2017-10-13 at 19:00 UTC

IAEA

International Atomic Energy Agency

Incident and Emergency Centre

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Status of Measurements of Ru-106 in Europe

Based on the information received up to 2017-10-13 15:00 UTC the following update related to the Ru-106 measurements in Europe being detected in air samples is provided.

Addition information is available on the USIE website:

- https://iec.iaea.org/usie/actual/LandingPage.aspx

The IAEA will promptly issue reports
if major changes regarding the safety / radiological situation occur.

Situation summary

During the period of October 3-6, 2017 the IAEA Incident and Emergency Centre (IEC) was informed by some Members States in Europe, through their emergency contact points, that low concentrations of Ru-106 were being detected in high volume air samples. The measured concentrations did not contain any other notable radionuclides (example: other fission products such as Cs-137) and were at levels far below those requiring public protective actions.

Since October 6, 2017 there was an increasing interest from Member States. Due to this fact and following the established procedure, the IAEA IEC sent out a formal request to Member States in the European region, through their emergency contact points, on 2017-10-07 at 17:15 UTC to confirm:

1. Whether there were Ru-106 measurements in air performed in those countries and if results could be shared with the IAEA;
2. Whether there were any recent events in those countries associated with an atmospheric release of Ru-106, and if so, could this information be shared through emergency contact channels due to the interest;

An event titled "Measurements of Ru-106 in Europe" has been created on USIE where this information has been shared with Member States and international organizations. Since 2017-10-08 the IAEA is publishing on USIE all information that has been shared by Member States in response to the request.

Measurement data provided to the IAEA

The majority of reported measurements are based on seven day high volume air samples. In general, the measurements of Ru-106 in the air have been reported within the range of 10s of $\mu Bq/m^3$ to 10s of mBq/m^3, with the highest measurement (145 mBq/m^3) reported in Bucharest, Romania on 2017-09-30, from a 24 hour sample.

In addition to the Ru-106 measurements, on 2017-10-09, the Swedish Radiation Safety Authority reported three measurements with very low levels of Ru-103 (in the range of 1 – 4.8 $\mu Bq/m^3$).

36 countries reported results of measurements to the IAEA and 7 countries have indicated that they do not have capabilities to perform measurements of Ru-106 in the air. Figure 1 provides the locations where concentrations of Ru-106[1] have been reported.

[1] And data on several measurements of Ru-103.

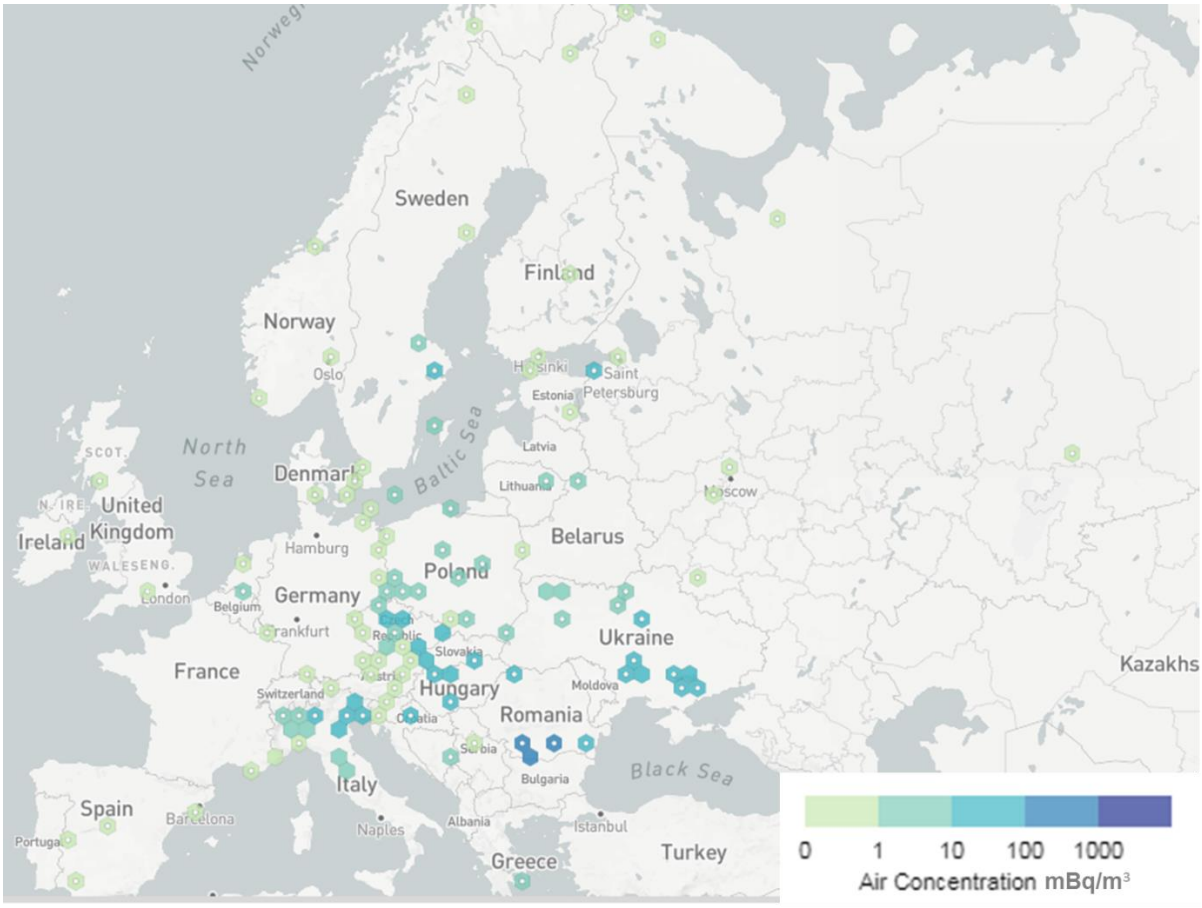

Figure 1 - Locations where concentrations of Ru-106 in the air have been reported to the IAEA[2]

A Technical Attachment to this Status Summary Report provides all of the measurement data that has been reported to the IAEA as of 2017-10-13 at 15:00 UTC.

Specific measurement data provided by emergency contact points has and will continue to be published on USIE.

Event related information provided to the IAEA

Member States voluntarily reported to the IAEA information on their measurements. All those Member States that responded to the IAEA stated that there were no events on their territories that may have caused the observed air concentrations of Ru-106.

Background technical data

Ru-106 is a fission product contained in spent nuclear fuel[3]. Typical inventories of Ru-103 and Ru-106 within a full nuclear reactor core of a representative 3000 MW(th) Light Water Reactor would be approximately: 4.1 E+18 Bq for Ru-103 and 9.6 E+17 Bq for Ru-106[4].

[2] Please note that many of these measurements were taken during different sampling periods. Some measurements were from daily air samples and some were from weekly air samples. Caution should be used when interpreting this data. Reference the Technical Attachment for the data used in this image and reference USIE for the latest available information.

[3] It can also be generated through other means including at accelerators and cyclotrons.

[4] INTERNATIONAL ATOMIC ENERGY AGENCY, Operational Intervention Levels for Reactor Emergencies and Methodology for Their Derivation, EPR-NPP Public Protective Actions 2017, IAEA, Vienna (2017).

Ru-106 has a half-life of 371.8 days and Ru-103 has a half-life of 39.3 days[5]. The ratio between these two isotopes of Ru could be used as an indicator of the approximate time the material was removed from a nuclear reactor.

Public protective actions

Several Member States have reported that they have increased the frequency of monitoring. No public protective actions have been reported by the Member States to the IAEA[6].

Assessment of current situation

The IAEA collaborated with Member States and relevant international organizations in collecting, analysing and sharing data with emergency contact points via USIE. This facilitated the exchange of information and contributed to national assessments.

The reported measurements of Ru-106 in air are in the range of 10s of µBq/m^3 to 10s of mBq/m^3. The radiological significance of such concentrations of Ru-106 in the air is very low. The IAEA considers that levels reported to the IAEA pose no risk to human health.

On the basis of all data reported up to now, the IAEA has observed some tendency towards decreasing air concentrations of Ru-106.

Ru-106 is a common fission product and would not be expected to be routinely monitored in atmosphere. The absence of any other fission products in the air samples implies that the Ru-106 is not being released from a nuclear power plant.

Ru-106 is used in the treatment of ocular cancer. Due to the level of their activities[7], the brachytherapy sources used in these types of cancer treatment are unlikely to cause, if aerosolized and dispersed, the wide-spread reported air concentrations.

Some references state that Ru-106 could be used as a source for radioisotope thermoelectric generators (RTG), however such usage is not common due to its short half-life.

Based on the monitoring data and the information provided by the Member States to the IAEA, no specific event or location for the dispersal of Ru-106 into the atmosphere have been determined. It is currently not possible for the IAEA to make conclusions towards identifying a location of the release without factual reporting from a State of the origin of the release.

[5] Radionuclide decay data is available: https://www-nds.iaea.org/relnsd/vcharthtml/VChartHTML.html

[6] Based on IAEA General Safety Requirement Part 7 on Preparedness and Response for a Nuclear or Radiological Emergency, urgent public protective actions are warranted in cases when the public may receive a dose in excess of 100 mSv in a 7 day period. Based on the reported air concentrations of Ru-106 the estimated dose to the public would be much less than 0.001% of that required for any such actions to be justified.

[7] International Catalogue of Sealed Radioactive Sources and Devices: https://icsrs.iaea.org/