

Pan-European Nuclear Energy Safety Systems

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Euratom Treaty 1957

<https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/>

- Co-ordinates EU Member States (MS) 'harmonised development' of nuclear safety and radiation protection systems.
- Non-binding recommendations and decisions to establish European nuclear safety standards.

Directive on the Management of Spent Fuel and Radioactive Waste: (Directive 2011/70/Euratom) <http://www.ensreg.eu/nuclear-safety-regulation/eu-instruments/Spent-fuel-and-radioactive-waste-directive>

- Legally binding and instituted a pan-EU framework on a key issue.
- Covers radioactive waste and spent fuel management, from production through to 'long-term disposal'...

- Rad-waste the responsibility of Producers and each Member State to ‘guarantee a high level of safety and to protect workers and the general public against the dangers of ionising radiation’.
- Member States (MS) must create a legal framework and independent regulatory authority.
- Transparency and the participation of the public.
- Ensure financial resources.
- Regular self-assessment and peer review.

(Amended) Nuclear Safety Directive: (2014/87/Euratom)

<http://www.ensreg.eu/news/amended-nuclear-safety-directive>

- Safety assessments to be carried out before construction of new nuclear power plant.
- Safety enhancements for old reactors.
- Strengthen the role of national regulatory authorities to ensure their independence: MS must provide their regulators with sufficient legal power, staff, and finance.

- Requires a safety re-evaluation for all nuclear power plants to be conducted at least once every 10 years.
- Operators must release information to the public, during normal operation and during incidents.
- Peer review system: EU countries choose a common nuclear safety topic every six years and organise a national safety assessment on it. Submit their assessments to other countries for review. Findings of these peer reviews are made public.

Basic Safety Standards Directive 2014

<http://www.ensreg.eu/nuclear-safety-regulation/eu-instruments/Basic-Safety-Standards-Directive>

- Sets out radiation protection standards for EU Member States.
- Sets limits on the maximum radiation dose that anyone should receive under ‘normal conditions’.
- Nuclear facilities and radioactive waste sites must keep radiation doses received by the public and its workers ‘As Low As Reasonably Achievable’.
(ALARA).

Basic Safety Standards Directive supplemented by five specific Directives on:

- Medical Exposures, Public Information, Outside Workers, Shipments of radioactive waste and spent fuel, Control of high-activity sealed radioactive sources and orphan sources, Drinking water.

European System: Directive Transposition

- Member States (MS) struggling in transposing Directives to National Legal Regulations.

IAEA Safety Standards

<https://www.iaea.org/about/partnerships/european-union>

- European Union (EU), and European Commission (EC) co-operate on policy and financing for nuclear safety and technical issues:
- Radiation protection, radioactive waste management, environmental remediation, decommissioning, nuclear safety culture, emergency preparedness and response.

IAEA / EC Treaties

- Convention on Nuclear Safety.
- Convention on the Physical Protection of Nuclear Material (CPPNM) and its Amendment.
- Conventions on civil liability for nuclear damage.

WENRA (Western European Nuclear Regulators Association), 1999.

<http://www.wenra.org>

Initial Objectives:

- Establish safety levels.
- Develop a common approach to EU nuclear safety regulation.
- Working groups: Nuclear power reactors; Management of spent fuels and radioactive waste and on decommissioning operations; Inspection.

- WENRA safety levels: not legally binding but have significant normative power – especially regards peer review.
- WENRA Members: Normally the same people.

ENSREG (European Safety REgulators Group)

<http://www.ensreg.eu>

- European Commission (EC) created the European High Level Group (HLG) on Nuclear Safety and Waste Management, which changed its name to ENSREG.
- No written definition on roles and processes.

- Group of experts from Member States represented by national delegates.
- Split evenly between heads of safety regulators and representatives of Ministries for the Environment or Energy (i.e. two representatives per delegation).
- More formal than WENRA.
- ENSREG an advisory body to the EC.

'Stress Tests': Pan-Europe Post-Fukushima Reassessment of Nuclear Plant Safety Margins

- ENSREG coordinated 'Stress Tests' on the basis of technical provisions established by WENRA.
- However, Stress Tests of EU's 143 nuclear power reactors did not include risk of accident and incident from a large aeroplane strike or terrorist attack...

ENSREG/WENRA: Iterative reflection process between the two organisations.

- WENRA: More of a 'club' with TOR's – no statute, unregistered.
- The strength of WENRA is that organizations are committed to it.
- WENRA is more 'technical' - ENSREG is more 'political'.
- E.g. 'Stress Tests': Series of WENRA technical reviews, then adopted by ENSREG.

European Nuclear Energy Forum (ENEF):

https://ec.europa.eu/energy/topics/nuclear-energy/nuclear-safety/european-nuclear-energy-forum-enef_en

- *‘A platform for a broad discussion, on transparency issues as well as the opportunities and risks of nuclear energy. EU MS Govts, European Parliament, European Economic and Social Committee, nuclear industry, electricity consumers and the civil society.’*
- However ... many see ENEF as a ‘talking shop’ pushing for new nuclear in Eastern Europe.

Scientific Radiation Risk Assessment

- Interaction of ionising radiation and the living environment (to determine differing pathways to, uptake of, and metabolism by, differing organisms, plants, soils, plants, water courses).
- Radiation Epidemiological (direct effect).
- Radiation Biology (mechanistic).

Current Institutional Radiation Risk Regulatory Assessment

- Linear no-threshold (LNT) model assumes that radiation doses greater than zero will proportionally increase the risk of excess cancer or heritable disease – i.e. no safe threshold.
- Paradox: Although ‘no safe threshold’, current radiation protection practices, disposals and dispersals do not present a ‘significant risk’...

Causation

Complete identification of source-pathway-receptor:

- Concentration of quantity and quality of radioactive pollutant.
- Pathways through environment.
- Uptake and metabolism to receptor (human beings and other organisms).

- Radio-isotopic species.
- Levels of radiation emissions (both authorised and accidental releases).
- Affected communities (including differing radiation susceptibility of critical/age groups).
- Complex environmental pathways (air, water, soil)
- Receptor uptake and metabolism (translocation, residency and excretion rates).
- Radiation health effects (aetiology of cancer, leukaemia, and other diseases including heart and immune-related).

Differing Quantities and Qualities of Ionising Radiation

- High or low linear energy transfer (LET).
- Single or continuous, periodic or episodic exposure.
- Anthropogenic (man-made), or natural background radiation (NBR).

- Delivered to differing receiving ecosystems: population, community, organism, molecular, and cellular levels.
- Providing experimental data concerning both deterministic and somatic (stochastic) effects.
- Translated into radiation protection models via national, regional and international scientific advisory organisations: e.g. ICRP, UNSCEAR, IAEA, NRA, WENRA ENSREG, CERRIE etc.

Scientific advisory bodies interpret radiation risk data which then translated as national regulatory standard regimes for:

- Nuclear plant operation.
- Environmental emissions from nuclear plant (e.g. general derived limits, consents and authorisations to discharge).

Fundamental Rad-Risk Knowledge Time-Lag

- Scientific committees not usually the most progressive.
- Even if organizations believe in need for change in levels, it takes decades to translate into regulations.

EU Taxonomy

- EU is currently deciding whether, or not, nuclear is 'sustainable'.
- EC reviewed rules for sustainable finance - EU Taxonomy - to identify economic activities that can be considered economically and environmentally sustainable.
- e.g. NGO Communique to EC:
<https://www.nuclearconsult.com/wp/wp-content/uploads/2020/04/communique-eu-teg-nuclear2april2020.pdf>

- EU Taxonomy Technical Expert Group (TEG) delivered their final recommendations to the Commission; excluding nuclear from the Sustainable Finance Taxonomy *'at this stage'*, stating that *'it was not possible to conclude the nuclear energy value chain does not cause significant harm to other environmental objectives on the time scales in question'*.
- Push-back from some Member States, especially France and nuclear industry. So, EC requested its Joint Research Centre (JRC) to draft a technical report on the 'do no significant harm' aspects of nuclear energy.

- In the next few weeks, EC Joint Research Council (JRC) - a subset of the EC Technical Working Group (TEG) - will publish their review.
- JRC assessment to be handed over to EC Department for Financial Stability and Capital Markets (DG FISMA).
- JRC report will be reviewed by two additional expert groups: Radiation protection and waste management (under Article 31 of the Euratom Treaty); and the Scientific Committee on Health, Environmental and Emerging Risks.

Austrian Govt Input

- Austria has drafted a scientific review of the issue which they have just published – I can send through the English version on request.
- https://www.bmk.gv.at/themen/klima_umwelt/nuklearpolitik/aikk/warum.html



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Thank You

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www.ucl.ac.uk/energy