JRC EUROPEAN COMMISSION

NEWSRELEASE

Illicit trafficking of nuclear materials

New forensic analysis released on Germany's 1940's nuclear programme

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The European Commission's Joint Research Centre (JRC) has today released details of nuclear forensic work carried out on samples dating back to the early days of the technology's history: from Germany's World War II Programme.

The JRC's Institute for Transuranium Elements (ITU) in Karlsruhe, Germany cooperates with the International Atomic Energy Agency (IAEA) in the control of nuclear materials and facilities. The IAEA is charged with verifying that states live up to their international obligations in the area of nuclear non-proliferation. This includes not diverting nuclear material or using facilities for the development of nuclear weapons. The Joint Research Centre has provided scientific and technical support to this work for over a quarter of a century, with over 100 scientists and technicians (so-called Atomic Detectives) working on more than 25 projects.

Shedding more light on Germany's first nuclear programme

In recent years, the *Institute for Transuranium Elements* (ITU) carried out nuclear forensic investigations on two samples dating back to the first German nuclear energy project which began in 1939. One sample (a uranium metal cube) was obtained from the Haigerloch Atomic Museum and originated from the German nuclear programme entitled "Uranverein", under the scientific leadership of the 1932 Nobel Prize Winner for Physics, Werner Heisenberg. The second sample (a uranium metal plate) was obtained from the Max Planck Institute for Nuclear Physics in Heidelberg and originated from the work of Heisenberg's fellow researcher, Karl Wirtz.

What did we learn?

ITU analysed a large number of parameters providing information on the age of the material and on its production scenarios. The geometry of the two materials clearly indicates that they served for testing different reactor designs. The plate can be attributed to a design of alternating layers of fissile material (uranium) and moderator for slowing down the neutrons (paraffin, dry ice, graphite). A completely different reactor concept made use of uranium metal cubes (the fissile material) that were drowned in heavy water which served as a moderator.

Both samples were found to originate from different production batches, as could be seen from the respective impurity patterns. Furthermore, it was found that the two samples had been produced at different times. The metal cube was produced in late 1943 while the metal plate dated back to mid 1940. This finding is also backed up by evidence of dissimilarities in the isotopic composition of some chemical impurities in the two samples.

Ultra-trace analytical techniques did not reveal any evidence of the presence of fission products, thus it can be concluded that the number of fissions induced in the uranium was very small, i.e. the reactor did not reach criticality.

Subsamples have been distributed to other research laboratories for specific measurements (University of Mainz, Australian National University).

Further information: New Collaboration Agreements to be signed

Various institutes of the JRC are involved in the work on nuclear safeguards in support of the IAEA: the *Institute for Transuranium Elements* in Karlsruhe, Germany; the *Institute for Reference Materials and Measurements* in Geel, Belgium; and the *Institute for the Protection and Security of the Citizen* in Ispra, Italy.

During 2009, the JRC will sign two new important Collaboration Agreements on nuclear security with the International Atomic Energy Agency (IAEA) and the Lawrence Livermore National Laboratory (LLNL), USA.

In annex, examples of this on-going and planned co-operation include:

- Support to the development of the Rokkasho Reprocessing Plant in Japan;
- Activities to develop a global approach to combat the illicit trafficking of nuclear materials;
- Training the next generation of IAEA inspectors.

Press enquiries

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- JRC activities: www.jrc.ec.europa.eu
- ITU activities: http://itu.jrc.ec.europa.eu
- IAEA activities: www.iaea.org

JRC Project Examples: Atomic Detectives at work

1. Rokkasho Reprocessing Plant (RRP), Japan

The IAEA and the Japanese Nuclear Material Control Centre (NMCC) will jointly operate an onsite laboratory for accountancy verification measurements at the newly constructed Rokkasho Reprocessing Plant (RRP) in Japan. This analytical laboratory is the third large-scale facility of this type in the world after Sellafield and La Hague in Europe.

The JRC designed and has operated analytical laboratories on the La Hague and Sellafield sites on behalf of the European Commission for the past 8 years. The analyses performed allow Euratom inspectors to check - independently of the plant operator - the fissile material stream and inventory in these facilities. The JRC's Institute for Reference Materials and Measurements (Geel, Belgium) provides the necessary reference materials for the calibration and verification of results in-line with international accountancy standards. The JRC also supports the operator with a monitoring system for near-real-time analysis of the chemical process areas of the facility. This unique know-how will be shared with the IAEA for use at Rokkasho.

The JRC has also developed the first world-wide automated system for Inspectors to verify that a complex installation such as the Rokkasho Reprocessing Plant has been built according to the declared design. This 3D technology and software can detect changes introduced within the plant to millimetre accuracy and has since been successfully tested by other Safeguards laboratories.

2. Illicit Trafficking: Towards a more globalised approach

The JRC's *Institute for the Protection and Security of the Citizen* (Ispra, Italy) has developed a number of advanced tools such as automatic intelligence gathering and risk analysis for containerised cargo itineraries world-wide. These capabilities have been successfully tested by anti-fraud professionals and are now being adapted to serve security needs, including counter-proliferation.

The JRC's *Institute for Transuranium Elements* (Karlsruhe, Germany) is one of the lead institutes of the Nuclear Smuggling International Technical Working Group, established by the G8 Summit on Nuclear Safety and Security. It has helped to implement a response action plan for seizures of illicit nuclear and radioactive materials in many new EU Member States and Eastern European countries.

This response action plan is now being taken over by the IAEA and further refinements are currently being introduced by a joint task force involving the IAEA, the JRC, and other Member States. In 2006, the IAEA, the JRC and the US Nuclear National Security Administration (NNSA) decided to work together within an informal Working Group on border monitoring and have since held meetings at the IAEA in Vienna, Austria and at JRC facilities in Ispra, Italy.

3. Training the next generation of IAEA Inspectors

The JRC has a proven track record in providing the IAEA with high-quality training programmes. Ensuring that a State abides by its non-proliferation commitments is becoming increasingly dependent on an Inspector's knowledge of novel detection techniques and equipment, more accurate analyses and the ability to handle more complex information and data.

The JRC has been requested by the IAEA to continue its training programmes to help ensure that its Inspectors are well-equipped to accomplish their on-site tasks and to draw appropriate Safeguards conclusions. The training programme covers well-established Safeguards instruments and methods as well as new generation of methodologies aimed at the detection of undeclared activities.

A new JRC Safeguards training course has recently been agreed for the IAEA. This course aims at enhancing the observation and investigative skills of IAEA Inspectors in view of the detection of undeclared materials and activities.

Similarly, it has been decided that facilities established jointly by the JRC and the US Department of Energy in Obninsk, Russia can be used by the IAEA to train its Inspectors on Russian design installations / reactors.