

For participants only
30 November 2005

Original: English

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)**

**Overview of NPS Working Group Report “A review of
international documents and national processes potentially
relevant to the peaceful uses of nuclear power sources in
outer space” (A/AC.105/781)**

**Working paper submitted by the United States of America on
behalf of the Working Group on the Use of Nuclear Power
Sources in Outer Space**

Note by the Secretariat

1. In accordance with paragraph 16 of General Assembly resolution 60/99 of 8 December 2005, 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.

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

V.05-90465 (E)



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).

Annex I

Overview of NPS Working Group Report “A review of international documents and national processes potentially relevant to the peaceful uses of nuclear power sources in outer space” (A/AC.105/781)

Working paper submitted by the United States of America on behalf of the Working Group on the Use of Nuclear Power Sources in Outer Space¹

I. Introduction

- The Working Group on the Use of Nuclear Power Sources in Outer Space of the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space (NPS Working Group) reconvened in 1998 to identify and study current international technical standards pertinent to the use of nuclear power sources (NPS) in space.
- Multi-year work plan was adopted
 - Focused on establishing process and framework for developing information or data that would facilitate future discussions of safety processes and standards for NPS.
- Report represents consensus reached by the Working Group and issued in March 2002.

II. Contents of report

- Factors that differentiate space NPS from terrestrial nuclear applications.
- International documents of a technical nature having potential relevance to space NPS and procedures for their development.
- Summary of launch approval processes.
- Potential future developments.
- Conclusions.

III. Differentiating factors: space NPS vs. terrestrial applications

- Differences and similarities dependent on specific application.
- Activities involving space NPS can be viewed as follows:

¹ The working paper is reproduced in the form in which it was received.

- Terrestrial-based operations (development, assembly, test, transport to launch site);
- Operations that can affect flight nuclear safety (launch, deployment, and use as part of a space mission).
- Existing terrestrial procedures most applicable to terrestrial operations, likely to be limited to space operations.
- Some similarities between space and terrestrial NPS:
 - Use of radioactive materials to benefit humankind;
 - Advanced science and engineering;
 - Emphasis on safety (and related issues of public perception);
 - Potential, in some cases, for consequences from accident scenarios to cross international boundaries;
 - High level of reliability and protection of workers, public, environment;
 - Analytical and engineering methods, to some degree.
- Factors leading to fundamental technical differences:
 - Nature of the applications;
 - Operating environment;
 - Nature and autonomy of operation of systems;
 - Quantity of radioactive material;
 - Frequency and duration of use;
 - Distance to, and effects of normal operation and potential accidents on, populated areas;
 - Complexity and designed reliability of systems;
 - Use of passive and/or active systems;
 - End of service.

IV. Documents of a technical nature having potential relevance to space NPS

- Review was conducted to identify various international documents, in addition to the existing Principles, of potential relevance to space NPS.
- Objective was to garner information that could be useful in facilitating any future discussions on safety processes and standards relating to NPS.
- Assessment focused on operations unique to space NPS that affect safety
 - A document is considered potentially relevant if it has the potential of providing a benefit or value as a technical resource or reference for

launch and operational nuclear safety activities of space NPS.

- Working Group undertook a review of the following documents to identify which might be of particular relevance:
 - International Conventions;
 - Recommendations of the International Commission on Radiological Protection (ICRP);
 - Safety Series publications of the International Atomic Energy Agency (IAEA);
 - Report of the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR).
- Listing of documents provided in Annex II to the document A/AC.105/781.
- Documents identified as potentially relevant to flight nuclear safety:

<i>Type of Documents</i>	<i>Number</i>
International Conventions	4
IAEA-related entries	24
ICRP publications	26
UNSCEAR documents	3
Total	57

- International Conventions – Focused on conventions more specific to NPS:
 - Early Notification of a Nuclear Accident;
 - Assistance in the Case of Nuclear Accident or Radiological Emergency;
 - Nuclear Safety;
 - Physical Protection of Nuclear Material.
- Documents grouped into following topical categories:
 - Nuclear safety (focusing on system safety);
 - Radiation protection (focusing on protection of individuals);
 - Emergency planning, intervention and mitigation;
 - Potential exposure situations;

- Transportation.
- Individual documents also categorized based on:
 - Potential relevance:
 1. Directly relevant only to space NPS;
 2. Potentially relevant to any nuclear application including NPS;
 3. Developed specifically for terrestrial applications, but contains some elements potentially relevant to space NPS.
 - Level of guidance or detail:
 - A. High-level;
 - B. Detailed.

V. Example from Annex II to the document A/AC.105/781

B. International Atomic Energy Related Documents of Potential Relevance

<i>Number</i>	<i>Reference: document number</i>	<i>Title</i>	<i>Comments</i>	<i>Designator</i>
20	Safety Series No. 119 (1996); STI/PUB/1014	“Emergency planning and preparedness for re-entry of a nuclear powered satellite”	Prepared to assist States in planning for possible re-entry events involving nuclear-powered satellites and to provide international consensus practices for responding to such a situation. Provides guidance on specific actions to be taken from the time of the announcement of an impending re-entry event through the locating, monitoring and recovery phases.	1B
Potential exposure situations				
21	Safety Series No. 104 (1990); STI/PUB/834	“Extension of the principles of radiation protection to sources of potential exposure”	The principles of radiation protection recommended by ICRP in ICRP-60 (document No. 2 in sect. B below) for the normal operation of a radiation source constitute a dose limitation system that has three components: the justification of a practice, the optimization of radiation protection and the limitation of individual doses. This report describes how the application of those principles may be extended to unexpected or accidental (potential exposure) situations by changing from the dose-based system of radiation protection to a unified approach within a probabilistic framework.	2A
22	75-INSAG-9 (1995); STI/PUB/992	“Potential exposure in nuclear reactor safety”	Advisory Group publication. Addresses the concept of potential exposure in nuclear and radiation safety, policy aspects, safety assessments, risk considerations and probabilities. Discusses the implications of low probabilities and includes a section on probability theory and its application in PSAs.	3A
Transportation				
23	Safety Series No. 6 (1990); STI/PUB/866	“Regulations for the safe transport of radioactive material: 1985 edition (as amended 1990)”	Presents international regulations on the packaging and transport of radioactive materials for shipment by truck, rail, ship and air. Current packaging and transport regulations of the United States Department of Transportation, the United States Nuclear Regulatory Commission and the United States Department of Energy are based on this document. Superseded by ST-1 (document No. 24 below).	3B
24	TS-R-1 (ST-1, Revised) (2000); STI/PUB/1098	“Regulations for the safe transport of radioactive material”	Supersedes Safety Series No. 6 (document No. 23 above). Presents the latest IAEA regulations and standards for the packaging and transport of radioactive materials.	3B

VI. Additional contents of report

- Procedures for developing and agreeing to international nuclear safety and radiation protection documents:
 - IAEA
 - ICRP
- Summary of national space nuclear power source launch approval processes:
 - Russian Federation
 - United States of America
- Potential future developments relevant to nuclear power sources in outer space:
 - Radioisotope
 - Reactors

VII. Report conclusions

- Some similarities exist between terrestrial and space NPS, but there are significant differences with regard to design and use relevant to safety processes and standards.
 - Nearly 60 additional international documents were identified as potentially relevant:
 - Most generic in nature (35);
 - One developed specifically for space NPS;
 - Remainder (21) developed specifically for terrestrial applications.
 - Current international documents examined are primarily focused on terrestrial applications:
 - Generally relevant to terrestrial-based activities involving space NPS;
 - Direct application to launch and operational safety is limited.
 - Potential options could exist for cooperation between the Committee and IAEA in the area of standards development.
-