Building resilience: How ”Retele Electrice” as DSO is facing with energy transition

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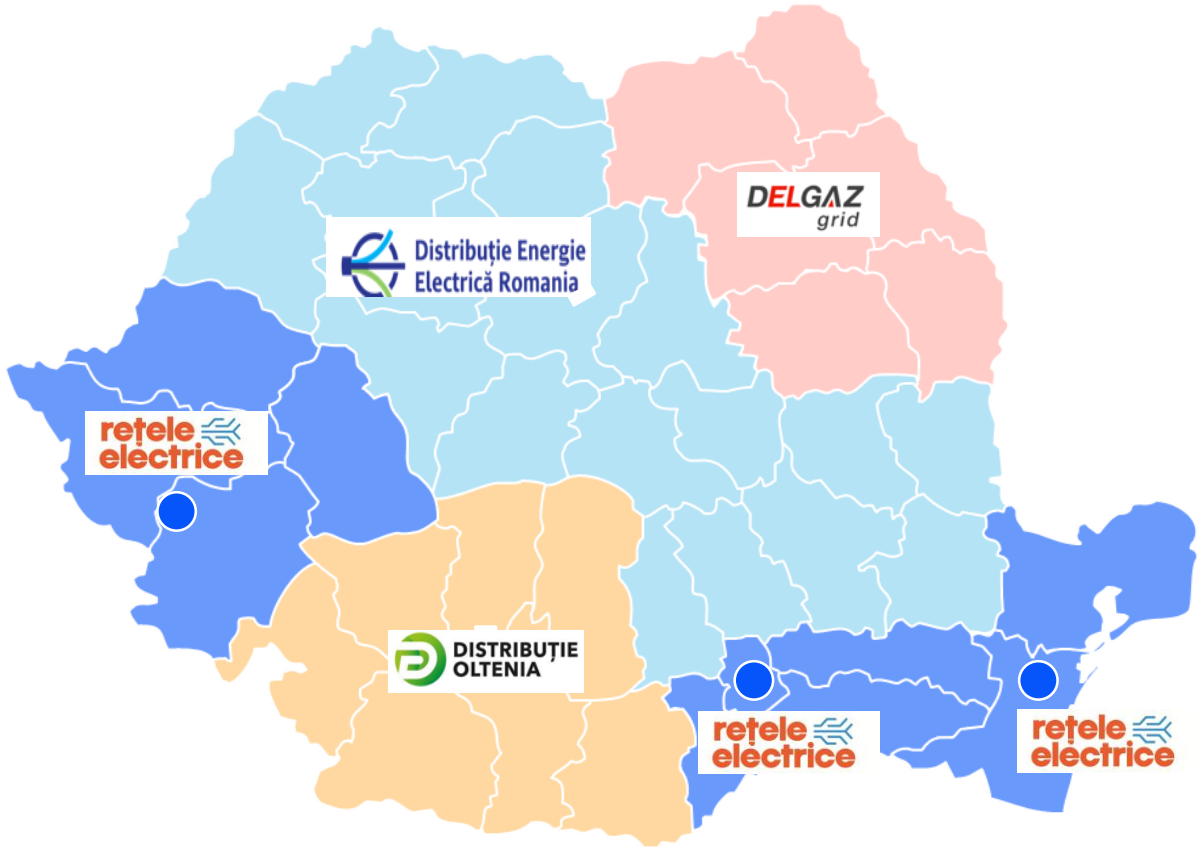
Outline

- Retele electrice. Main data.
- Innovative Resilience Strategy
- Case study: emergency situation
- Q&A

Framework information
Grid Consistency @2024

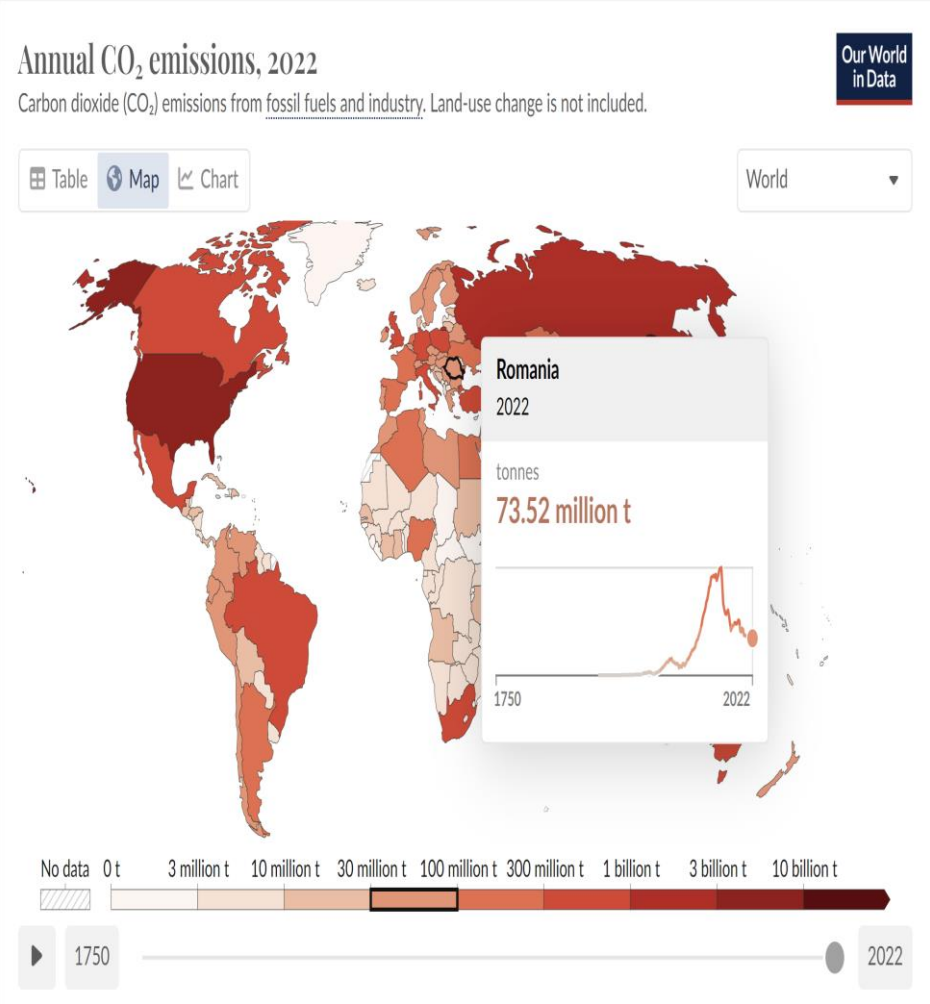


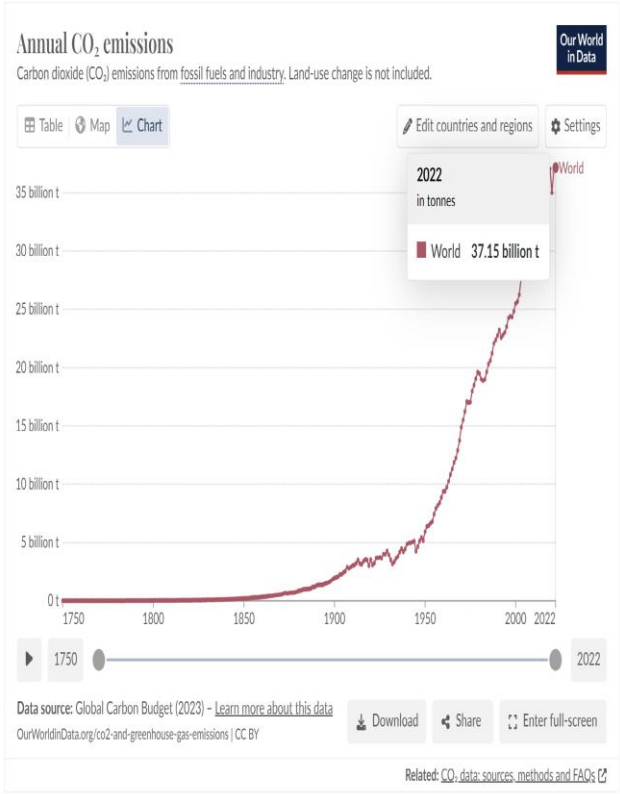
rețele electrice

Full Concession Area Consistencies:

- Power Installed HV/MV: 12,8 GVA
- Power Installed MV/LV: 8,4 GVA
- Primary Substations: 289
- Secondary Substations: >25k
- HV Lines: ~6.500 km
- MV Lines: ~36.000 km
- LV Lines: ~91.000 km
- Customers: ~3.100k

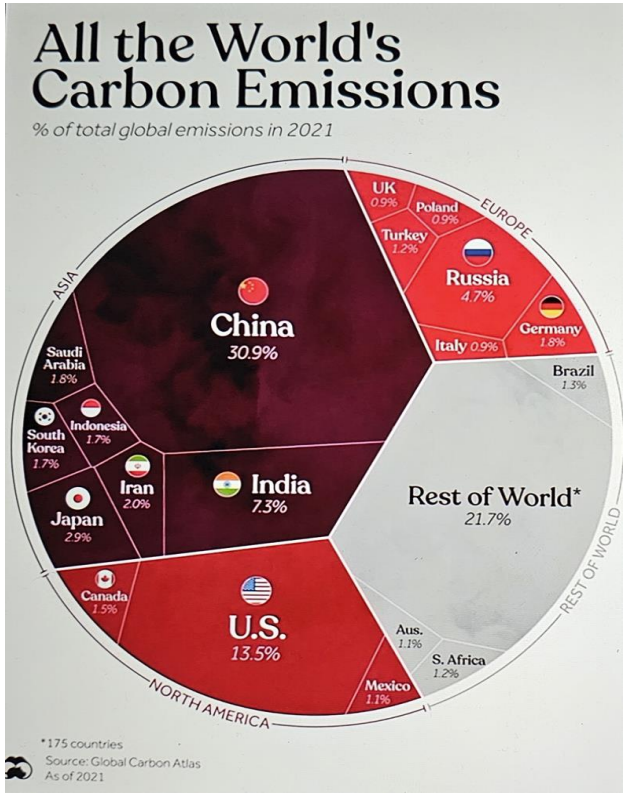
What is our problem…?





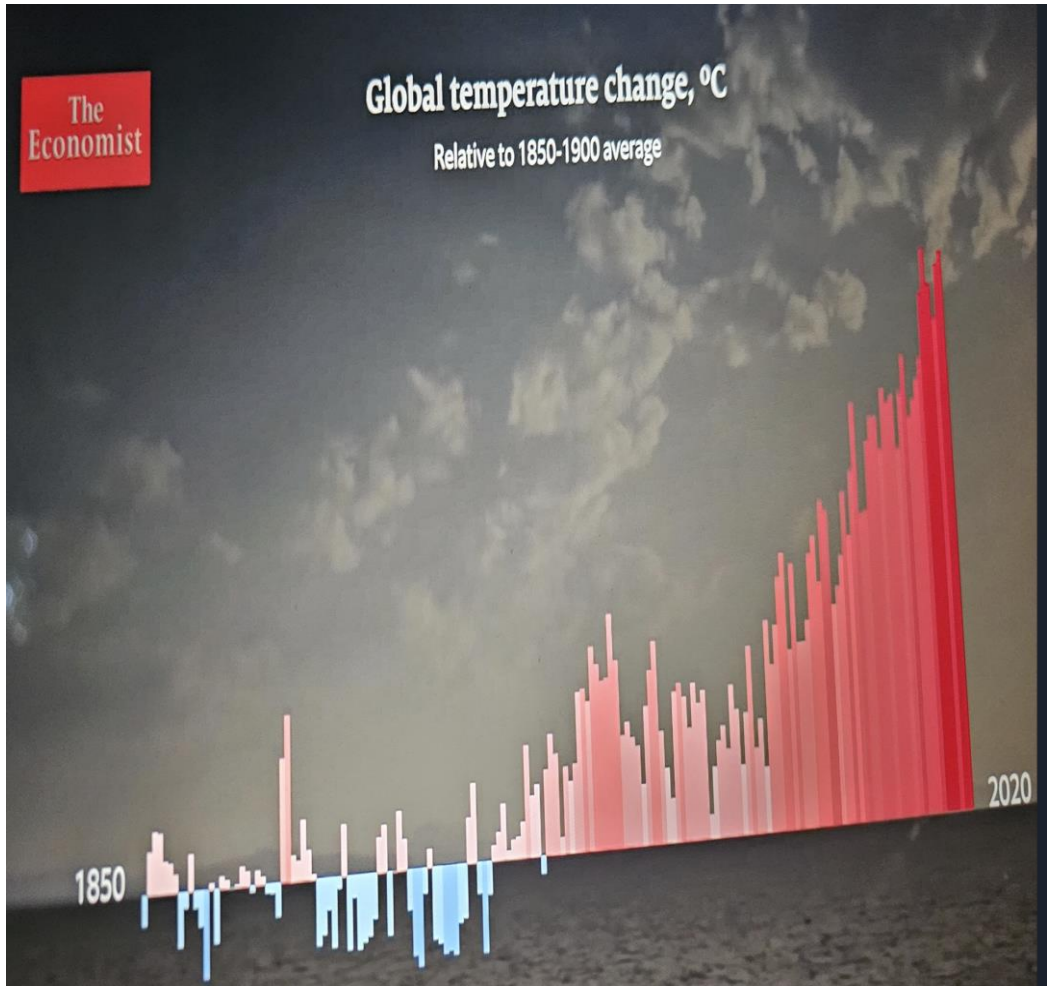
Global CO_2 emissions from fossil fuels and land use

Romania counts for < 0.2% of total world CO2 emissions



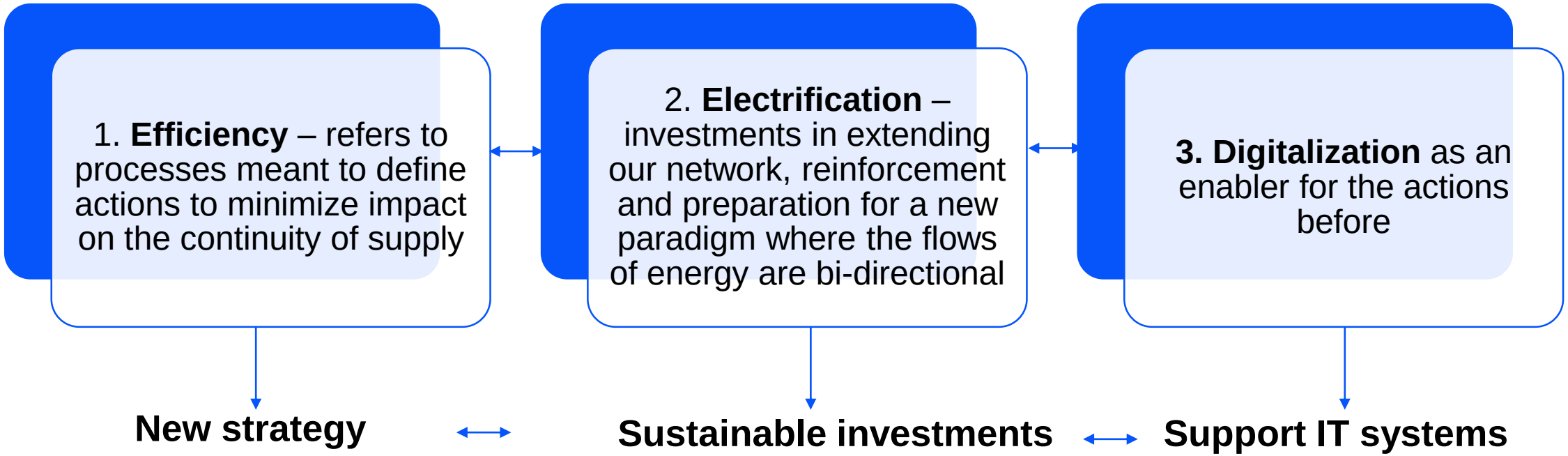
More than 50% of total World's Carbon Emissions are coming from 3 countries: China, USA and India

And where it leads all of us….?



0.16% increase in avg temperature 2010-2019, but…0.26% increase from 2020-2024 Weather changes will severely affect our grid…

Main levers for our actions
Retele electrice approach



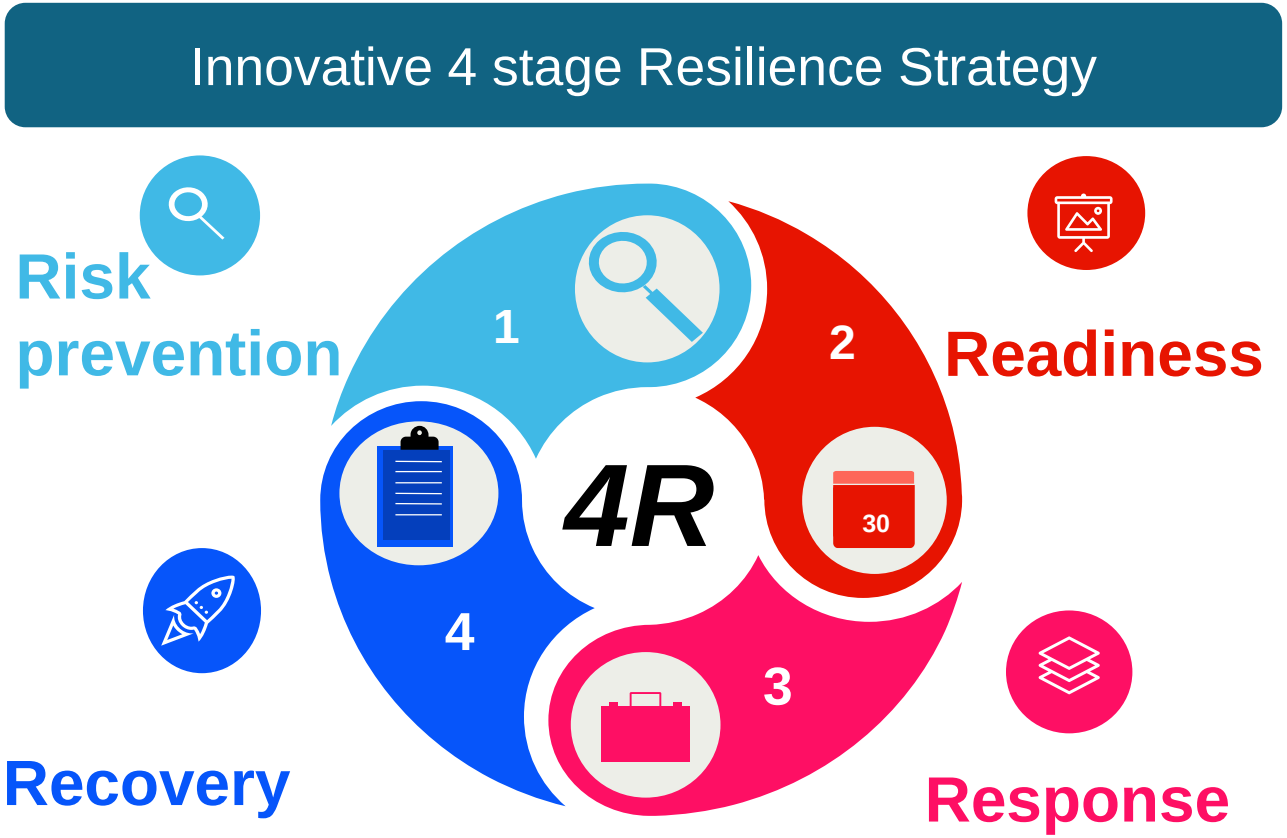
Innovative resilience/operational strategy – focus on efficiency

Resistance

Act or effect of resisting, not giving up. Tendency to endure hardships, great effort

Resilience

Ability to easily revert or adapt to events or change



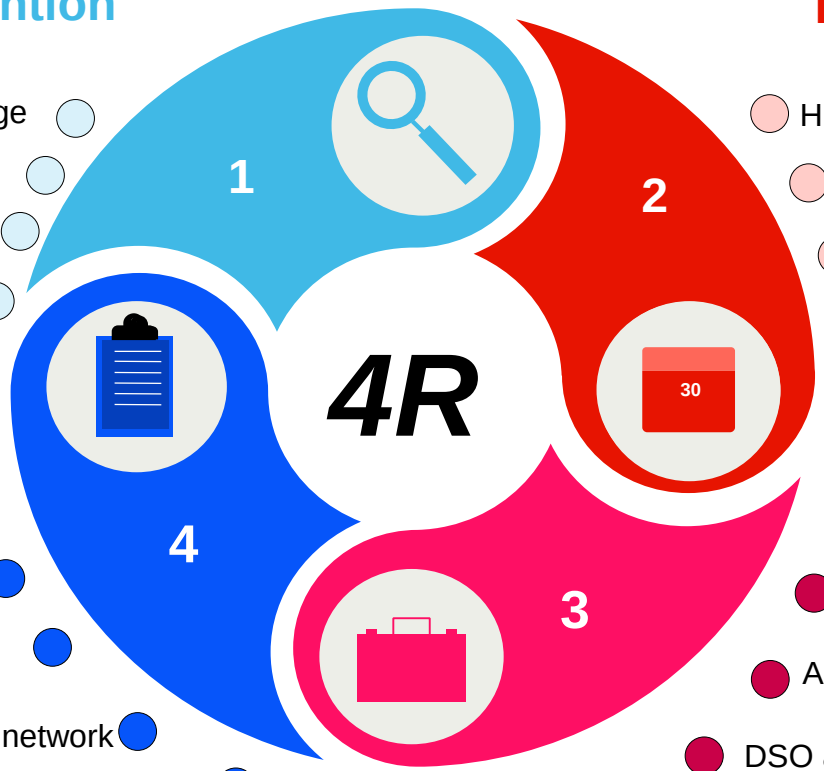
Innovative resilience/operational strategy (in 4 stages)

Risk prevention

- Improving network resilience and reducing damage
- Maintenance procedures, operative inspection
- Standardization of projects, location and construction
- Systems stability

Readiness

- High level of involvement and adequate knowledge
- Advanced systems monitoring and automation
- Better anticipation of the network situation before outages occur
- Preparing for the response and recovery phase



Recovery

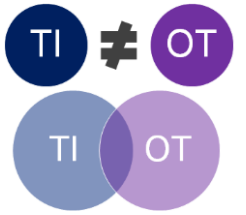
- Effective restoration and timely return to the previous state
- Operational flexibility - the ability to resupply customers in minimal time
- Temporary interventions and repair (recovery) of the network
- Organization of the way in which the distribution service to customers will be restored

Response

- Planning and managing field teams
- Assertive communication with all stakeholders
- DSO acts as a catalyst for the environment with which interacts
- Strategic outage and alert/emergency management

DSO purpose: Ensuring continuity of service

Innovative resilience: Cyber Security



Main activities in the context of the Innovative 4R Resistance

Risk prevention

Valuation of assets across the perimeter

Readiness

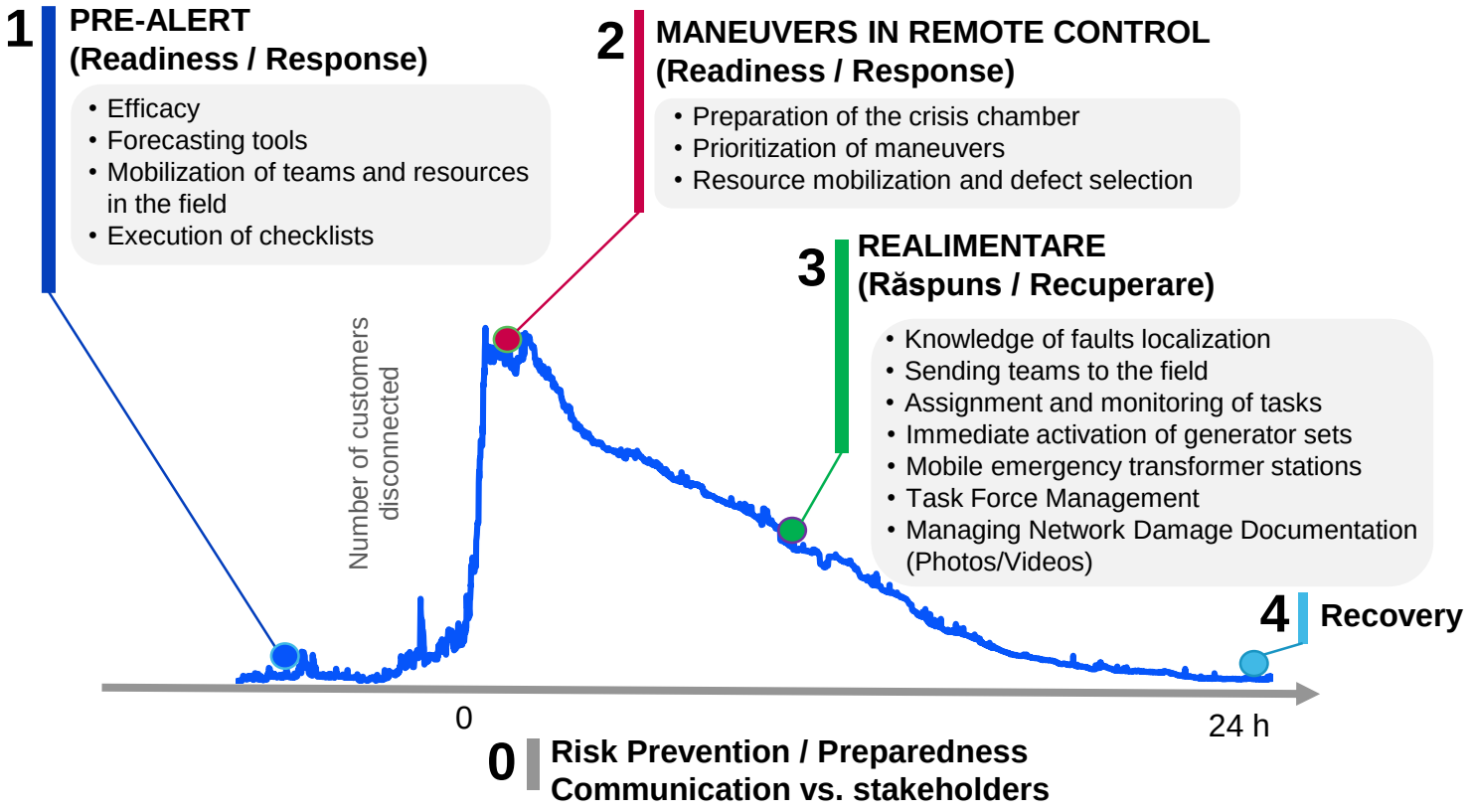
The entire CERT integration program

Recovery

Post-attack analysis to determine how to improve the end-to-end process

Response

Cyber simulations, coordinates communication between all stakeholders and continuously monitors during an attack



Case study: Emergency situation

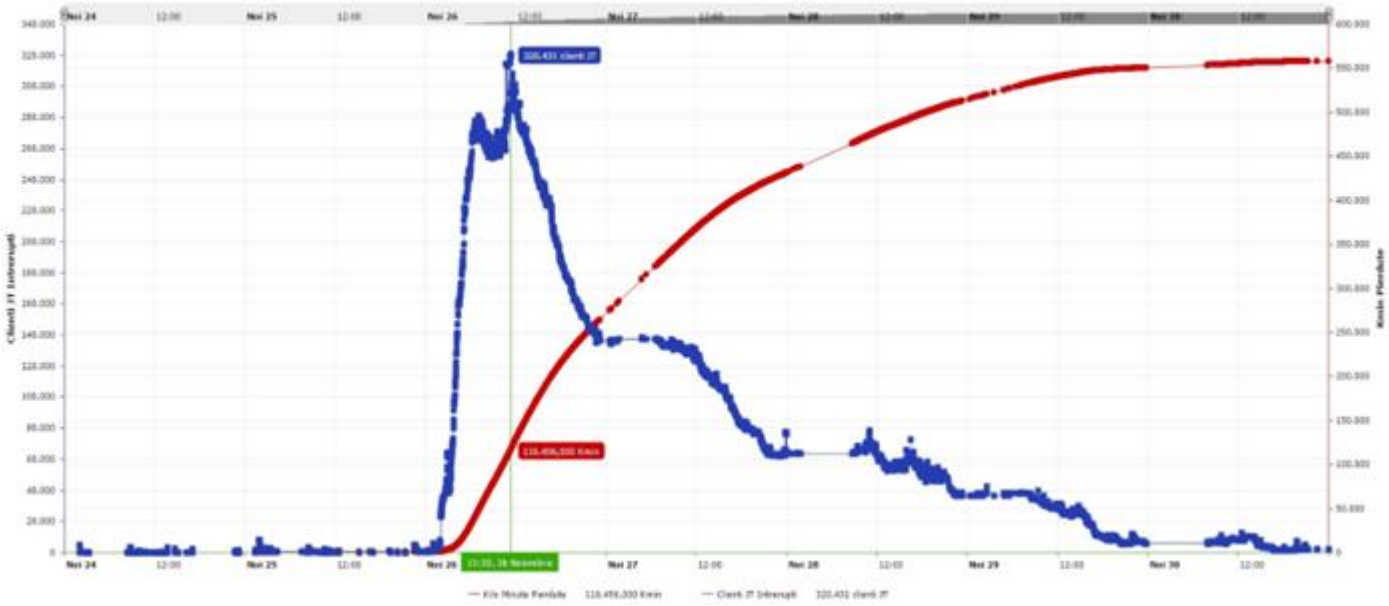
Red code declared by National Meteorological Institute on 26 november 2023 with gusts of wind between 90-100 km/h

Starting with **24.11.2023**, there were weather phenomena classified in the yellow code category, consisting of precipitation with significant amounts of water of 25...30 l/sqm and on restricted areas of over 40...50 l/m, wind with gusts generally of 60...75 km/h and intervals with blizzard and low visibility, then during the night of 24.11.2023 to 25.11.2023, the weather phenomena increased in intensity, turning into heavy rainfall, through which 50...60 l/sqm accumulated and 70 l/sqm isolated.

On **26.11.2023**, the weather phenomena increased a lot in intensity, turning into blizzards, wind with gusts generally of 85...90 km/h and visibility below 50 (orange weather code), it turns into a red code characterized by strong intensification of the wind that exceeded 100 km/h at a gust, and the precipitation turned to sleet and snow as well as very heavy blizzards

The wind speed reached the gust of almost 40 meters/second, over 140 km/h.

Due to the extreme weather phenomena, which had a very long duration of manifestation, the electrical networks in the area served by the DSO were affected. Thus, the triggering of high and medium voltage power lines, as well as disturbances in the low voltage network followed the trend of weather phenomena, with a **maximum on 26.11.2023 at 11:20** a.m., when a number of **320.431 low voltage customers were without power from the medium and high voltage networks**



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Given the unfavorable weather conditions, as well as the difficult access in many areas, due to the closed roads, the interventions are very difficult, and the electricity supply situation during the period in which the extended red code and orange codes were affected, was a dynamic one.

Case study: Emergency situation

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The strategy adopted by the company was to intervene and fix the faults in the descending order of the voltage level and the number of affected customers, focusing on the networks that supplied domestic customers, so that the actions taken to restore the electricity supply have as big an impact as possible.

After most of the medium voltage lines supplying household customers were repaired, thus significantly reducing the total number of affected customers, the next step was to intervene in the low voltage network, primarily for the collective disturbances that affected a large number of customers. In order to increase the efficiency of the interventions, taking into account the long distances that had to be covered to remedy the defects in the network, as well as the state of the roads, once the works were initiated in a locality, action was taken until all disturbances were completed.

Case study: Emergency situation

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Particular attention was paid to ensuring the utilities of the cities of vital importance for the inhabitants (drinking water supply, district heating, natural gas) through targeted repairs in the medium and low voltage networks as well as through the installation of own and third-party generating groups. The company has also ensured the fuel supply of these generators, so that the discomfort felt by customers is as little as possible.

Case study: Emergency situation

Red code declared by National Meteorological Institute on 26 november 2023 with gusts of wind between 90-100 km/h

An essential factor that prevented interventions to remedy the damage was the generalized lack of communications starting with the middle of the day on 26.11.2023, both for the transmission of data, necessary for remote control in the transformer stations and for the medium voltage equipment in transformer stations and overhead power lines, as well as voice communications for the coordination of maneuvers by dispatchers and low-voltage interventions between teams and coordinators Local. The lack of telephone signal for data and voice remained generalized until the middle of the day on 28.11.2023 when, as the power supply of the pillars of mobile operators was successful, the lack of signal became local. We specify that mobile operators have as a backup source for the supply of electricity UPSs with a relatively short operating life, which led us into a vicious circle: lack of electricity supply to the pillars - lack of communications - impossibility of performing maneuvers to locate and isolate defects - impossibility of moving on public roads of the generating groups for powering the pillars.

Case study: Emergency situation

Red code declared by National Meteorological Institute on 26 november 2023 with gusts of wind between 90-100 km/h

The extreme weather phenomena affected not only the RED installations, but also those of Transelectrica. On 26.11.2023, in the intervals 10:40 - 10:42 and 13:10 - 13:13, the entire Tulcea county was cut off from the 400 kV network, under the conditions that the 110 kV lines that ensured the interconnection with other counties were triggered. Our teams acted with priority to ensure the reservation with electricity of the internal services of the Transelectrica transformation stations.

A special accident occurred in the 110/20 kV Sarinasuf substation in the Tulcea city, which supplies the entire Danube delta with electricity through the 110/20 kV Crisan station. The wind with gust speeds over 110 km/h tore off a piece of the station's roof and knocked a 110 kV current measuring transformer from its pedestal, which led to the tripping of the 110 kV Tulcea Vest-Sarinasuf line and the lack of electricity supply of all customers from the Danube delta and part of the continental part of the city.

Case study: Emergency situation

Red code declared by National Meteorological Institute on 26 november 2023 with gusts of wind between 90-100 km/h

Due to the difficult access, the interventions to replace the defective transformers were equally complicated. As the machines (trailer, crane, etc.) could not reach the vicinity of the transformer substations, the transformers were transported, handled and mounted manually

Thank you for your attention

Q&A