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Safeguards Considerations for the Design of a Future Fast Neutron Sodium Cooled Reactor

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Incorporating safeguards at an early stage of a reactor design is a way to increase the effectiveness and efficiency of safeguards measures minimizing the possibilities of misuse of the plant or nuclear material diversion. It also reduces the impact on the construction and operation cost. At the preliminary phase, the design will integrate: confinement, containment, surveillance features and non-destructive assay equipment. Taking into account these requirements will help the operator in the approval of the plant at the design phase by national and international authorities in charge of Nuclear Material accounting and safeguards.

A large amount of work has been made by the GEN IV International Forum to assess the proliferation resistance of nuclear systems. The IAEA has developed guidelines on "Safeguards by design" describing reference requirements for future nuclear facilities. Based on these studies, this communication details implementation of safeguards in the design of a sodium cooled fast neutron reactor (SFR) currently studied in France. Specificities are the use of MOX fuel with high concentration of plutonium and the potential capacity of breeding. A great attention should be paid to avoid diversion of nuclear material contained in fresh or irradiated fuel. Scenarios of reactor misuse are analyzed.

The identification of diversion pathways and requirements for nuclear material accountancy, leads to an approach of safeguards, specific to SFR: Material Balance Areas (MBA) and some key measurement points (KMP) are characterized. Specific instrumentation assay helping in the identification and/or characterization of fuel elements and the inventory of nuclear material is described.

As concerns the fuel cycle, the safeguards of the reprocessing unit will be progressively increased through the development of materials monitoring and the implementation of these measures at strategic locations of buildings, thus providing real-time information on the distribution and quantities of materials in the process.

Country or International Organization

France

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