25 September 2025
15:00 (CET) - Online

UIC WEBINAR

Sharing Railway Response to the Iberian Power Outage: Impact on Railway Systems and lessons learned

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The Day: April 28, 2025 – An Overview

An unprecedented event in the electricity grid occurred:

- **Unprecedented Blackout:** The power outage was a rare and unparalleled event.
- **Scope of Impact:** The blackout led to a widespread power failure, impacting the entire Iberian Peninsula simultaneously.
- **Disruption of Essential Services:** The outage caused severe disruptions to critical services, including hospitals, emergency response units, and vital public services, posing a significant threat to both public safety and live

Impact on essential services in Portugal

Disruption of Public Services:

- **Healthcare facilities:** In the health sector, hospitals were forced to convert to generator power to sustain operations, but many backup sources succumbed to fuel shortages or UPS exhaustion, threatening patient care and loss of lives.

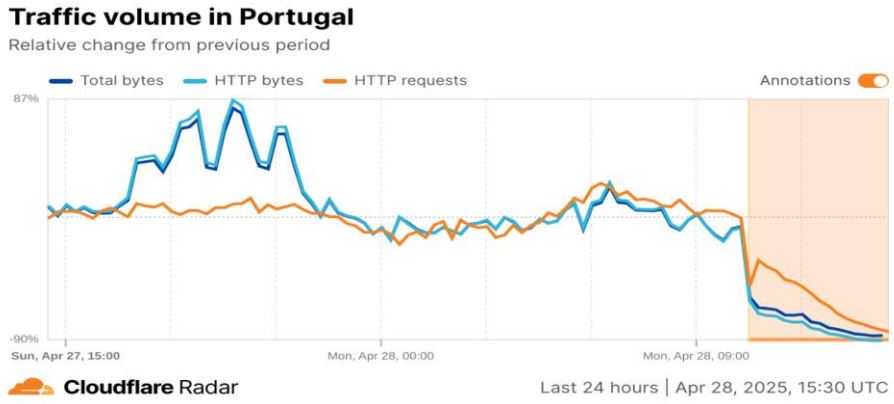
- **Transportation Disruptions:** the blackout wreaked havoc on transportation systems, with traffic management crippled and public transport systems like trains and metro effectively paralyzed due to the power failure.

Impact on essential services in Portugal

Disruption to services relied upon by the public:

Communication Network Limitations:
Telecommunication networks were severely impacted by the blackout. Mobile services became unreliable as UPS systems and local generators failed due to fuel shortages or depleted batteries. This disruption of critical communication channels hindered coordination and emergency response efforts

Widespread Service Failures:
The escalating crisis intensified public frustration and obstructed recovery efforts across multiple sectors. As essential services continued to degrade, concerns grew over public safety and the overall stability of vital infrastructure.



Civil Protection Response:
The blackout exposed serious flaws in emergency preparedness plans. Diesel fuel distribution became a major bottleneck as authorities struggled to keep vital services operational. Backup power systems failed, causing hospitals to struggle to maintain care standards and emergency communications to collapse. This strain revealed critical gaps and underscored the urgent need to strengthen infrastructure resilience.

Consequences for Rail transport (CP)

On April 28, 2025, rail transport in Portugal was completely halted due to a general strike at Comboios de Portugal (CP).

Workers' Union Strike Effects

Luckily, an early morning strike by CP workers with 100% stopping of the circulation, inadvertently mitigated the situation, as there were no stranded trains needing rescue operations during peak disruptions.

To summarize, the challenges faced by CP on April 28, 2025, were:

Due to a strike:

- **No Business**
- **No operation**
- **No major problems with the trains**

Lessons learned - Incident / accidents resolution

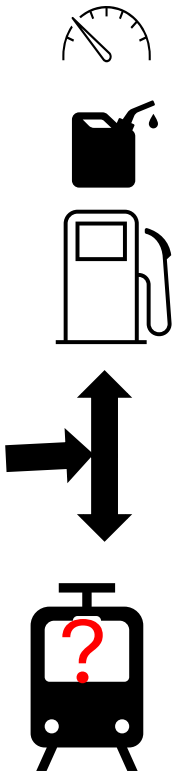
Lessons learned

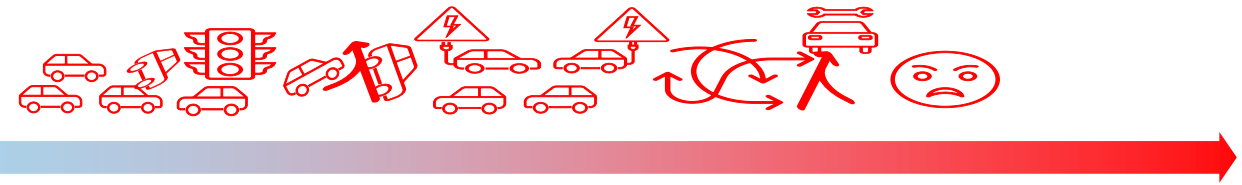
Incident / accidents resolution

Interventions and protocols with the police authorities

Protocol Resilience Under Stress:
Although existing emergency response protocols are conceptually solid and have been tested in previous real-world events, the blackout revealed the strain they face under extreme conditions. Response efforts had to shift rapidly toward two urgent priorities: transporting injured individuals to hospitals through congested and chaotic traffic and preserving energy supplies in healthcare facilities to keep critical operations running.

Systemic Prioritization Challenges:
The incident exposed a fundamental challenge in emergency management: in large-scale crises like a national blackout, the protection of human life and the functionality of hospitals become the overriding priorities. As a result, routine operational targets and procedures are sidelined. This underscores the urgent need to revise, adapt, and rigorously stress-test emergency protocols to ensure they remain effective under extreme and rapidly evolving scenarios.

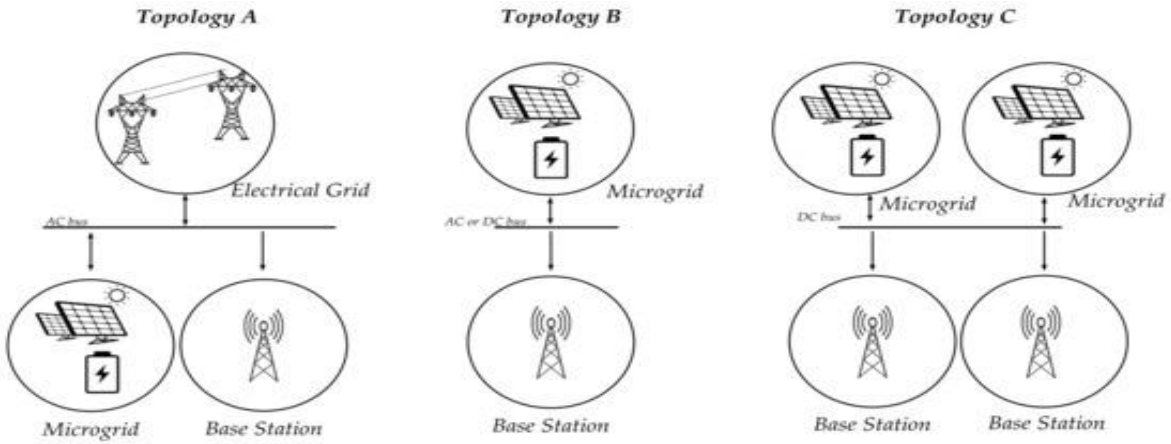




Lessons learned

Infrastructure resilience and telecommunications autonomy

- **Need for Alternative Communication Channels:**
  The failure of primary telecommunication networks during the blackout demonstrated the importance of establishing alternative, redundant communication systems. This includes satellite-based communications, radio networks, and other offline-capable technologies that can ensure coordination between emergency services and critical infrastructures when conventional systems are compromised.



Lessons learned

Infrastructure resilience and energy autonomy

- **Critical Energy Autonomy Needs:**
  The incident underscored the urgent need for energy autonomy in critical infrastructure. It prompted serious reflection on the adequacy of existing emergency power solutions and the strategic design of energy reserves to ensure uninterrupted functionality during future crises.

- **Fuel Logistics Dependency:**
  The blackout exposed a major vulnerability: the heavy dependence of fuel distribution and refueling stations on a stable electricity supply. This dependency disrupted logistics chains and revealed systemic weaknesses that must be addressed through more resilient and decentralized fuel and energy delivery strategies

- **Resilience of Transport Infrastructure:**
  Despite the blackout, both land and river transport infrastructure remained structurally intact, enabling an almost seamless resumption of operations the following day. However, the event sparked renewed discussions about the true resilience of these systems under prolonged or repeated stress.

Conclusions:

We must improve preparedness and coordination

- **Enhancing Telecommunication Autonomy**
  Telecommunication networks must evolve to reduce their reliance on continuous power supply. Strengthening backup systems — including battery reserves, generators, and off-grid solutions — is essential to maintaining communication during future disruptions.
- **Importance of Simulation Exercises**
  Regular simulation exercises focused on large-scale power outages can provide critical insights, improve readiness across sectors, and expose operational blind spots before real crises occur. These exercises help align protocols, test coordination mechanisms, and build institutional resilience.
- **Clarifying Coordination Roles**
  The clarification of rules and protocols among all entities responsible for critical and essential services, as well as a thorough assessment of their operational needs, is increasingly important. These assessments are key to enabling incident command and coordination centers to effectively prioritize the allocation and deployment of available resources.

Questions?

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THANK YOU FOR YOUR PARTICIPATION!