WINTER OUTLOOK 2016/ 2017
FOLLOW-UP

Electricity Coordination Group
14 February 2017

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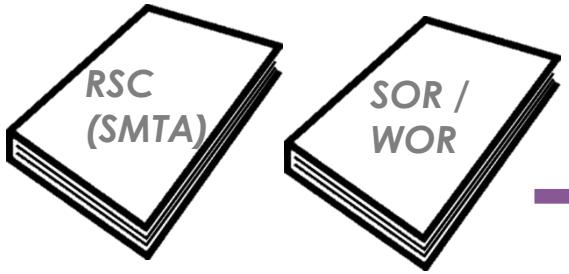
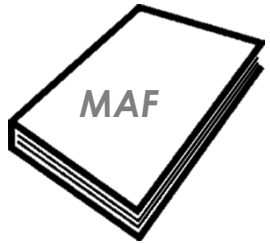
WHAT DO THE OUTLOOKS TELL YOU?

- **Role of interconnection**
- **Influence of external factors:** weather, market conditions, consumer behaviour…
- **Sensitivity analysis:** look for severe case scenario & see how network reacts (1 out of 10 years)
- **Review** (in June): deeper understanding of the previous season

DIFFERENT RISKS ADDRESSED AT DIFFERENT TIMES



UNCERTAINTY INCREASES

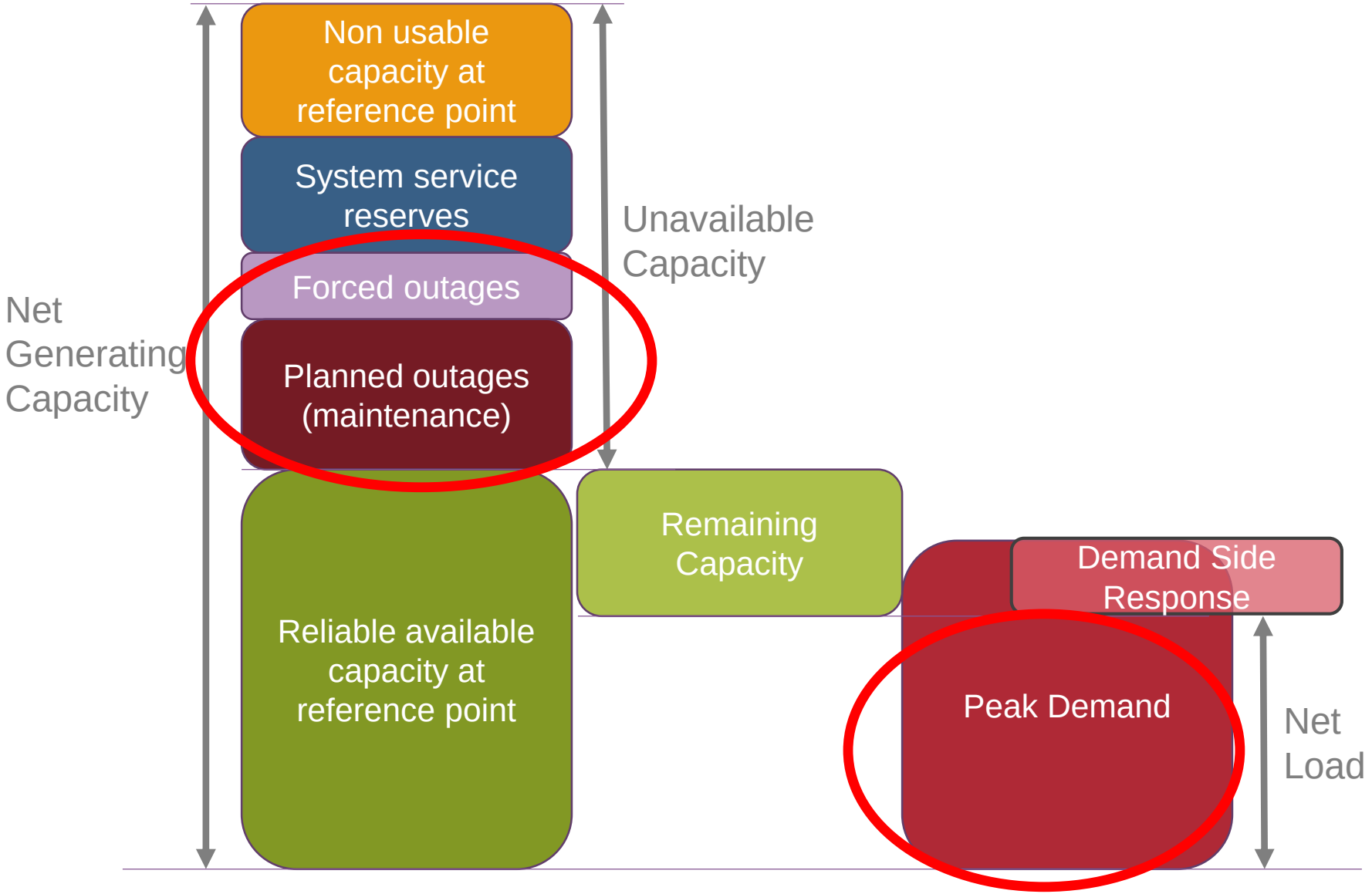


Short term **Mid term**

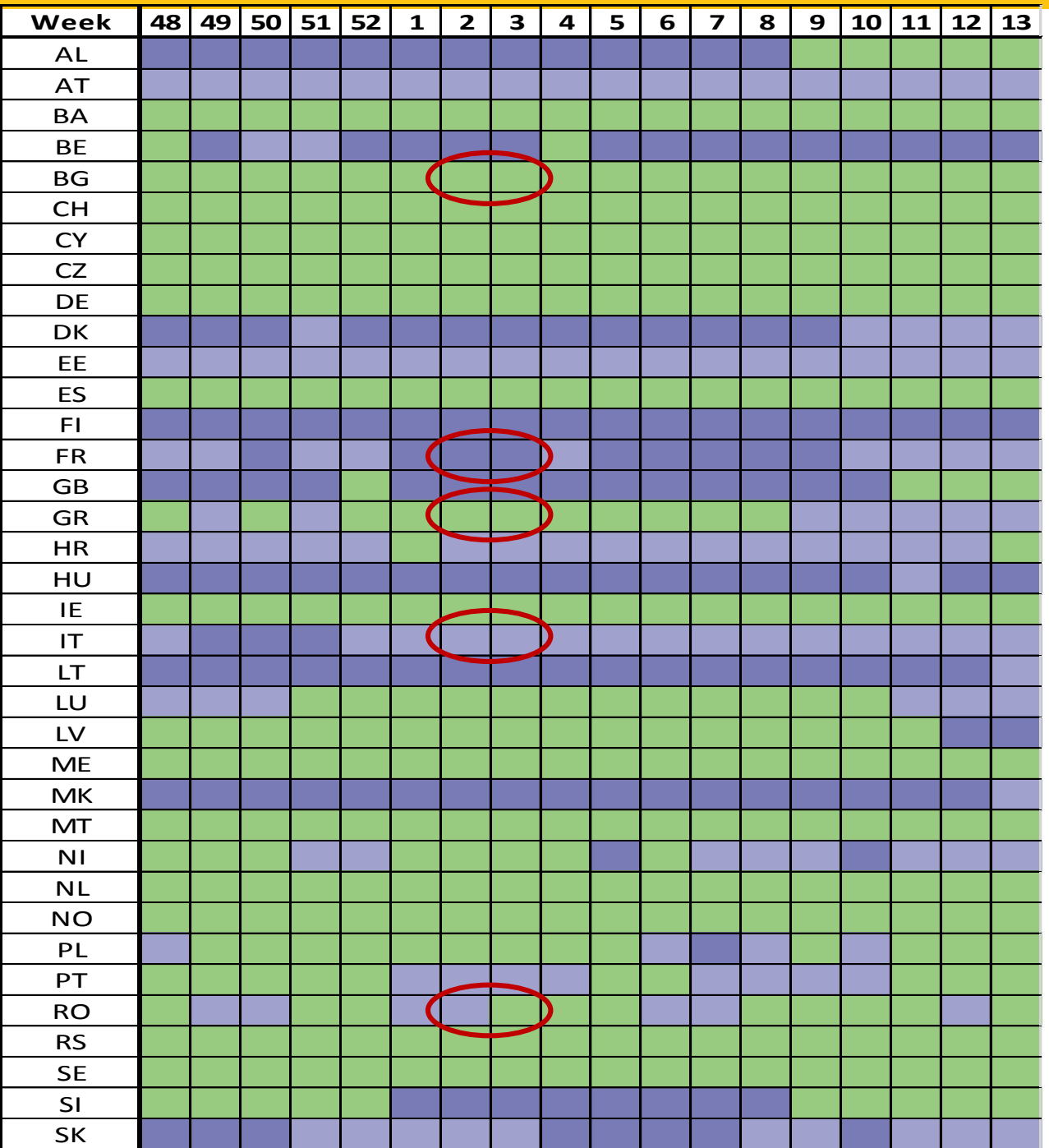
1 week | 6 months | 1 year | 5 years | 10 years

Operational decisions	Investment decisions	Policy decisions

ENTSO-E– General Methodology - Upward adequacy



Difference between Winter Outlook and Actuals



Key drivers

- Extreme low temperatures in SEE
- Generation unavailability in CWE & SEE

Country prone to export from a market perspective
Country prone to import from a market perspective
Country required to import from an adequacy perspective

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HOW TO KEEP SYSTEM SAFE FOR THE CONSUMERS?

Knowledge sharing & cooperation at European level essential to maintain safe system

Example of possible gradual measures to maintain the supply that operators can use

- Structural grid reinforcement internally & cross border
- Local optimisation of the grid
- Extra generation reserves
- Demand Response
- EXCEPTIONAL MEASURES
  - Voltage lowering
  - Local power cuts

Measures planned to be applied in case the generation is not sufficient to cover the load

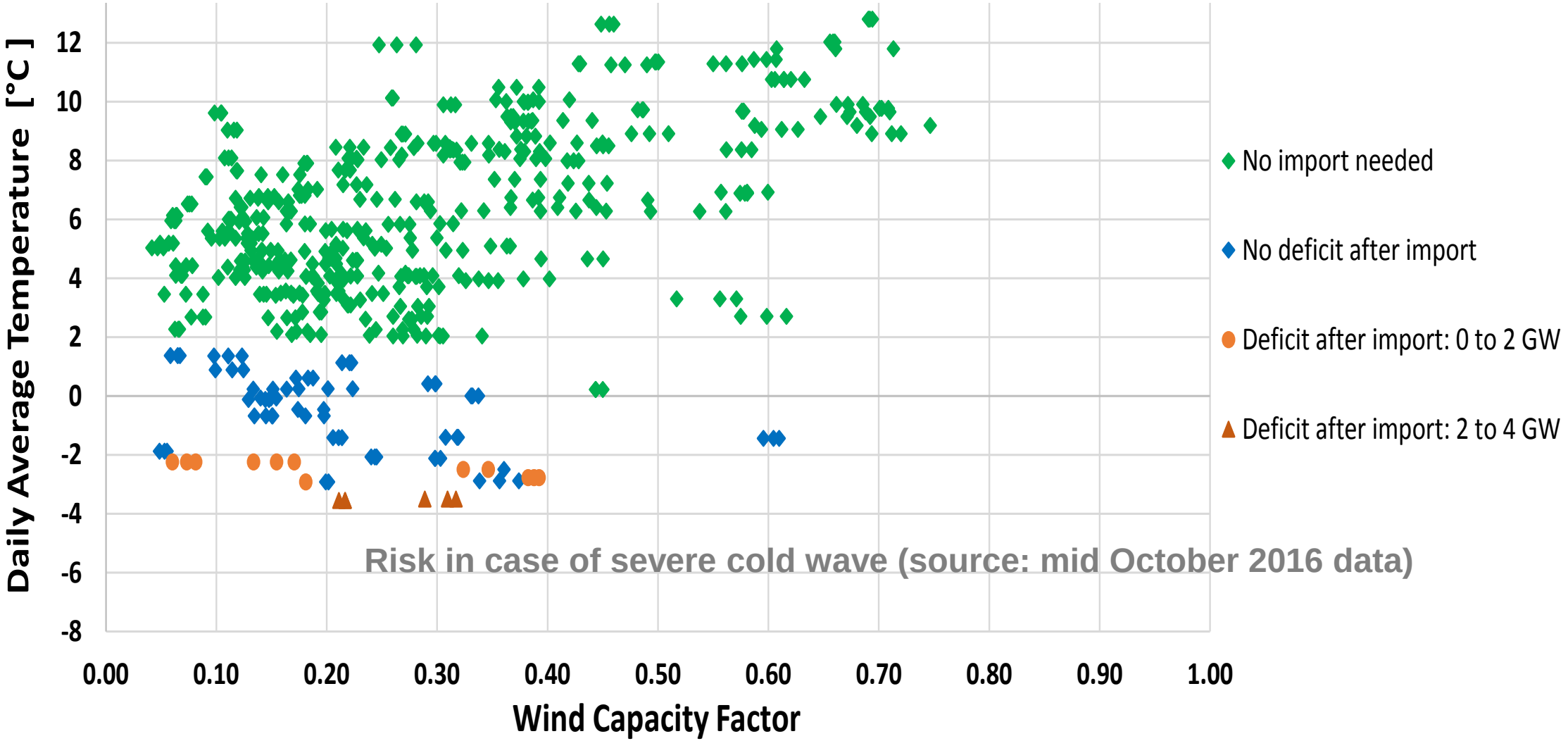
	Non-costly measures	Costly measures
INTRA-DAY Close to real time	• Voltage reduction (in cooperation with DSOs) • Demand response - reducing the power supply of consumers with such contracts	• Internal re-dispatching (also to increase import capacity) • Using replacing reserves for balancing • Power curtailments (planned or in emergency)
D-1 D-2 D-3 Two-three days ahead	• Changing the standard topology of the grid (also to increase import capacity)	• Countertrading and re-dispatching (to increase import capacity • Reducing export capacity (if permission available; it depends on the law whether it is a costly measure)

Cold Spell, January 2017: Measures taken by affected TSOs

Country	TSO	Reported XB curtailment measures
Bulgaria	ESO	Bulgarian government has decided a ban on energy export from Bulgarian generation applicable as of 13.01.2017
Croatia	HOPS	No extra measures
France	RTE	Capacity between FR and UK limited to 1GW
Greece	ADMIE	Export curtailment
Hungary	MAVIR	No extra measures
Kosovo	KOSTT	No extra measures
Montenegro	CGES	No extra measures
Romania	Transelectrica	No extra measures only the possibility
Slovenia	ELES	No extra measures
Turkey	TEIAS	No extra measure

Winter Outlook France

ENTSO-E WINTER OUTLOOK– SITUATION FOR FRANCE (WEEK 2)



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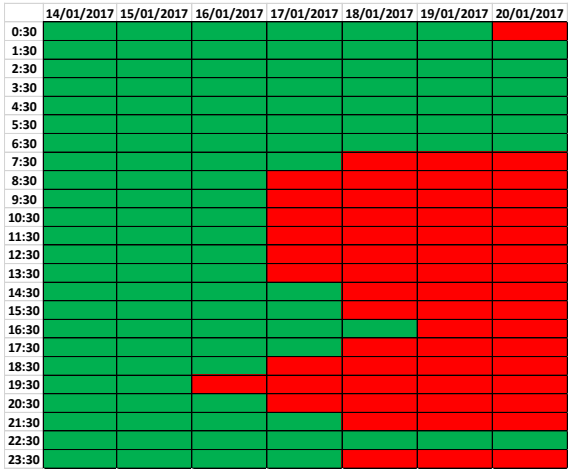
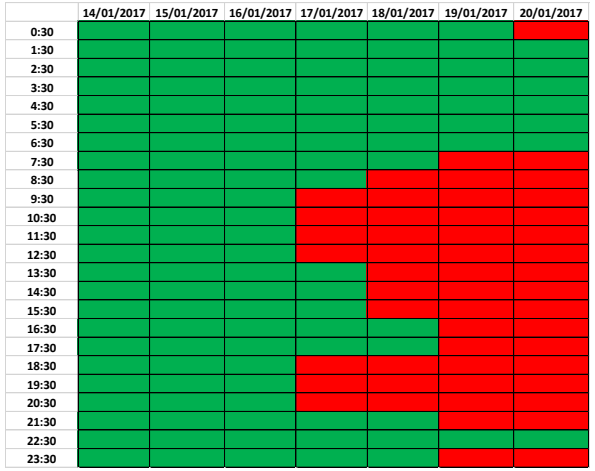
Week ahead adequacy: RESULTS WEEK 3 OF 2017…

Friday 13/01 9h30:
W-1 Adequacy Calculation



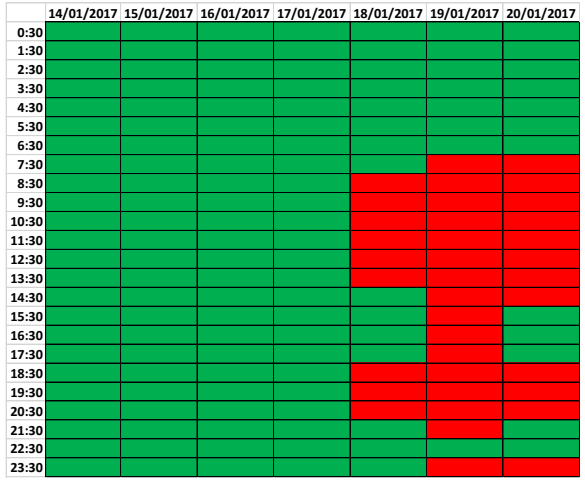
Worst case:
FR misses 12,5 GW
19th Jan 19h30

Friday 13/01 11h30:
W-1 Adequacy Calculation with consideration of UK and NL



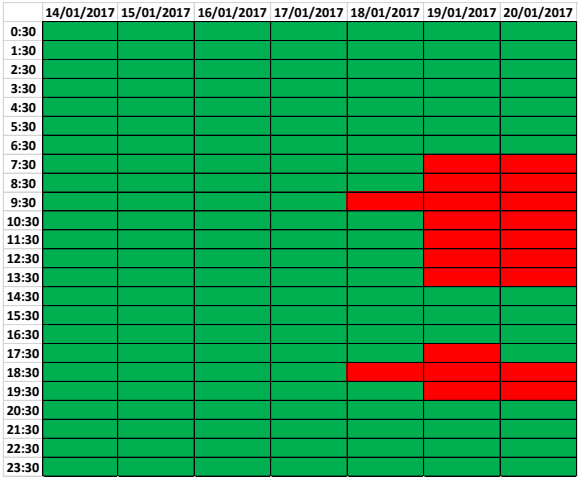
Worst case:
FR misses 10,6 GW
19th Jan 19h30

Saturday 14/01 10h30:
W-1 Adequacy Calculation with consideration of new RCs for FR and BE



Worst case:
FR misses 9,4 GW
19th Jan 19h30

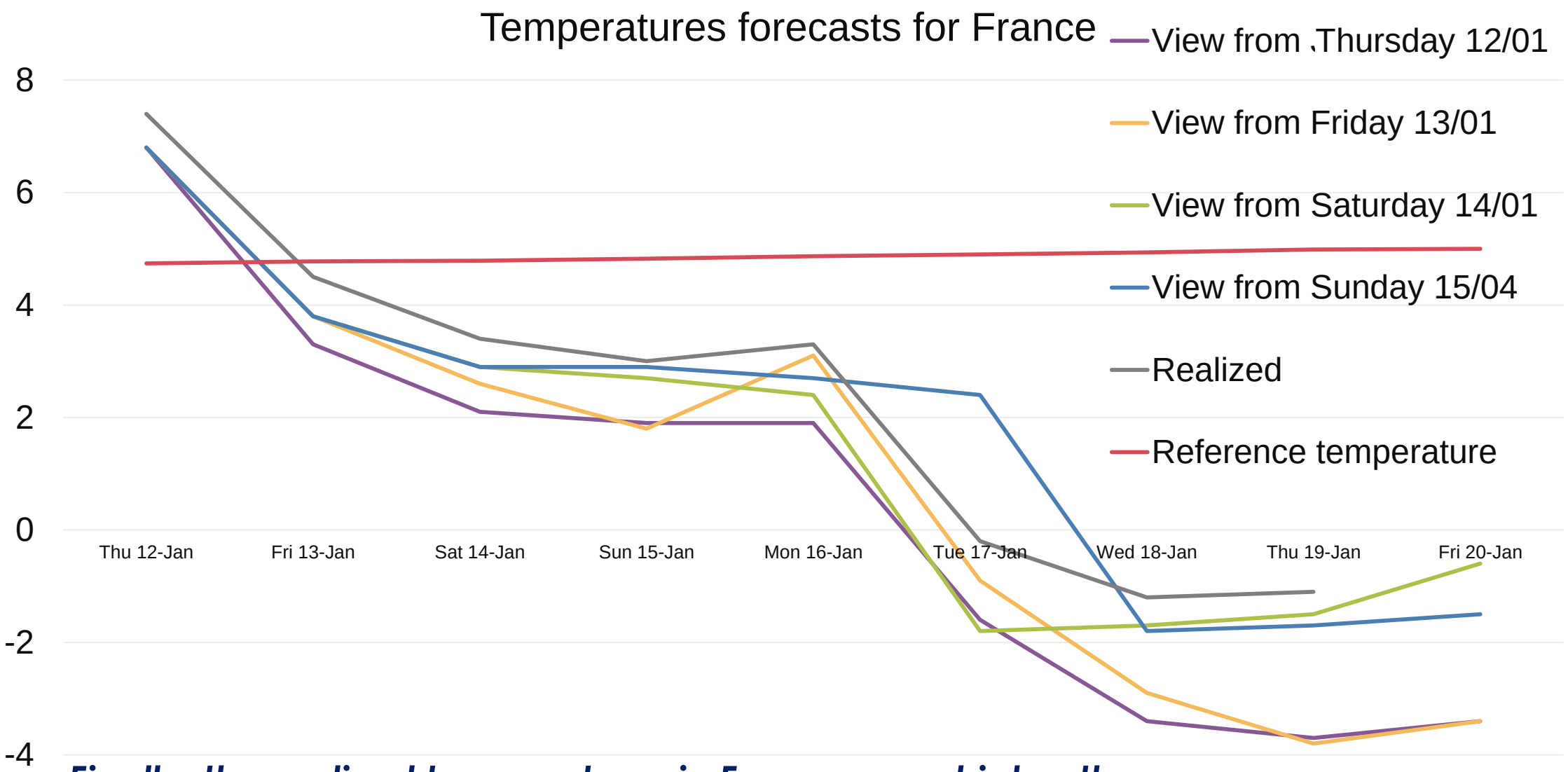
Monday 16/01 10h30:
W-1 Adequacy Calculation with consideration of new RCs for FR



Worst case:
FR misses 5,9 GW
18th Jan 9h30

Following received information, better was the forecasted situation

Week Ahead Adequacy - RESULTS WEEK 3 OF 2017…



Finally, the realized temperatures in France were higher than expected and no adequacy absence reported in real time

French context: Tuesday January 17th => Wednesday 25th

- Very low temperatures equivalent to decennial cold wave
  - Week-ahead forecast: 8°C below reference temperatures
  - Realized: 5°C below reference temperatures

  Average on the French territory during the whole cold wave

- Leading to high peak loads
  - Week-ahead forecast : 101GW for Thursday 19th
  - Realized: 94GW on Friday 20th morning

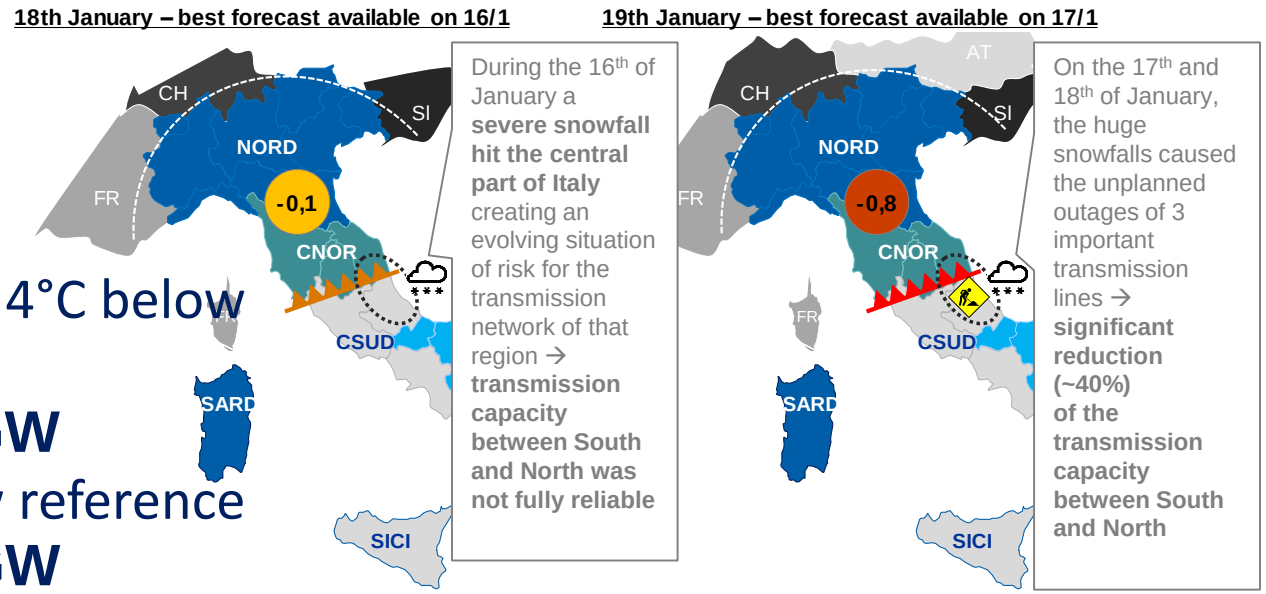
  French consumption increases around 2,4GW for 1°C temperature drop

- While generation unavailability is high:
  - 5 nuclear units in outage
  - Up to 10GW of unavailable thermal generation (nuclear + classic)

Italian context: Tuesday January 17th => Friday 20th

- Temperatures below historical averages and Very **high peak load** for winter season
  - Week-ahead forecast: 4°C below reference temperatures / **50,2GW**
  - Realized: **2,5°C** below reference temperatures / **49,3GW**

- Huge **snowfalls** in central Italy caused the **unplanned outage** of three important 380 kV lines
  - significant reduction of transfer capacity from South to North Italy affecting both energy and reserve



Expected missing operational reserve [GW]

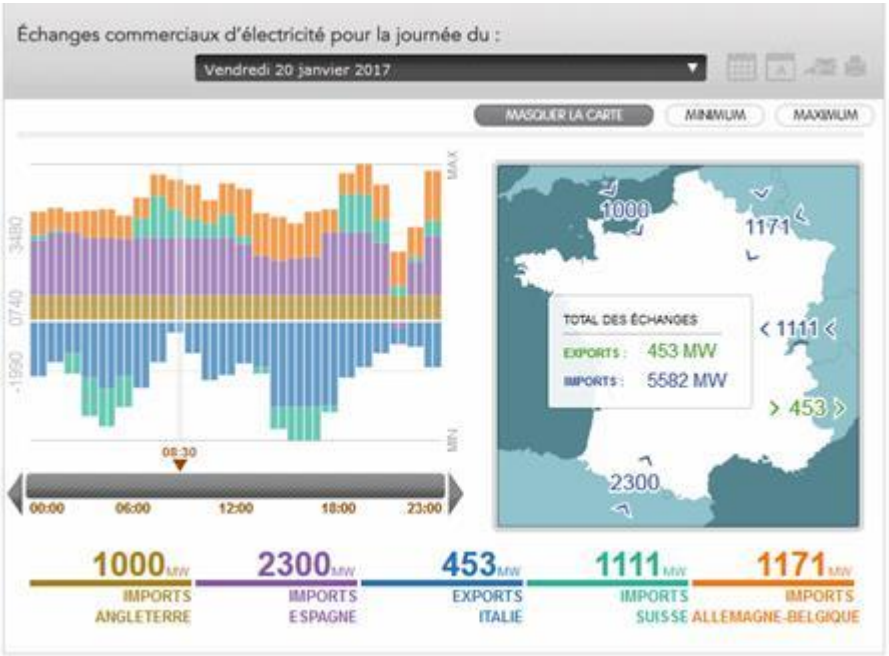
Concrete risk of missing operational reserve requirements

Regional context

- Need for import up to 5GW and more to ensure adequacy in France *(before activation of exceptional measures such as contractual industrial emergency load shedding, 5% voltage drop, load curtailment…)*

  + IFA cable capacity limited to **1GW** due to unplanned outage since November 2016

- Low generation margins at the same time in Belgium and Italy
- All concerned TSOs and RSCs proposed their cooperation along the cold wave
- High level calls among "affected" TSOs under the umbrella of the IBWT voluntary cooperation and ENTSO-E SG CSO



Inter-TSO cooperation – January 2017 cold wave

Inter-TSO cooperation

- This situation has been anticipated since October. On RTE request, Coreso had prepared specific inter-TSO coordination thanks to extra staff mobilization:
  - CWE area: specific grid studies from D-2 to intraday to maximize exchanges towards countries with higher adequacy needs
  - France-Swiss border: specific grid studies in D-1 to optimize exchanges based on the last hypotheses available

- Extraordinary coordinated capacity calculation process (from D-2 to intraday) between RTE and REE set up and applied for the cold wave thanks to extra staff mobilization

- Extraordinary operational information exchanges between RTE and Terna and capacity evaluation in D-2 on the Italy North borders

- Mutual Emergency Assistance Service (MEAS) exchange on France-Italy and France-Belgium borders

Lessons learned and next steps

- This situation and the way it was managed show the efficiency of inter-TSO coordination and the importance of RSCs involvement from week-ahead to intraday.

- The Short & Medium Term Adequacy service, still under development, which is part of the 5 coordination services assigned to RSCs in System Operation Guideline has proved its importance for week-ahead timeframe.

  It should be extended to D-2 and D-1 timeframes in the future.

- The implementation of Capacity Allocation & Congestion Management Guideline and more specifically the setup of D-2 to intraday coordinated capacity calculation processes on all borders (e.g. RTE-REE) will be valuable.

Overview of Inter-TSO cooperation

- The communication on strengthen cooperation of TSOs dated back 12 January demonstrates once again the commitment of European TSOs to foster cooperation and solidarity mechanisms:

  - Reinforced coordination in forecast studies and daily operation among the 8 grid operators of central Europe and their Regional Coordinator Centers*
  - Goal: to optimize cross-border exchange capacities at each interconnection, according to system needs and conditions
  - Main procedures put in place:
    - Newly-created catalogue of extraordinary measures to increase capacity
    - Reschedule of maintenance works impacting the cross-border exchanges
    - The deployment of these new measures comes in addition to the existing mutual assistance arrangements between TSOs

Winter Situation - Romania

Weather calamitous period

The cold spell started on the night of 5th to 6th of January:

- very dramatic drop down of the temperature (even – 25 ºC in some regions of the country);
- very high wind blows and gusts;
- very high level of snow precipitations – all of the country, but especially on the south and south-east part.

Impact on the grids:

- no relevant impact on the transmission grid (short outage of two 400 kV Overhead Lines, and two days outage of one 220 kV Overhead Line);
- hard impact at the distribution level:
  - not highly destructive impact on the 110 kV grids;
  - crushing impact at the medium voltage grids level!.

Interventions under very difficult conditions (wind gusts, severe cold and especially high snow bed blocking a big part of the roads in the east, south-east and south part of the country). Need for help from army and other military institutions (gendarmerie, emergency bodies)

Many localities and clients without electricity – mainly rural (e.g. 172 localities & 67.240 consumers/clients on 7th of January in the morning).

Some of these consumers → days without electricity, until restoring.

12th of January – windy & snowy period = over. Most of the distribution grids was restored and all the consumption supply recovered. The very low temperatures and cold spell = keeps on!

Adequacy issue

Specific for this winter: long time lasting of the very low temperatures.

Effects:

- **relevant consumption & generation increasing → peak load records of the last 20s years**
  - **load: 9730 MW/10th of January (hourly mean)**
  - **generation: 11.019 MW/11th of January (hourly mean)**
- **increasing of the energy regional prices → high electricity export level**
- **boost of the energy prices + use of reserves for balancing + export → high level of commercial deficit on load curve covering! (some intervals almost up to 30% of the system load). On the spot market the sale offers < buy offers.**

Problems:

- **dramatic decrease of the Danube river flow (1950 m3/sec.<<4950 m3/sec = multiannual mean value), entailing a very poor generation of the Danube hydropower plants (1.467 MW installed);**
- **high use of inland waters → more than permitted by Water Administration Authority;**
- **plights on coal transportation and delivery toward some thermal power plants (frozen coal, railways problems);**

Adequacy issue

- coal low quality (humidity, frozen coal)
- generation units' failures/accidental outages:
  - one nuclear unit (714 MW installed/2,5 days)
  - some units in the big coal thermal power plants (old generation park in Romania, financial problems for the coal based thermal power producers, affecting maintenance activity during the year)

The regional context to be considered! (also, featured by very high prices and power reserves decline)

Even having these problems and system stress, the power system was operated under safe conditions and keeping the export contracts alive. No limitations on interchange capacity and/or export schedules were needed. When the prices in Romania were lower then regional prices, we exported until maximum of the network transfer capacity, with no limitations, over all the Romanian borders (1500 – 1600 MW NTC).

The cold spell ended at the beginning of February (2th – 3th of February). During the positive temperature days the system stress partially eased:

- power reserves recovering (especially water reservoirs and Danube flow coming back)
- market prices lowering (but not at the initial level, still unusual high)

System risk and safeguard measures

The Romanian TSO didn`t curtail nor the network exchange capacity neither the export exchanges, and also, no other extraordinary measures with high impact on the electricity market were not applied!

Government Decision no. 10/13.01.2017 related to some safeguard measures in the Romanian energy market:

The Decision was issued in line with Directives 72/2009/EC, art. 42 - *Safeguard Measures* and Directives 2005/89/EC, art. 4 - *Operational network security*;

- states the possibility to apply extraordinary measures with market impact and client affecting

- **reduction/canceling the network interchange capacity;**
- **curtailment of exports;**
- **load limitations (some industrial clients, only, but no disconnections)**

According with the Romanian Energy Low and secondary regulation which sets the rules to be applied on the crisis power system situation, we need more than 6 days from the process triggering (the TSO`s report toward the authorities) until the actual bringing into effect (min. 5 day until the Government Decision and more than 24 hours for the preliminary notifications of the market particpants and official authorities). This due date is too long in terms of power system security, so, it was a real need to create the legal/formal conditions to measures` applying, if the case.

This assessment was made considering the limited amount of reserves for the peak load intervals and chiefly the bad wheater forecasts – very low temperatures and flows on the Danube river – at the decision making moment. By this, the Government endorsed the TSO to analyse and to make the decision of applying the safeguards measures in case of emergency level of the power system (decision making transfer to the TSO level, as preparation for the potential crisis situation/"just in case")

Conclusions (preliminary)

Lessons learned (preliminary)

- Importance of efficient **inter-TSO cooperation** and **involvement of RSCs** from week-ahead to intraday
- **Short & Mid Term Adequacy**, still under development, proved its importance for week-ahead (D-2, D-1?)
- **Coordinated capacity calculation** D-2 to intraday will be valuable (this will be delivered when SOGL is implemented)
- **Specific grid studies** D-2, D-1 done by RSCs useful
- **Seasonal Outlooks**: additional sensitivities?
- **Crisis Communication Tool** of TSOs: more testing required?
- **Investments** in grid and generation infrastructure

Thank you for your attention

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