For participants only
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Committee on the Peaceful Uses of Outer Space
Scientific and Technical Subcommittee
Forty-third session
Vienna, 20 February-3 March 2006
Item 9 of the provisional agenda*
Use of nuclear power sources in outer space

Joint United Nations/International Atomic Energy Agency technical workshop on the objectives, scope and general attributes of a potential technical safety standard for nuclear power sources in outer space (Vienna, 20-22 February 2006)

Minimum essential elements of a safety framework

Working paper submitted by the Russian Federation

Note by the Secretariat

1. In accordance with paragraph 16 of General Assembly resolution 60/[…], the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space will organize, jointly with the International Atomic Energy Agency, a technical workshop on the objectives, scope and general attributes of a potential technical safety standard for nuclear power sources in outer space, to be held in Vienna from 20 to 22 February 2006.

2. The working paper contained in the annex to the present document was prepared for the joint technical workshop in accordance with the indicative schedule of work for the workshop, as agreed by the Working Group on the Use of Nuclear Power Sources in Outer Space during the intersessional meeting held in Vienna from 13 to 15 June 2005 (A/AC.105/L.260).

* A/AC.105/C.1/L.283.

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Annex I

Minimum essential elements of a safety framework

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I. General requirements for the safe use of space nuclear power sources

1. These requirements are designed to ensure the radiation safety of personnel and of the public and to protect the environment from radionuclide contamination.

2. These requirements apply to reactor and radioisotope space nuclear power sources that may be used as sources of power (electricity, heat or ionizing radiation) for supply systems and for special and servicing equipment on board spacecraft, rocket propulsion units and electrorocket (electroreactive) engines.

3. The safety systems and equipment of nuclear power sources must be such that, in the event of a foreseeable accident involving a nuclear power source or the fall such a source into an inhabited area, the expected radiation dose received by individual members of the public does not exceed 1 millisievert (mSv) during the clean-up operation, in accordance with the assumptions (based on distance from source and duration of exposure) regarding the irradiation of individual members of the public prior to recovery of the nuclear power source by search personnel in the event of accidental discovery of the source by the public and/or if the source is not found and the search is called off.

4. In the unlikely event of an emergency in which the expected radiation dose received by individual members of the public exceeds 1 mSv – a situation which is considered a radiation accident – the irradiation of personnel and individual members of the public is governed by national standards and rules and by the instruments of the International Atomic Energy Agency based on the recommendations of the International Commission on Radiological Protection.

II. Requirements governing reactor nuclear power sources

5. The reactor should be powered up only after the spacecraft has reached a sufficiently high near-Earth operational orbit or interplanetary flight trajectory.

6. The safety systems and structural elements of nuclear power sources must ensure the subcriticality of the reactor when the reactor is on the ground; during insertion of the spacecraft into operational near-Earth orbit or onto an interplanetary flight trajectory; when the spacecraft's mission is completed and the nuclear power source is withdrawn from operation and subsequently remains in space for a prolonged period; and in the event of an accident involving the fall of a reactor into an inhabited area.

7. The radiation safety of reactor nuclear power sources used on board spacecraft in high near-Earth orbits is ensured by the long lifetime of the said sources and spacecraft, which is sufficient to allow the uranium fission products that have accumulated in the reactor, together with activated radionuclides in the structural elements of the nuclear power source, to decay to the lowest possible level.

8. The length of time for which a reactor nuclear power source must remain in a sufficiently high orbit is determined by the requirement that the permissible radiation dose of 1 mSv must not be exceeded while individual members of the public may come into contact with an intact or partially destroyed reactor following its fall into an inhabited area.

III. Requirements governing radioisotope nuclear power sources

9. The safety of radioisotope nuclear power sources must be ensured through maintenance of the integrity and leak-tightness of the radioisotope source (radionuclide ampoule) structure at every stage of operation, including in the event of foreseeable accidents, or if the nuclear power source is withdrawn from operation and remains in space for a prolonged period.

10. In the event of a radioisotope nuclear power source falling into the Earth's atmosphere following an accident on board the launch vehicle or spacecraft during ascent, including the explosion of the launch vehicle or a fire, or following the entry of the spacecraft with nuclear power source on board into the upper layers of the atmosphere, destruction of the radioisotope source (radionuclide ampoule) and dispersal of the radionuclide into the environment must be prevented.

11. In the event of impact of a radioisotope nuclear power source (radionuclide ampoule) on the Earth's surface following the accidental return of the source to Earth, emission of the radionuclide into the environment must be prevented.

12. If a radioisotope nuclear power source (radionuclide ampoule) remains in the environment for a prolonged period following re-entry into the atmosphere and impact on the Earth's surface, emission of the radionuclide into the environment as a result of corrosion or natural external effects must be prevented.