



Brussels, 3.7.2013
COM(2013) 489 final

**REPORT FROM THE COMMISSION TO THE COUNCIL AND THE EUROPEAN
PARLIAMENT**

Operation of the High Flux Reactor in the year 2011

{SWD(2013) 238 final}

REPORT FROM THE COMMISSION TO THE COUNCIL AND THE EUROPEAN PARLIAMENT

Operation of the High Flux Reactor in the year 2011

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 2011 HFR activity report is the third and last of three yearly reports that have covered the whole supplementary research programme.

In operation since 1961, and following a new vessel replacement in 1984 and large repair in 2010 on the Bottom Plug Liners (BPL), the reactor provides a variety of irradiation location possibilities (reactor core, reflector region and in the poolside).

The main objectives of the supplementary research 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.

The safe operation and research objectives were fulfilled as follows in 2011:

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 reactor¹. 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.

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.

The HFR has been subject to an independent INtegrated Safety Assessment for Research Reactors (INSARR) review performed by the International Atomic Energy Agency (IAEA) in April 2011. The INSARR review concluded that all the recommendations/suggestions deriving from the safety review regarding the Bottom Plug Liner repair in 2010 and about 50% of those deriving from the INSARR 2005 have been addressed. The implementation of all the corrective actions will be completed in 2012.

Following the nuclear disaster in Fukushima, Japan, in March 2011, the HFR and the other nuclear facilities on the Petten nuclear site were subject to stress tests.

The results showed that the nuclear installations met all of the safety-relevant licensing requirements and could also withstand a wide range of extreme weather conditions, including flooding and earthquakes or a combination of both. The stress test also showed that it is feasible to increase the robustness of the nuclear facilities and their safety margins by taking a number of extra measures for example in the domain of : extra mobile equipment, reinforcement of structures, development of new procedures etc. These measures are currently under implementation.

In 2011 the HFR was operational for 290 days. This performance corresponds to an actual availability of 99.22 % with reference to the original scheduled operation plan. Nominal power was 45 MW with a total energy production of approximately 13,008 MWd, corresponding to a fuel consumption of about 16.24 kg U-235.

In the first quarter of 2011, the last 18 High Enriched Uranium (HEU) spent fuel elements were shipped in a CASTOR MTR2 container to the storage facility (HABOG) of the Dutch Central Organisation for Radioactive Waste (COVRA).

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. The periodic license required a leak test (0.5 bars overpressure - 48 hours duration) and several modifications were performed (LOCA 4, 5 and 6). All modifications were implemented after the revision of the plant description and operating instructions and following the successful commissioning and testing and licensing approval where necessary.

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 in 2011:

- Managing NeT, the European Network on Neutron Techniques Standardisation for Structural Integrity. The main experimental activities in 2011 were relative to small angle scattering studies of materials ageing processes;
- Neutron diffraction investigations in nickel based alloys;
- Fuel irradiation experiments to reduce the radiotoxicity of nuclear waste relative to minor actinide transmutation technological issues (i.e. fission-products retention capabilities, dust-free process, helium swelling);

- Experiments to investigate reactor structural material degradation under irradiation (graphites, model steels, realistic welds and high-nickel welds);
- Fusion reactor technology concerning the irradiation and post irradiation examination of material foreseen in the shielding blanket in ITER (CuCrZr).

2.2 Isotope Production

After three disrupted operational years for isotope production in the HFR, 2011 was a year with a normal operational pattern as experienced in the years before 2008. Once again, the HFR was able to demonstrate that it plays an essential role as the largest producer of medical isotopes in Europe and one of the largest producers in the world. The total volume and value of the isotopes and associated services supplied from the HFR grew again in 2011.

The production of Neutron Transmutation Doped (NTD) silicon for the specialist electronics industry was resumed after the final repair of the HFR in September 2010. During 2011, NRG returned to using a standard configuration of the HFR production facilities and reintroduced the irradiation of silicon ingots to produce high quality products used in high voltage and other specialist electronic applications that can only be served with NTD silicon.

In 2011 NRG continued to work closely with other players in the Medical Isotope supply network, as well as with the Medical Community, Governments, the European Commission, the OECD/NEA and the IAEA. These actions were to continue to support the coordinated efforts necessary to minimise the future risks to security of supply of critical medical isotopes.

3. Financial contributions for the execution of the programme.

In 2011, 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 of Council Decision 2009/410/Euratom. These amounts have been calculated in order to balance the forecasted costs of the reactor for the period 2011 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 2011 from the supplementary programme 800,000 € as provisions for the Decommissioning fund. This amount, together with other expenditures (e.g. direct personnel, utilities, spent fuel management) incurred by the Commission was paid from the supplementary programme budget for a total of 5,597,000 €

An accompanying Staff Working Paper presents in more detail all the results of the operation of the HFR in 2011.