

The European Commission's science and knowledge service

Joint Research Centre

Managing the risk from geological hazards to critical infrastructure and industrial facilities

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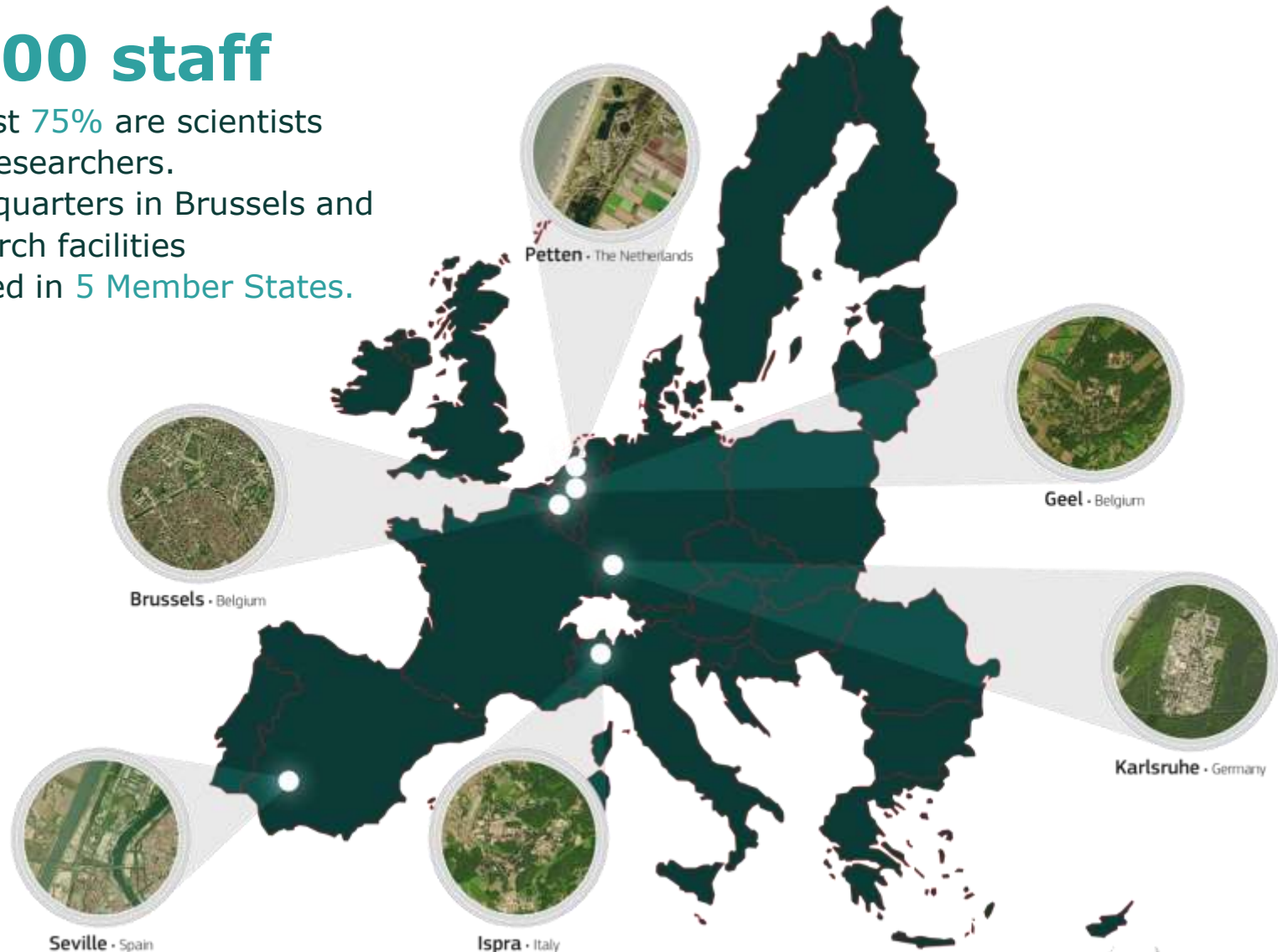


The Joint Research Centre at a glance

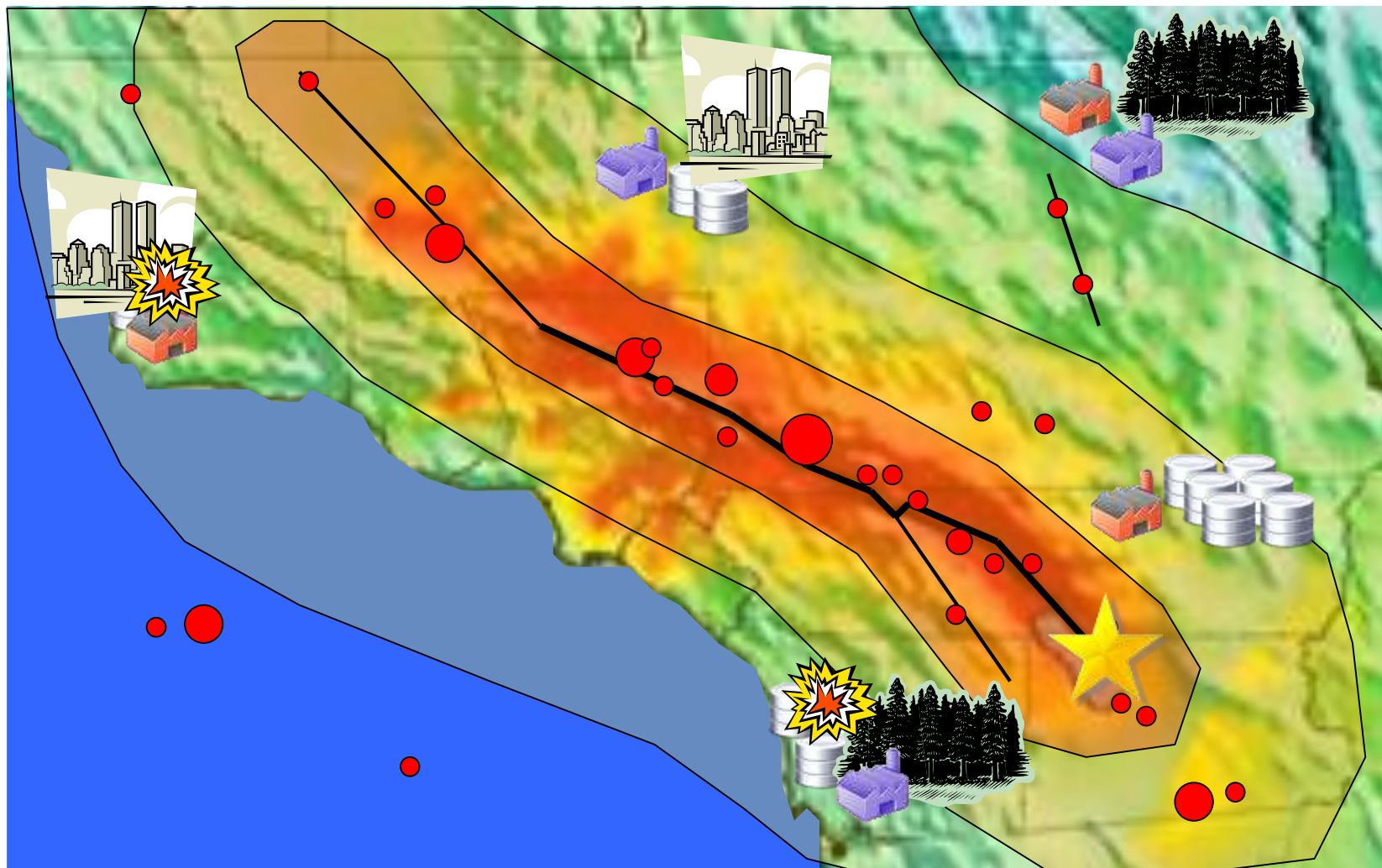
3000 staff

Almost 75% are scientists and researchers.

Headquarters in Brussels and research facilities located in 5 Member States.



Earthquake risk on technological systems



JRC Activities

Forensic Analysis and Guidance

- Site **surveys** (e.g. Japan, China)
- Statistical **analysis** of accident data
- **Lessons learned** and **recommendations**
- **Natech database: eNatech**
<http://enatech.jrc.ec.europa.eu>

Forensic Analysis and Guidance

- Natech risk assessment **trainings**
- **Emergency response exercises** support
- EU Natech Expert Group

Risk Analysis/Mapping

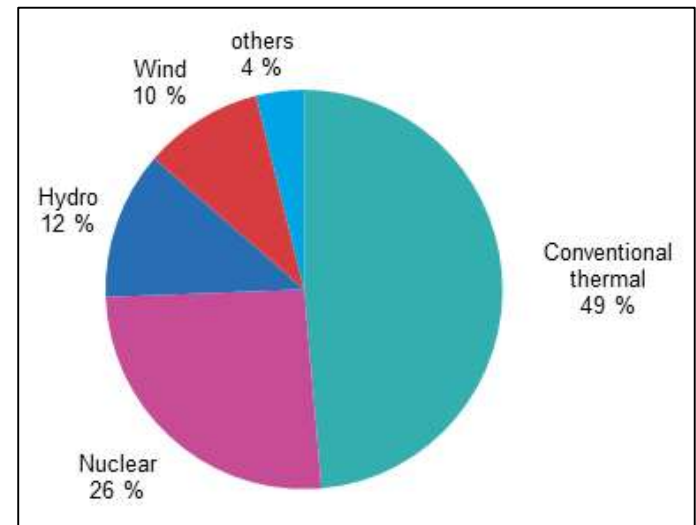
- **Natech risk assessment and mapping framework: RAPID-N**
<http://rapidn.jrc.ec.europa.eu>

Stakeholders

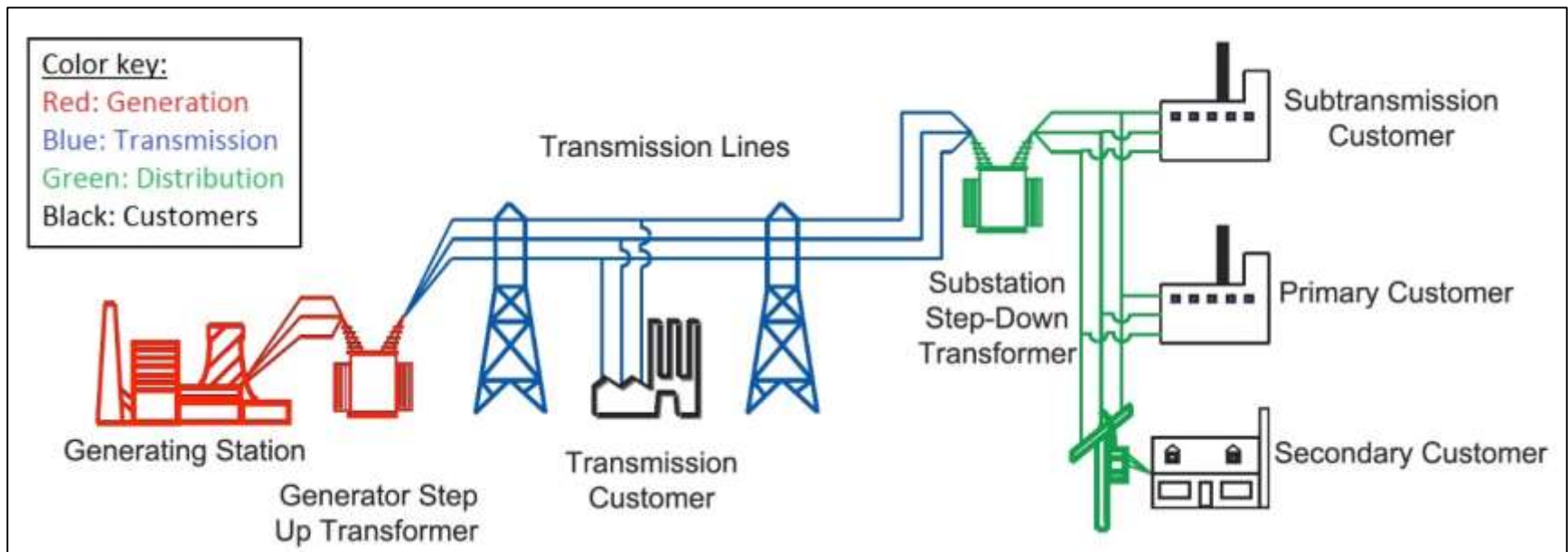
- EU MS, CC and neighbor countries
- Third countries
- OECD
- UNEP/OCHA JEU
- UNISDR
- WHO

Electricity in Europe

- Assets and facilities owned by public and private entities.
- Risk reduction and crisis management scattered over different EU legal acts.



Source: Eurostat (2017)



Source: Adapted from US-Canada Power System Outage Task Force (2004)

Earthquakes

- Damage types:
 - Inertial damage to structures/equipment
 - Foundation/ground failure
- Contributing factors:
 - Soil liquefaction
 - No warning



Source: T&D World Magazine ([2014](#))

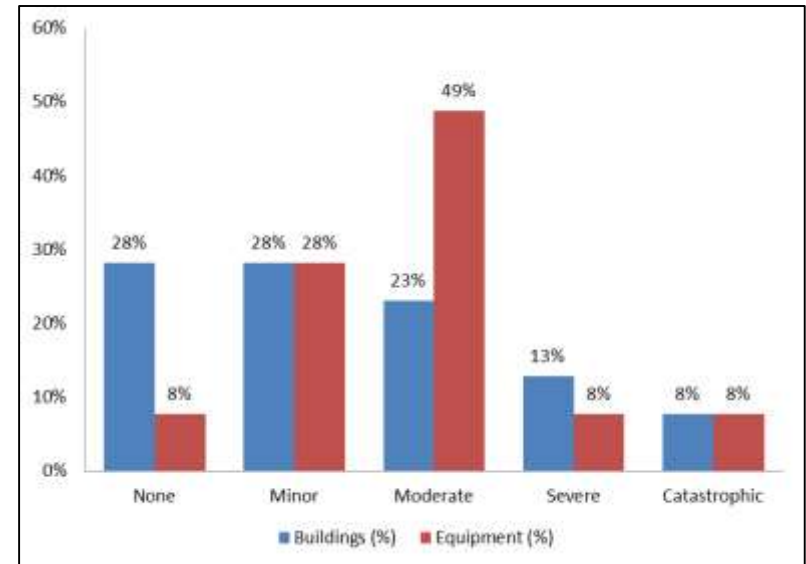


Source: thunderboltznz blog ([2011](#))

Earthquakes (contd.)

- Vulnerable equipment:
 - Heavy items
 - Ceramic parts
- Recovery time driven by:
 - Widespread moderate and severe damage
 - Access
- Recovery time:
 - Ranges from a few hours to months
 - Most commonly, 1 to 4 days

Distribution of damage severity per damage level (based on a sample of 39 facilities)



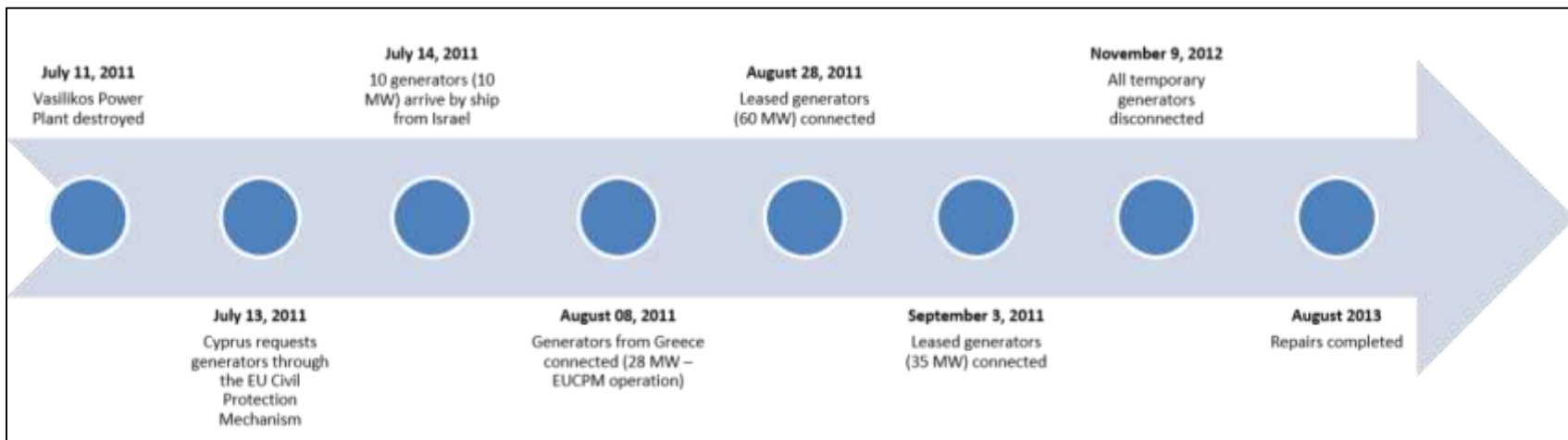
Estimated repair time

Component	Repair strategy	Repair time
Transmission Tower	Replacement	10 days
	Erect temporary tower	1-2 days
Large Power Transformer	Inspect, reset and re-energize	14-20 hours
	Refill oil, onsite	2 days
	Minor repair, onsite	1-2 weeks
	Change windings, onsite	3 months
	Replace (no existing spare)	1 year or more
	Replace with spare	5 days

Resilience

- Capability to meet response-generated demands.

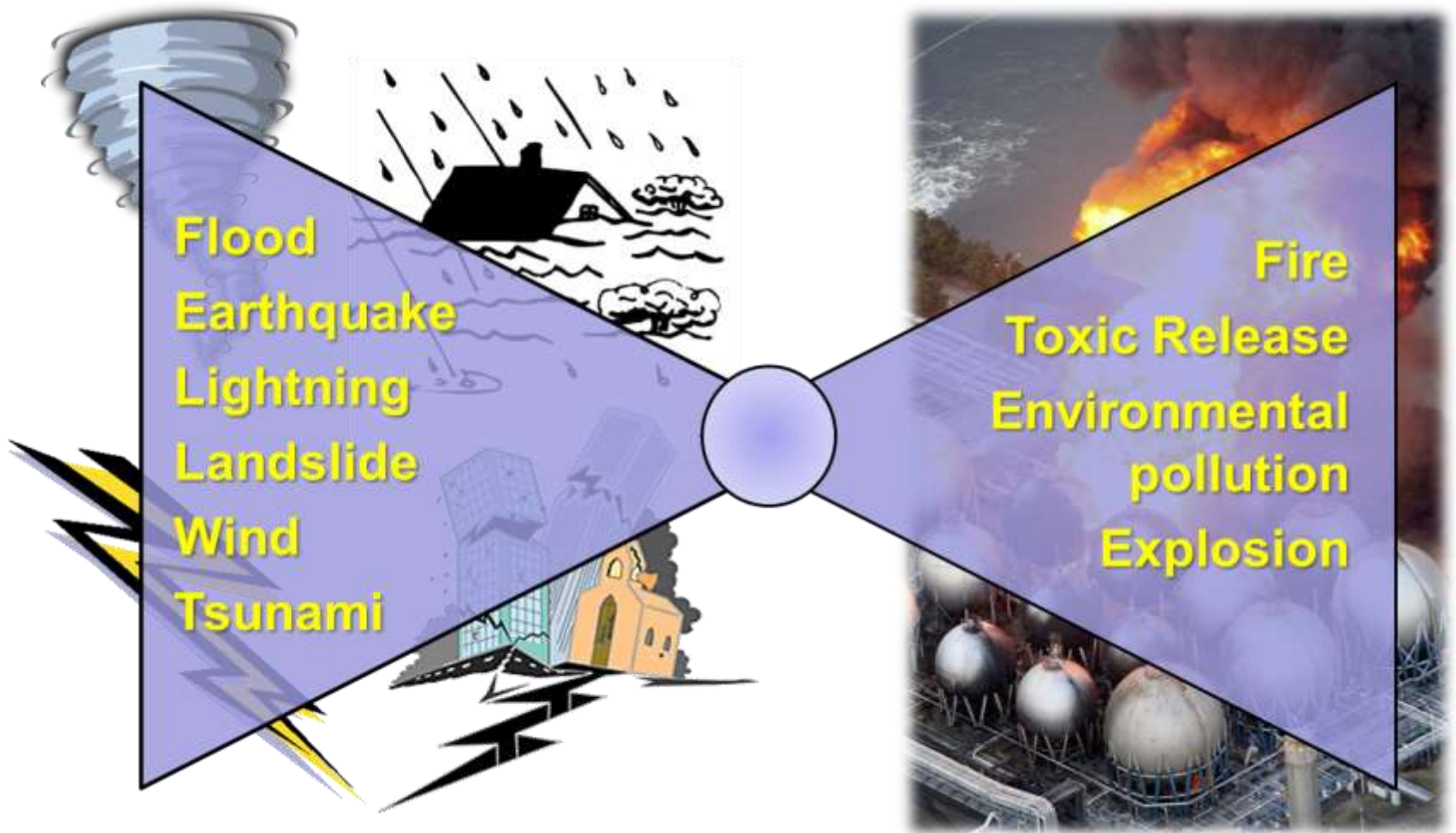
Power grid recovery timeline following the 2011 explosion at the Evangelos Florakis Naval Base, Cyprus



- Availability of spare parts and equipment items.
- Network interconnections increase resilience by providing alternative power supply routes.
- Network configuration.

Natural Hazard Triggered Technological Accidents

Accidents involving **hazardous-materials** caused by **natural hazards**





Obstacles to Natech Risk Reduction

Lack of recognition that include natural hazards.

Lack of guidance on how to manage the associated risk.

Lack of information due to limited data on Natech accidents and hence

Questions about adequacy c

- Design codes and standards for prevention of loss of containment
- Uncertainty as to which level of risk is acceptable above the design-basis load

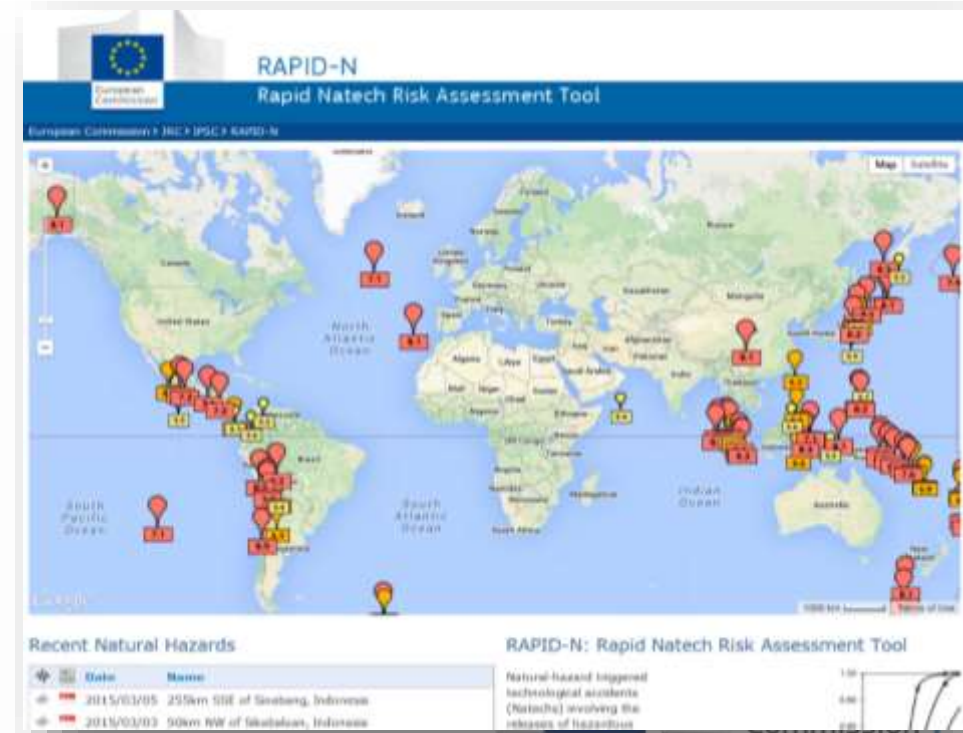
Natech risk assessment i
cuts across traditional pr

Priority work areas:

- Implement and enforce regulations for Natech risk reduction
- Develop methods, tools and guidance for Natech risk management
- Develop dedicated Natech emergency management plans
- Develop Natech risk maps
- Raise awareness and improve risk communication
- Train stakeholders on Natech risk reduction

RAPID-N

- Web-based, publicly available **decision-support** tool for Natech risk assessment and mapping
- **Unites** natural-hazard assessment, damage estimation and consequence assessment **in one tool!**
- Features
 - **Collaborative**
 - **Multilingual**
 - **Modular** architecture
 - **Easy** and **quick** data entry
 - Automated **data estimation**
 - **Rapid** and **scalable** analysis
 - Visualization



Thank you for your attention!



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