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REPORT FROM THE COMMISSION TO THE COUNCIL AND THE EUROPEAN PARLIAMENT

Operation of the High Flux Reactor in the year 2010

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REPORT FROM THE COMMISSION TO THE COUNCIL AND THE EUROPEAN PARLIAMENT

Operation of the High Flux Reactor in the year 2010

The Council adopted on 25 May 2009 a three-year (2009-2011) supplementary research programme to be implemented by the Joint Research Centre (JRC) concerning the operation of the High Flux Reactor (HFR) located in Petten, The Netherlands. Article 4 of this Council decision provides that the Commission will inform yearly the European Parliament and the Council by producing a report on the implementation of the supplementary research programme. This 2010 HFR activity report is the second of three yearly reports that will cover the whole supplementary research programme.

The main objectives of the programme are the following:

(1) To ensure the safe and reliable operation of the HFR in order to guarantee the availability of the neutron flux for experimental purposes.

(2) To allow an efficient use of the HFR by research institutes in a broad range of disciplines: improvement of the safety of fuels and materials for nuclear reactors of relevance for Europe, health including the development of medical isotopes to answer questions of medical research, nuclear fusion, fundamental research and training and waste management.

The HFR acts as a training facility for doctoral and post-doctoral fellows, allowing them to perform research activities through national or European Programmes.

The reactor is also used for the commercial production of radio-isotopes which cover more than half of the 10 million medical diagnoses executed each year in Europe.

The safe operation and research objectives were fulfilled as follows in 2010:

1. Safe Operation of the HFR

The European Atomic Energy Community (Euratom) is the owner of the plant (for a lease of 99 years) and the JRC the plant and budget manager. The HFR reactor is operated by NRG (Nuclear Research and consultancy Group) which operates and maintains the plant and manages the commercial activities around the reactor[1]. It has an operating licence granted by the Dutch national regulator KFD (Kernfysische Dienst). As for nuclear power plants, the HFR is subject to legally required 10-year periodic safety reviews which are performed by NRG. The HFR has been also the subject of an independent INSARR (Integrated Safety Assessment for Research Reactors) review performed by the International Atomic Energy Agency (IAEA) in April 2011.

[1] on 20 June 1967 the JRC and Stichting Energieonderzoek Centrum Nederland, referred to as "ECN", (then called Stichting Reactor Centrum Nederland, referred to as "RCN") concluded a Co-operation Contract No. 054-68-1 PET N with regard to the operational management of the HFR at the JRC's Site.

In 2010 the HFR was operational for only 143 days as it was shutdown for the extensive repair of the Bottom Plug Liner (BPL). The preparation and implementation of the repair was monitored and inspected by the Dutch nuclear safety regulatory authority in accordance with the applicable national regulations and requirements. The reactor repair, inspection and testing lasted 201 days.

The maintenance activities consisted of the preventive, corrective and regular maintenance of all systems, structures and components executed with the objective to enable the safe and reliable operation of the HFR. Also the periodic leak test as one of the license requirements (0.2 bars overpressure - 24 hours duration) and the extended in service inspection including the measurements of the Bottom Plug Liner were successfully performed.

No incident on the International Nuclear Event Scale (INES) was reported.

2. Research and isotope production

2.1 Research

The following ongoing scientific activities were performed:

- Managing NeT, the European Network on Neutron Techniques Standardisation for Structural Integrity. The main experimental activities in 2010 were relative to small angle scattering studies of materials ageing processes;
- Residual stress measurements by neutron diffraction, assessing microstructure evolution in thermally aged strengthened steels and investigating thermal acceleration of radioactive decay;
- Fuel irradiation experiments relative to minor actinide transmutation to reduce the radiotoxicity of nuclear waste;
- Fuel irradiation experiments for investigating fission-products retention capabilities;
- Experiments to investigate reactor structural material degradation under irradiation (graphites, composites, tungsten alloys and steel);
- Fusion reactor and accelerator driven system technology concerning the irradiation and post irradiation examination of beryllium pebbles, steels, and welds.

2.2 Isotope Production

The year 2010 was unusual for the HFR regarding medical radioisotopes production and can be divided in three periods: for the first weeks of the year until mid-February the HFR continued to work at maximum production capacity. Production was then stopped during the BPL repair period (at a time of continuing international medical isotope shortage) and then restarted with a normal operating pattern in September 2010.

Until the HFR repair, the medical isotopes production continued to be given the highest possible priority. The reactor loading was tailored to ensure the absolute maximum production levels of key radiopharmaceuticals and in particular the production of Molybdenum-99 for medical applications (e.g. cancer treatments). This configuration allowed as many as 11 parallel Molybdenum-99 production irradiations to be performed. During this maximum

capacity period, the HFR production exceeded the radiochemical processing capacity available within the European supply network. It was estimated that during this period the HFR produced enough material to allow >50,000 patient scans per day to be performed worldwide; this represents around 60% of the global demand.

During the year 2010, the operator NRG coordinated efforts to minimise the effects of the supply problems and kept the isotope customers informed about the progress of the repair and the projected HFR return to service date. The events also underlined the critical role of the HFR in the supply chain of isotopes for medical services.

3. Financial contributions for the execution of the programme.

In 2010, the following financial contributions were received from Member States for the execution of the programme: Belgium: 400,000 €, France: 300,000 €, The Netherlands: 8,223,000 €.

It should be noted that these contributions cover the expenses according to Annex II to Council Decision 2009/410/Euratom. These amounts have been calculated in order to balance the forecasted costs of the reactor for the period 2010 taking into account an expected level of commercial income. In no case does the Commission cover any operational deficit, including potential costs for maintenance or repair.

The Commission received in 2010 from the supplementary programme 800,000 € as provisions for the Decommissioning fund. Other expenditures (e.g. direct personnel, utilities, spent fuel management) for a total of 1,674,000 € incurred by the Commission were also paid from the supplementary programme budget.

An accompanying Staff Working Paper presents in more detail all the results of the operation of the HFR in 2010.