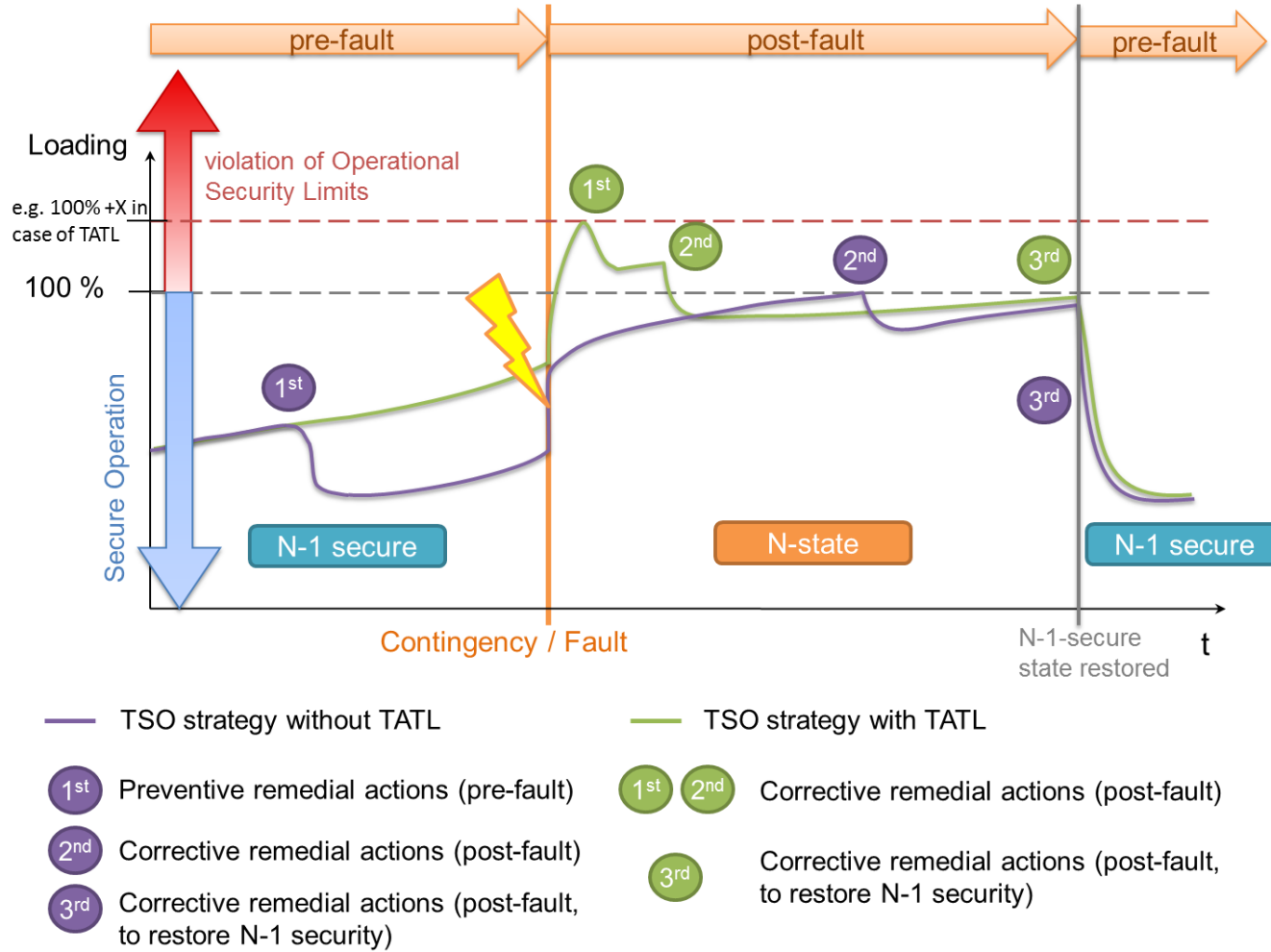
The TSOs should model the topology in a **breaker-oriented** way in order to assign equipment and loads properly.

### Recommendation 2: Enhanced data format and network modelling

“When exchanging data using the **CGMES format**, European TSOs should **use persistent identifiers for equipment** in order to be able to match them with **additional data** automatically (e.g. dynamic and economic data). The incorporation of the additional information, like **redispatch potential**, should be considered in the further development of CGMES. Aggregation of injections (loads and generation units, also RES) should be avoided, whenever possible, and forbidden for large generation units.

Furthermore a **common understanding** and as far as possible a **harmonization** regarding the **detail of grid modelling** should be sought by the TSOs.”

## II. Common recommendations



**Figure 3: Different TSO strategies regarding current limits lead to different operation strategies. This has to be modelled adequately in order to achieve reasonable calculation results.**



## II. Common recommendations

### Recommendation 3: Exchange of remedial actions in stationary data

“In addition to stationary data of their respective system, European TSOs should **exchange a list of contingencies** to be simulated or the **methodology** to determine the contingencies as well as a **catalogue of relevant remedial actions**. Moreover a **harmonization of the merit order** of remedial actions **is needed** to be able to get **common proposals** of remedial actions from the new tools developed by iTesla and UMBRELLA. The exchange format needs to be consistent with the description of the system (use of CGMES with unique and persistent identifiers).”

## II. Common recommendations

There is a broad consensus among the TSOs on the need to take into account the effect of dynamic phenomena in the transmission system operation in a more systematic way than today

### **Recommendation 4: Exchange of dynamic data in the future transmission system operation**

“European TSOs should **exchange dynamic data** of their respective system to be able to run **time domain simulations** on all or parts of the European system in the framework of systematic security assessment of system situations from **D-2 to close to real time.**”

## II. Common recommendations

### Recommendation 5: Recommendation regarding the format of exchange of dynamic data

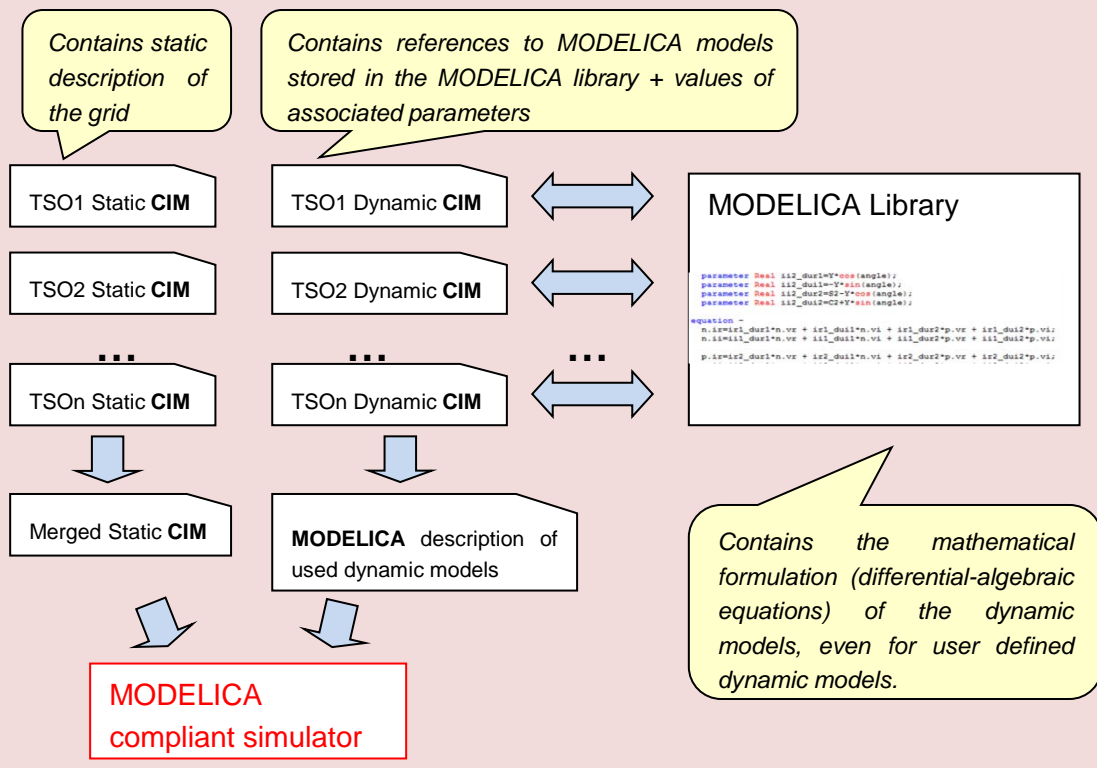
“In the short term, European TSOs should exchange **dynamic data** using **standard or user defined models** in the format they use for their **internal** dynamic studies.”

The short-term solution relies on the exchange of:

- Data in CGMES format as already explained in Recommendation 1
- Dynamic models in native formats, i.e. in the original dynamic formats used by TSOs for their own dynamic studies (for instance in PSS®E or EUROSTAG® format)
- A table of association to map the CIM ID of any stationary component with a dynamic model

## II. Common recommendations

### Recommendation 6 (iTesla): Recommendation regarding the format of exchange of dynamic data (Long term solution)



“European TSOs should exchange CGMES files of their respective system and it is proposed to encourage the power system community to use the **open source iTesla Power System MODELICA library** to be able to run time domain simulations on all or parts of the European system using **MODELICA language compliant simulation engine.**”

## II. Common recommendations

### Recommendation 8: Defence and restoration plans

“European TSOs are encouraged to continue the ongoing work towards **harmonization of defence plans and restoration procedures**, and consider to integrate solutions for **coordinated power flow control** of embedded HVDCs to dampen inter-area oscillations, **over-frequency control of RES generation and frequency control of consumption** to defend the frequency stability, and use of **PMU information** for early detection of voltage instability and use tools for **automatic tuning of out-of-step relays**. There is also a need to consider the impact of the steadily increasing amount of **distributed generation** on the existing load shedding schemes. Finally, the TSOs should consider using automatically computed **coordinated restoration plans** taking into account dynamics and further investigate possibilities of using AC and DC connected controllable wind power plant to speed up restoration.”

## II. Common recommendations

### Recommendation 7: Risk management and reliability criteria

$$Risk = Probability \cdot Severity$$

Currently, there is no explicit calculation of risk in operational planning or real-time operation.

“European TSOs should be encouraged to **develop and include** common **risk-based criteria** for **security assessment** in their **operational planning process** and **real-time operation**. In particular, these criteria should include data related to **reliability** and/or **failure** rates of **equipment**, estimates of the (cost of) **energy not served**, as well as more comprehensive **forecasts** to **describe uncertainties** from **RES**, **load** and intra-day **trading**.”

## II. Common recommendations

### Recommendation 9: Amendment of operational security processes & tools

Current situation:

- Integration of partially massive volatile generation (RES) into the IEM requires adjustments of:
    - grid design (→ adequate infrastructure) and
    - market design (→ adequate incentives for local storage, staying balanced, etc.)
  - Maintaining Security of Supply (SoS) is a growing challenge for TSOs
  - The costs for maintaining SoS also grow rapidly in terms of frequency, duration and volume / scope of remedial actions
  - Each of the remedial actions is well defined and they are applied considering the policies
- but
- the heterogeneous legal/regulatory frameworks in the different countries and the different views on the right order of the remedial actions cause **retarding discussions in the daily operation**

## II. Common recommendations

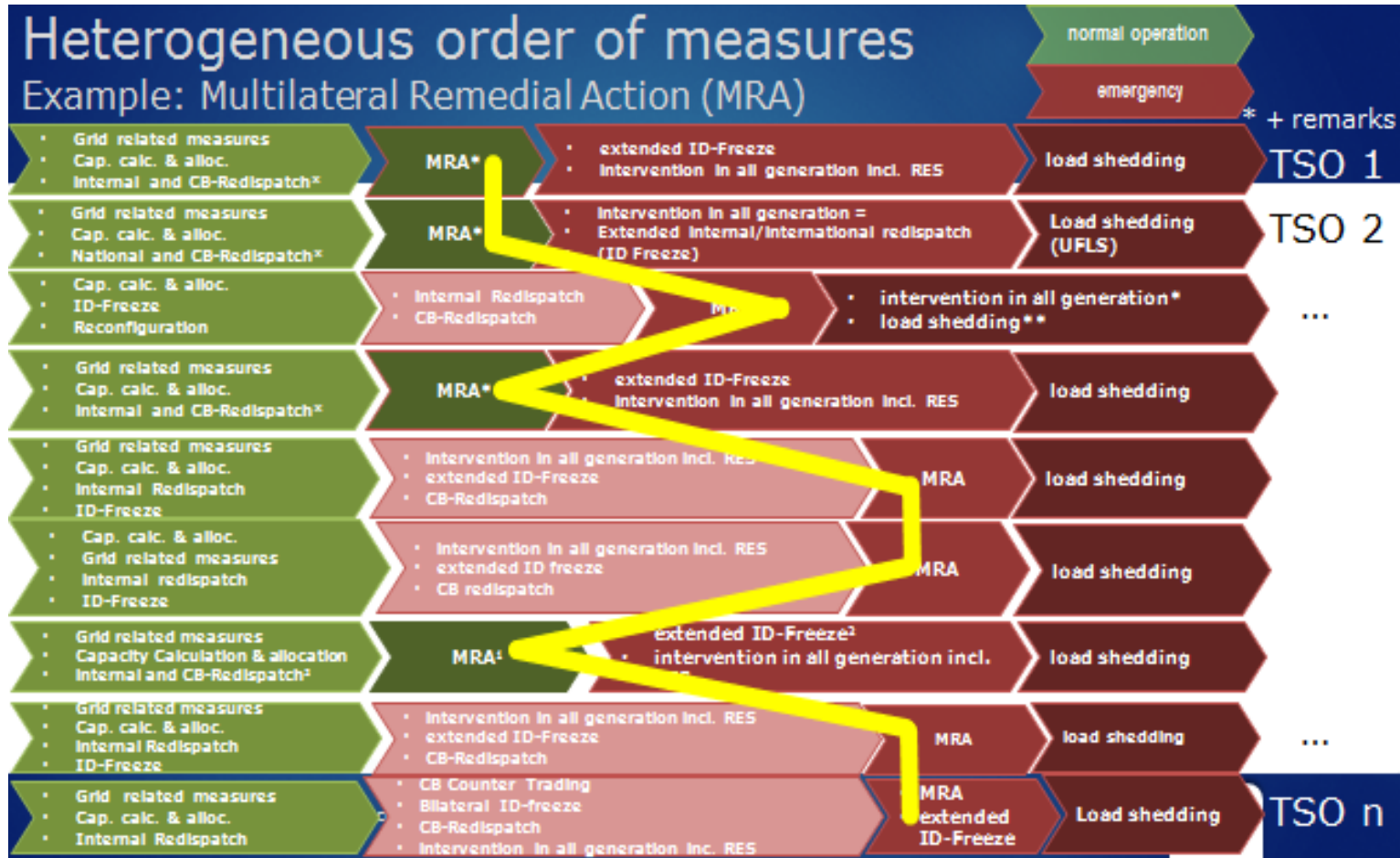


Figure 4: Example of heterogeneous order of (remedial) measures by different TSOs' operating rules due to the non-harmonized legal/regulatory frameworks, with focus on the use of multilateral remedial actions (MRA) within the TSC-region.



## II. Common recommendations

### **Recommendation 9: Amendment of operational security processes & tools**

“The experience of the TSOs shows that for the **successful daily operation** the **European TSOs** should further **develop** and **harmonize** their **processes** regarding **operational planning** and **real-time operation**, **incorporating** the preferable **functionalities** from the **research projects**.

**Support** from **legal** and **regulatory** side is **needed** in order to **achieve** the best possible **solutions** in terms of a European optimum. The **most promising approach** in order to achieve this is a **strong cooperation** among the **national regulations authorities**.”

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## III. Conclusions

The iTesla and UMBRELLA projects **encourage** to further **develop** the **legal/regulatory frameworks** within the **European** countries and **neighbouring stakeholders**.

Their processes regarding **operational planning** and **real-time operation** should be further **harmonize, incorporating** the preferable **functionalities** from the **iTesla** and **UMBRELLA** research projects, in order to be able to actually **achieve** the **best possible solutions** in terms of a **European optimum**.

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# Thank you for your attention!

Questions?

Comments?

This research work has been carried out within the scope of both iTesla and UMBRELLA projects, supported under the 7th Framework Programme of the European Union.



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