## Focus 09 Growing safety concerns in the fuel chain

The incidents at Tricastin and Romans-sur-Isère in July 2008, involving uranium spilling into the environment at nuclear facilities related to uranium conversion and enrichment and fuel fabrication, showed that nuclear safety is not only about nuclear power plants.

The risk of major accident in case of core fusion is specific to nuclear reactors. This scenario is seen as the most extreme, in terms of potential damage, that could happen on nuclear facilities. As such, it focuses most of the attention paid to safety in terms of R&D programmes, regulations, safety studies, etc. In France, after nuclear facilities had been operating for more than ten years, the plan to develop nuclear reactors to produce electricity led to the first regulations specific to nuclear activities, a 1963 decree that defined the status of "nuclear basic installation" (installation nucléaire de base, INB) and introduced a framework centred on the control of the risk of criticality.[59] The basic safety requirements, defined by orders called "fundamental safety rules" (règles fondamentales de sûreté, RFS) dealing with various issues, were introduced much later for other nuclear facilities than nuclear reactors. The RFS relating to the approach for considering the risk of plane crashing, for instance, was introduced in 1980 for reactors, and only in 1992 for other facilities. The same delay applied to other issues such as seismic risk. The MOX fuel fabrication unit ATPu, which was eventually shut down in Cadarache due to unsufficient seismic design, is only one of many facilities that were built up to the mid-1980s without sufficient regulation on that point.

In addition, the high level of variety of nuclear facilities other than power plants, as opposed to the standardisation of EDF reactors, makes it even more complicated to develop a thorough assessment and control of all relevant risks in all facilities.

When WISE-Paris published, in the aftermath of 9/11, estimates on the risk of radioactive releases "up to 67 times the equivalent of Chernobyl"[60] at La Hague reprocessing plants in the case of a plane crashing on one spent fuel storage pond, it seemed like this was a brand new issue. One of the immediate answers from Areva was that this was absurd, as "there is no risk of chain reaction in such a facility, unlike in reactors"… The assessment was based on US safety authority NRC's calculations that 50 to 100% of fuel rods could catch fire from their own thermal output if the pool was emptied, as could happen in the case of a plane crash or other events (explosion, seism, etc.). Commissioned by the Ministry of Industry to analyse the issue, the IRSN concluded that "only" 10% of the fuel inventory might burn, which still meant a release six times larger than the Chernobyl accident! The inventory of radioactive materials at La Hague, where all spent fuel from EDF reactors, and high and intermediated level waste arising from their reprocessing is stored, is such that the potential for radioactive release in case of an accident might exceed that of a single reactor in the worst case.

Any facility involving the storage of radioactive materials presents a risk which is a combination of the potential danger linked to the radioactive inventory and the vulnerability of the plant to scenarios leading to the release of some fraction of this inventory – taking into account that containment systems are generally not as large in those facilities as they are for reactors. The same applies to the transport of nuclear materials and waste.

The historical development of the French nuclear industry around various sites, and the extension of the services it provides to every step from front-end to back-end of the fuel chain, creates a whole range of hazards that have long been dealt with as secondary while the prime focus was on reactors. Moreover, the decision to develop industrial reprocessing and plutonium re-use leads to a qualitative and quantitative increase of risks, as it implies more manipulation, transport and storage of more dangerous materials.

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[59] This decree remained for more than 40 years the main regulatory framework for nuclear activities, until it was eventually included in a comprehensive nuclear law untitled "law on nuclear transparency and security" passed in June 2006.

[60] This "equivalence" was based on the content of Caesium-137 to be released, as this radionuclide represents around 75 percent of the long-term collective dose from the Chernobyl accident.