

Strengthening Radiological Protection in SMR Deployment

A Strategic Imperative for Europe's Nuclear Future

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Key Message

SMRs are pivotal to Europe's energy transition and security.

Deployment must rest on a robust, forward-looking Radiological Protection (RP) strategy.

Rethink: emergency planning, source terms, staffing, and public communication for SMR specifics.

Europe at a Crossroads: Innovation and Security

Europe is rebalancing between innovation and security. As energy systems decentralize, resilience becomes as important as sustainability.

SMRs offer both — but only if they are deployed responsibly, under strong regulatory oversight. This is where radiological protection moves from policy into practice.

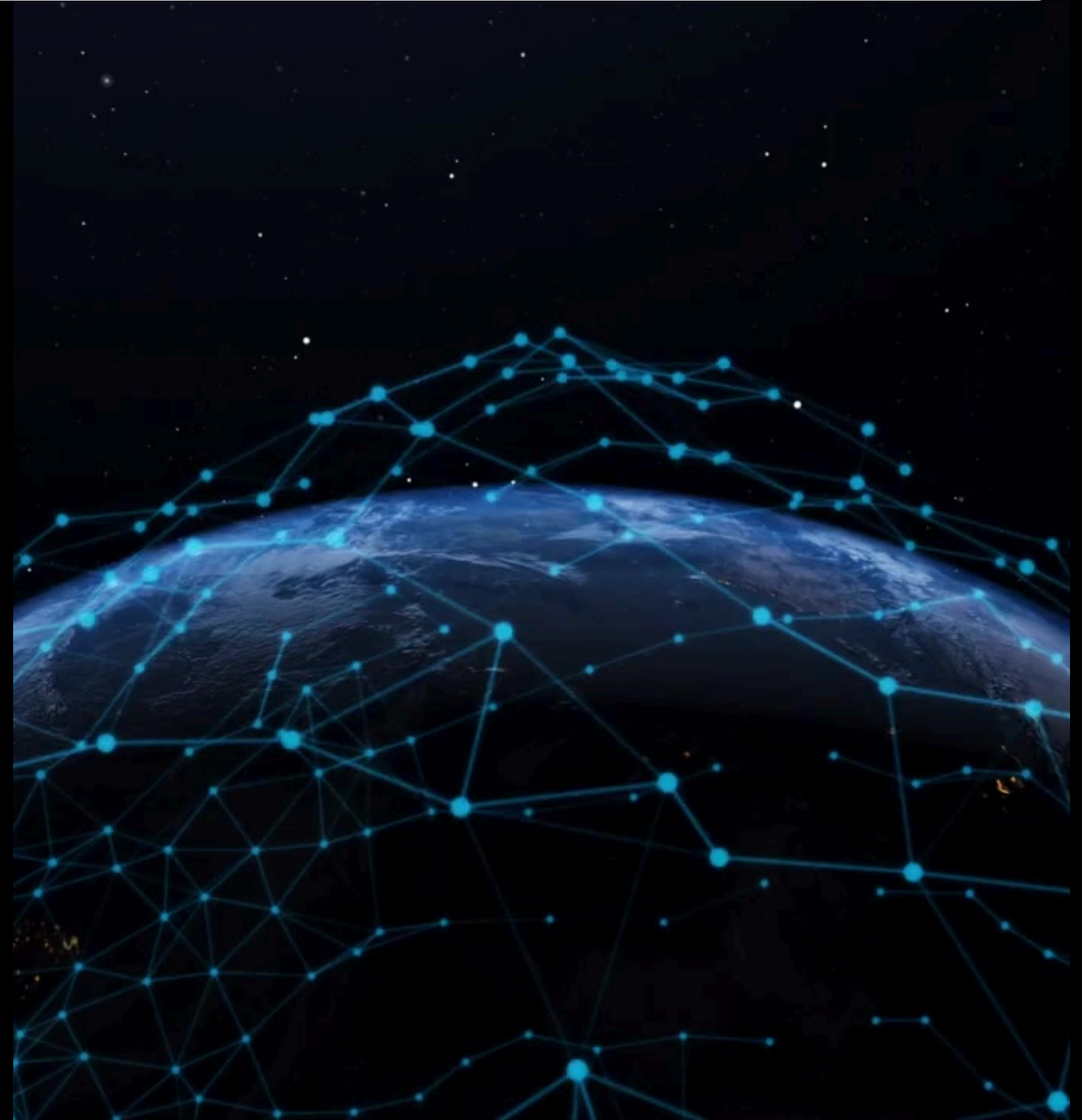
The energy transition demands resilient, low-carbon solutions.

Nuclear energy anchors strategic autonomy and stability.

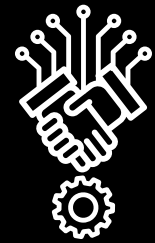
SMRs combine innovation with responsibility.

Why SMRs Matter for Europe

- Flexible, scalable capacity for decarbonisation and grid support.
- Siting diversity: urban/industrial, remote regions, offshore configurations.
- Beyond electricity: heat, desalination, hydrogen, district energy.

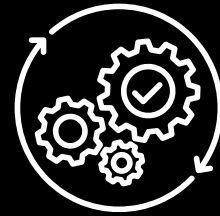


THE REGULATORY IMPERATIVE



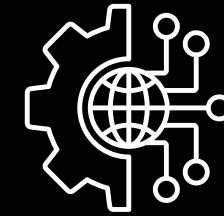
No responsible SMR rollout without a modern RP framework.

I argument



Adapt requirements to SMR specifics while keeping LWR-equivalent protection levels.

II argument



Transparency and engagement to sustain public trust.

III argument

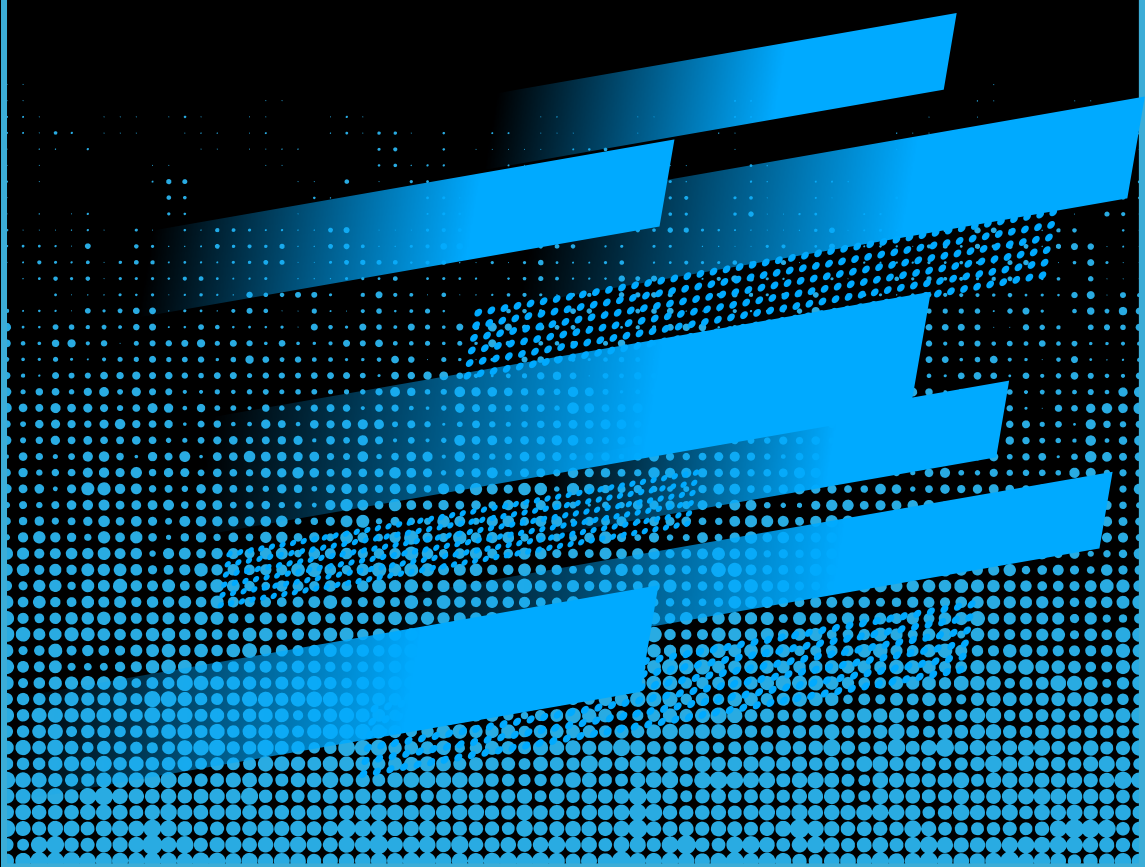
SMR-Specific RP Challenges (as Regulatory Checkpoints)

- Limited OPEX and diverse designs (LWR & non-LWR/Gen IV).
- Source terms and release pathways differ from large LWRs.
- Emergency Planning: proportionate EPZ & multi-unit scenarios.
- Staffing, culture of safety & MCCO (supply chain traceability).
- Siting & environmental interfaces; risk communication.

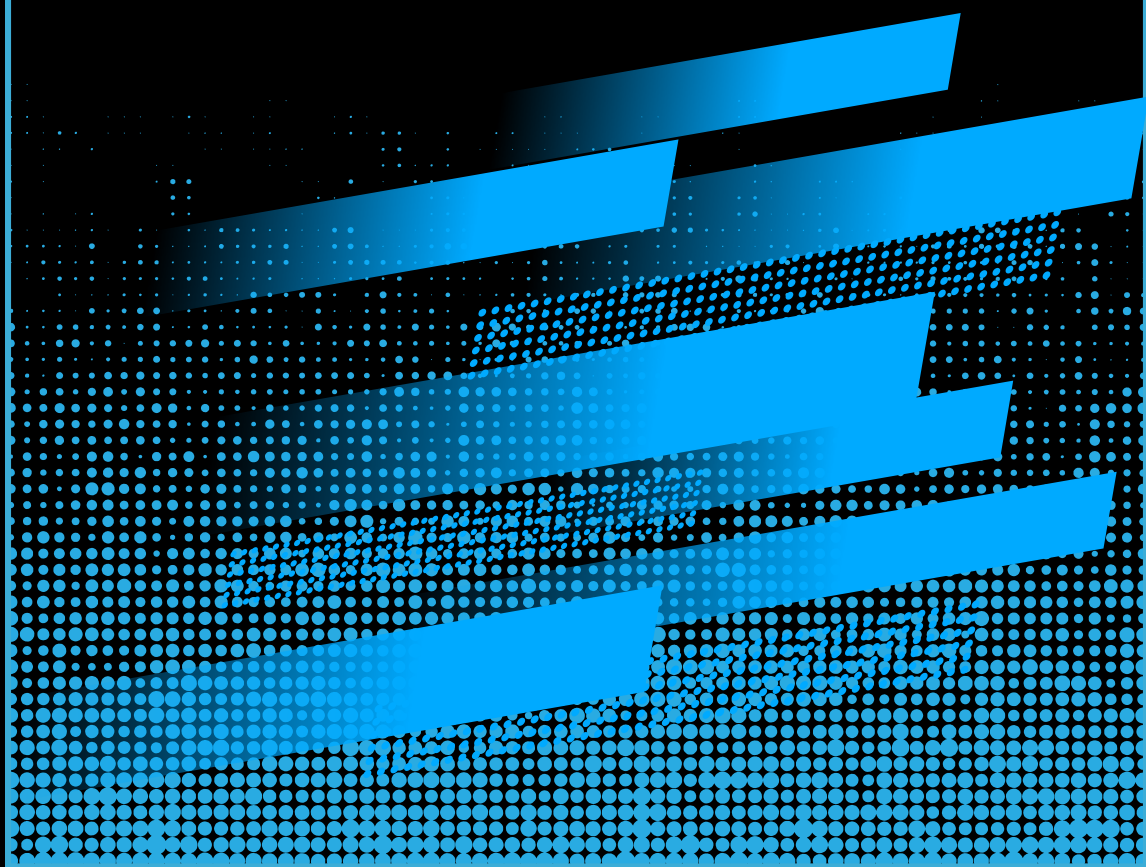


RETHINKING DEFENCE-IN-DEPTH (DID)

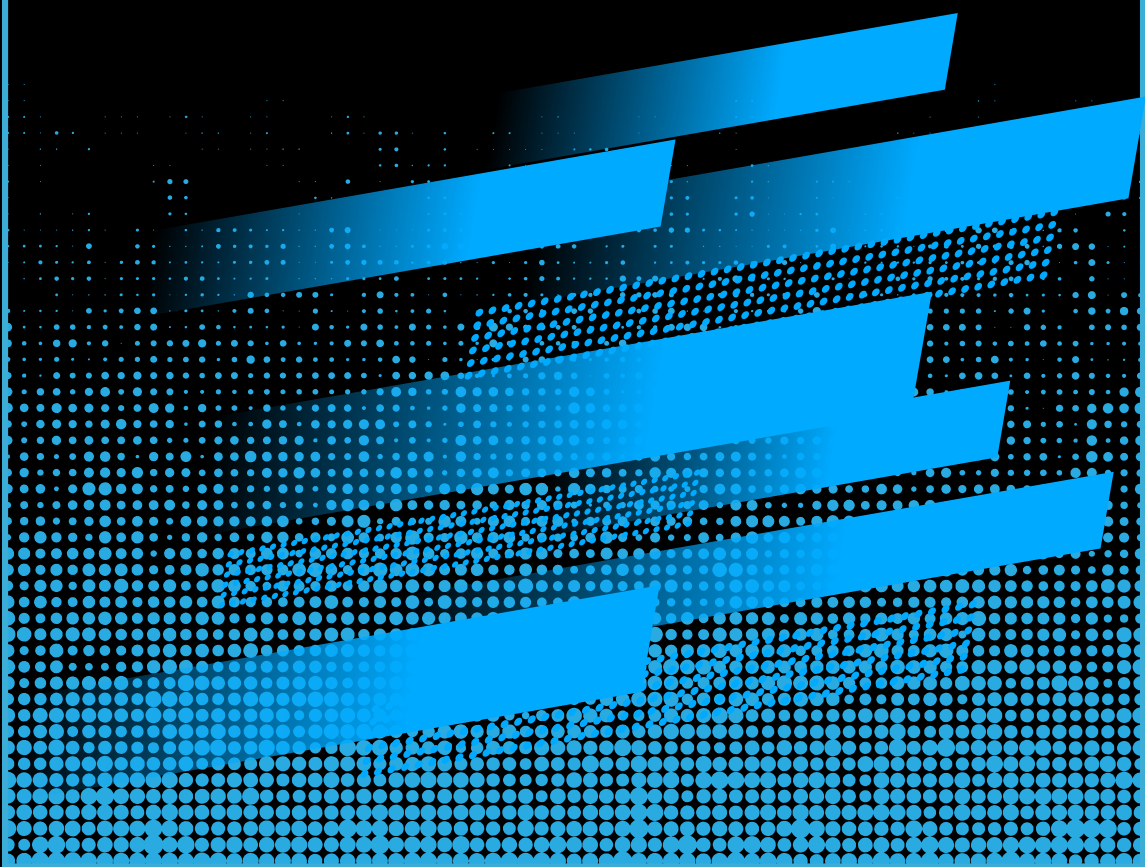
Advanced barriers: novel fuels (e.g., TRISO), modular/underground layouts.



Passive safety and extended coping times as design drivers.



Demonstrate equivalence or superiority vs. LWR DiD—risk-informed and performance-based.




Functional Containment: A New Regulatory Question

- Some SMRs rely on radionuclide retention at the source rather than classic pressure-retaining buildings.
- Clear acceptance criteria required: barrier robustness, independence, reliability.
- Consequences for emissions limits and EPZ sizing must be justified.

EMERGENCY PREPAREDNESS & RESPONSE (EPR) FOR SMRS



Proportionate EPZs and protective strategies based on credible source terms.



Include multi-unit & common-cause hazards (fire, flood, seismic).



Drill, train, and verify readiness of licensee and authorities.

Regulatory Diplomacy

- Harmonizing graded approaches across Europe.
- CNCAN's leadership in ENSREG, RANET, IAEA.
- Safety cooperation as soft power.

**Regulatory alignment is the quiet
diplomacy of nuclear safety.**

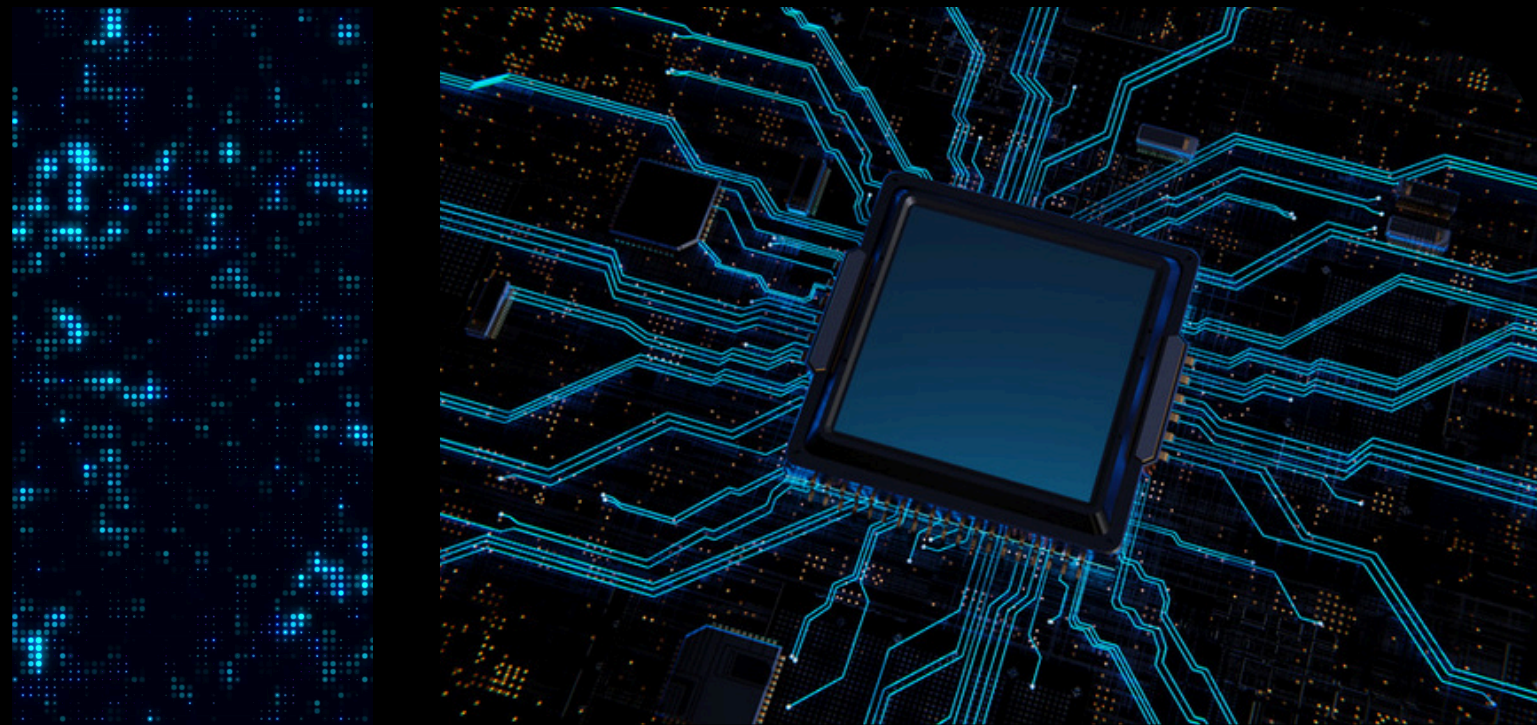
Through partnerships and peer reviews, CNCAN promotes proportionate, harmonized standards.



EMERGENCY PREPAREDNESS & RESPONSE (EPR) FOR SMRS

Doicești: A Case of Regulatory Foresight

- Romania's first SMR: a testbed for the graded approach.
- Early engagement, transparent evaluation.
- Evidence-based, predictable oversight.

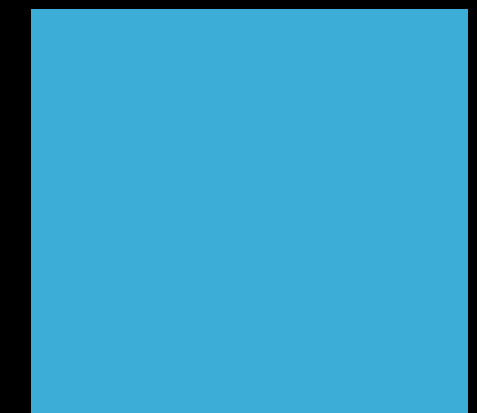
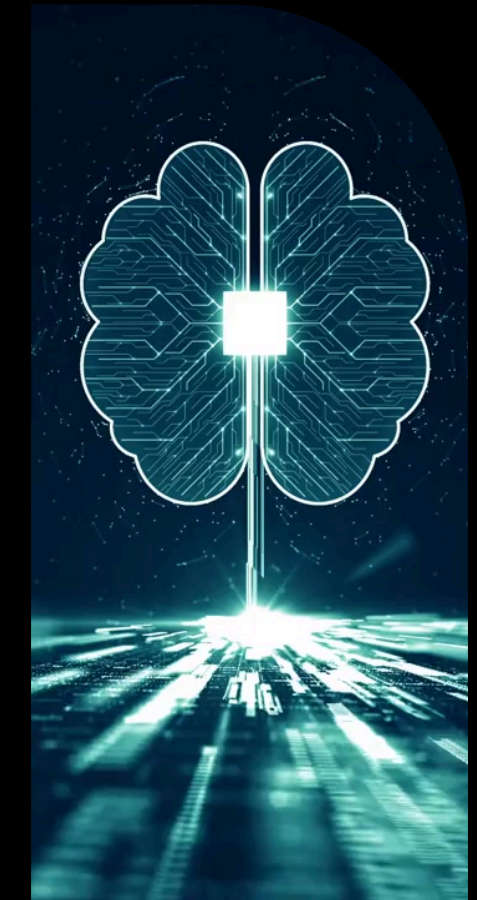


Doicești is more than a project — it's a statement of readiness.

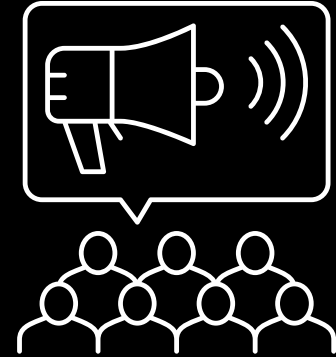
CNCAN applies graded oversight from planning to operation. It shows how innovation and protection can advance together under transparent regulation.

Beyond Electricity

- SMRs for hydrogen, desalination, and industrial heat.
- Expanded RP oversight at industrial interfaces.
- One safety standard, multiple applications.



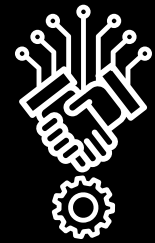
Public Communication and Trust



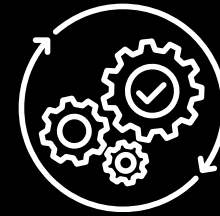
- Public confidence defines legitimacy.
- Transparency transforms fear into understanding.
- RP oversight as public service.



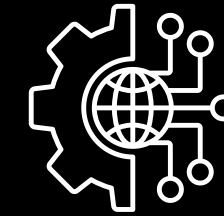
THE ROAD AHEAD: LEADERSHIP THROUGH REGULATION



Radiological protection as
Europe's strategic shield.



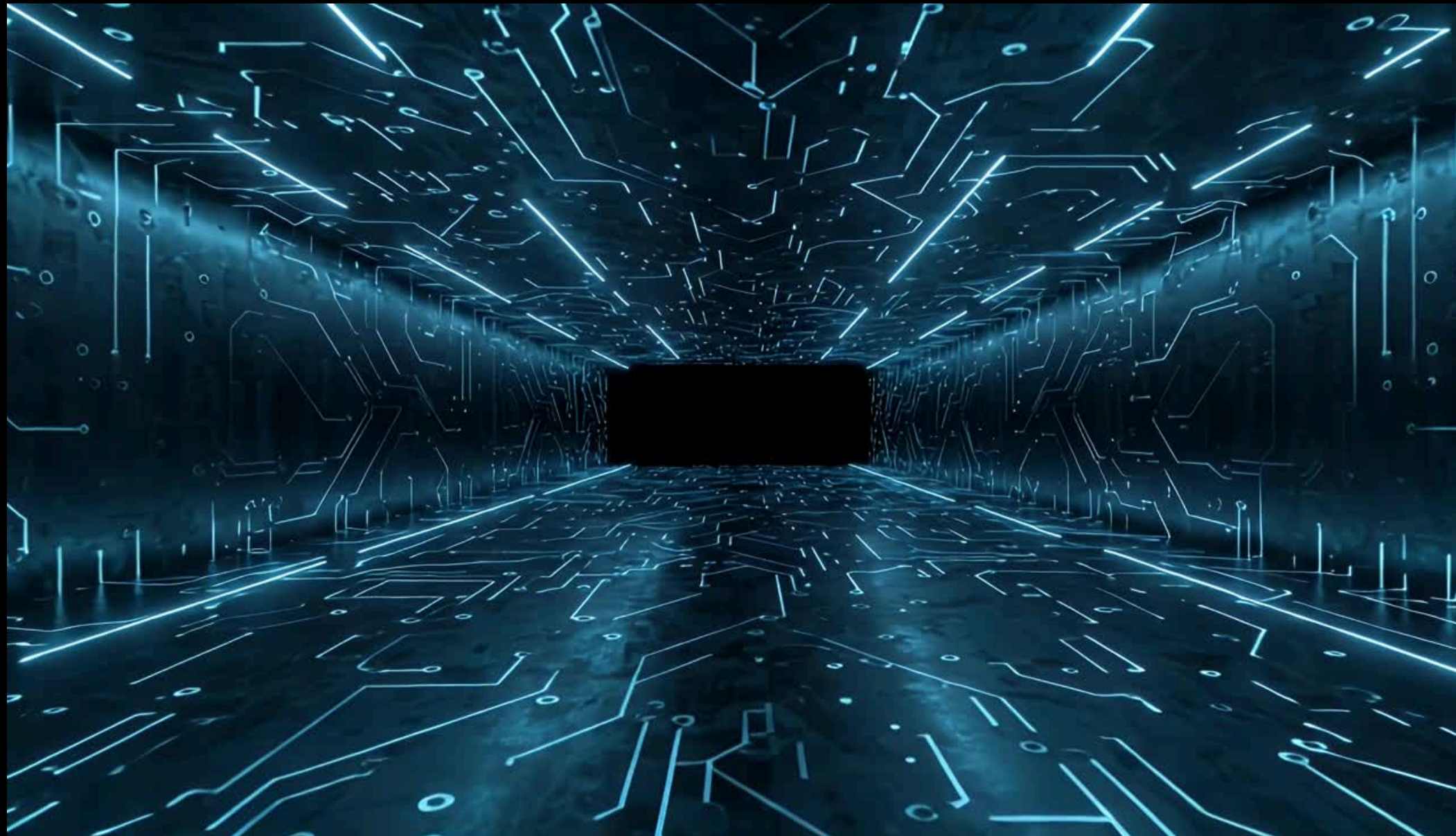
Anticipate, harmonize, lead.



CNCAN as regional model for graded
oversight.

Conclusion

Technology builds capability; regulation builds confidence.



I

- SMRs unite innovation and responsibility.

II

- Graded regulation ensures flexibility and protection.

III

- RP is the architecture of trust.

Europe's nuclear future will belong to those who integrate innovation with integrity.

Thank you

for your attention

Prepared by Phd. Petre MIN

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