Contribution ID: **7** Type: **ORAL**

Performance and sustainability assessment of nuclear energy deployment scenarios with fast reactors: advanced tools and application

Monday 26 June 2017 13:40 (20 minutes)

A performance and sustainability assessment of nuclear energy deployment scenarios with fast reactors is a multi-criteria problem which is determined by a wide spectrum of criteria characterizing resource consumption, economic performance, risks of unauthorized proliferation, safety and waste management etc. In determining the most promising scenario, it is necessary to consider the conflicting nature of the criteria because an improvement in one of the criteria causes, as a rule, a deterioration of values in the others. To increase the validity of judgments formulated on the basis of calculations, an uncertainty analysis is also required. There is a need to use multiple criteria decision making methods.

Multiple criteria decision making methods are a support tool aimed to help experts and decision makers who are faced with numerous conflicting assessments to highlight conflicts and perform proper trading off during the decision making process. A multi-criteria decision analysis and multi-objective decision making constitute the main components of multiple criteria decision making. The major distinction between these groups of methods is based on whether the solutions are defined explicitly or implicitly. Although tasks that can be solved using these methods are different, their combined use seems to be appropriate to identify the most suitable and balanced nuclear energy deployment scenarios with fast reactors despite various contradiction criteria.

The both groups of methods may be applied to assess the performance and sustainability of nuclear energy deployment scenarios with fast reactors by searching for compromises between the conflicting system factors that determine the nuclear energy deployment scenarios and selecting the trade-off option, to carry out multi-objective optimization of nuclear energy structures, taking into account the nuclear energy system evolution, the structure and the organization of nuclear fuel cycle and the most important system constraints and restrictions.

The paper presents the toolkit developed in the National Research Nuclear University MEPhI for a performance and sustainability assessment of nuclear energy deployment scenarios with fast reactors providing a solution to the problem of optimizing and comparing nuclear energy deployment scenarios with fast reactors in multiple criteria formulation. Some results of implementation of this toolkit for the performance and sustainability assessment of nuclear energy deployment scenarios with fast reactors are presented which demonstrate that technologically diversified nuclear energy structures in which several different fast reactor technologies are present may produce a synergetic effect in terms of nuclear energy system sustainability and performance improvement.

Country/Int. Organization

Russian Federation

Author: Mr ANDRIANOV, Andrei (National Research Nuclear University, MEPhI)

Co-authors: Dr KUPTSOV, Iliya (National Research Nuclear University, MEPhI); Ms SVETLICHNYY, Leonid (National Research Nuclear University, MEPhI); Ms UTIANSKAIA, Tatiana (National Research Nuclear University, MEPhI)

Presenter: Mr ANDRIANOV, Andrei (National Research Nuclear University, MEPhI)

Session Classification: 7.1 Sustainability of Fast Reactors

Track Classification: Track 7. Fast Reactors and Fuel Cycles: Economics, Deployment and Proliferation Issues