SAFIR2018 – Update to the Framework plan for 2017 call

SAFIR2018 Management Board 18.8.16

General

The operating environment of energy production has been subjected to changes as compared with the views during the preparation of the SAFIR2018 Framework plan published in 2014. The VYR funding, which is the basement for the financing of the programme research projects, has also decreased due to the stopping of Olkiluoto 4 (OL4) project in 2015 before entering the construction license phase and this funding proportion has not been available since 1.1.2016. The funding based on Hanhikivi 1 (FH1) unit has decreased as well because of the change in the reactor type and unit size after the decision-in-principle. The payment for the smaller unit size of FH1 came into force from 1.1.2015.

After the changes in the VYR funding the framework plan covers a wider scope of research than what can be covered with the available funding. Therefore, it is essential to focus on the most important topics that shall be completed during the programme. At this point of the programme there are also important topics in the framework plan where the research has not yet been started.

The ongoing projects reflect the SAFIR2018 framework plan and the focus in the programme will be in the completion of the started activities that have progressed well. However, also new activities and enhancement of the ongoing projects are encouraged. Three general topics to be considered in project proposals are described below:

- A memorandum of an ad hoc planning group is available in the material for 2017 call ("SAFIR2018 ja ajankohtaiset Tepco Fukushima Dai-ichi onnettomuudesta johdetut kansainväliset tutkimusteemat"). The themes described in the memorandum have become topical after the Fukushima Dai-ichi accident and should be taken into account in preparing the proposals. Many of the themes are already dealt with in the on-going SAFIR2018 research projects.

- There will be a change in the electricity production modes supporting the grid. The production that is dependent on weather conditions will increase and at the same time the production based on fossil fuel will decrease. Less conventional base load capacity will be available for maintaining the power balance and this may also have effects on the operation of the nuclear power plants. Potential safety issues related to the operation of nuclear power plants in the load following mode are an important topic for research.

- Research organisations are encouraged to seek for still more co-operation with other national and international research organisations in relevant topics that are of common interest. The co-operation is looked for also beyond the tradition nuclear specific safety research projects, e.g., in the areas of ageing of the concrete containment and NDT testing methods for concrete structures.

There are also several specific research topics in the research areas of the steering groups that are considered important in the 2017 call by the SAFIR 2018 Management Board. The specific topics are listed below.

SG1 – Plant safety and systems engineering

- Plant overall safety and electrical systems are already included in the framework plan and the start of research in 2017 would be desirable. The Management Board has ordered small preliminary study projects on both topics in 2016.
- Case studies would be important in the organisation research.
- The operation of the emergency preparedness organisation and co-operation and interactions between different organisations ("organisation of organisations", tendency of the whole community to adopt questionable beliefs) shall be continued and emphasised in the research.
- Possible operation of nuclear power plants in the load following mode could have effect on operator work and training and safety I&C.
- There is still a need for a practical new methodology for the qualification of devices having software components. Alternatively, system design rules for using components having software-specific failure models should be developed such that the component qualification rules could be relaxed.
- PRA could be applied to new areas where it is not traditionally applied such as security, fuel pool and load following.
- Potential new presently unknown threats for safety could also be hypothesised by any appropriate means.

SG2 – Reactor safety

- Analysis of passive systems from several aspects is considered important. Passive systems may operate in a partly degraded mode instead of completely functioning or failing modes. The analyses include simulations with CFD models and traditional system codes, and also PRA. Defining the approval criteria for passive systems is also an important topic.
- Research on the effects of load follow on nuclear fuel and pressure boundary integrity (fatigue due to varying loads) is important. It would be useful to review how the fuel models used in Finland can be applied in the analysis of fuel loading in the load following operation of the plant, and how the Finnish plants would respond to load follow demands (which parts would be subjected to load variation and how much).

SG3 – Structural safety and materials

- A few limitations for the framework programme text have been set by the SG3: research on new plant concepts should not be started in 2017 and the testing of irradiated materials will not be topical in 2017.
- Research on earthquakes is still considered important. Co-operation on national and international level on NPP site specific seismic monitoring should be developed and the continuity of knowhow related to the seismic hazards of nuclear facilities should be ensured.
- Research on concrete structures is still considered important, especially for the long term operation of plants, e.g. studying aging mechanisms and NDE methodologies from structural design and in-service monitoring point of views for the assessment of integrity and performance of concrete structures.