

Development of a Safety Framework for Nuclear Power Source Applications in Outer Space

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STSC/IAEA Joint Expert Group

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Uses of Nuclear Power Sources

Nuclear Power Sources (NPS) are used to enable, or to significantly enhance, interplanetary missions that would otherwise be limited or unfeasible if restricted to solar power.

Examples include long-duration missions to the outer planets and extended Mars surface exploration missions.

Examples of NPS:

- radioisotope heater units (RHUs)
- radioisotope thermoelectric generators (RTGs), and
- fission reactor systems.

Fission reactors are not currently flown and there are no plans to use them in the near future, but they are contemplated for scientific and exploration missions (e.g. Moon, Mars, other Solar System destinations, missions requiring high power).

United Nations Committee on the Peaceful Uses of Outer Space (UN COPUOS)



- Set up by the General Assembly in 1959
- Charter
 - Review the scope of international cooperation in peaceful uses of outer space
 - Devise programmes in this field to be undertaken under United Nations auspices
 - Encourage continued research and the dissemination of information on outer space matters
 - Study legal problems arising from the exploration of outer space

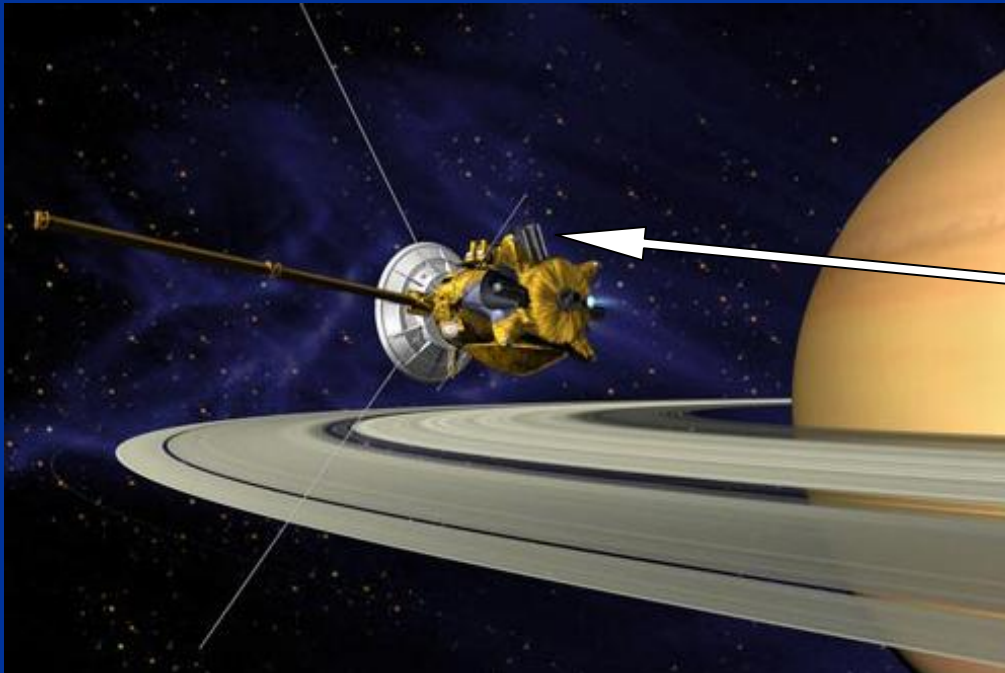
International Atomic Energy Agency (IAEA)



- World's center of cooperation in the nuclear field
- Set up as the world's "Atoms for Peace" organization in 1957 within the United Nations family
- Agency works with its Member States and multiple partners worldwide to promote safe, secure and peaceful nuclear technologies

Safety Framework Background

In 2003, the Scientific and Technical Sub-Committee (STSC) of COPUOS adopted a work plan to develop an international technically-based framework of goals and recommendations for the safety of nuclear power source applications in outer space



Radioisotope thermoelectric generator (RTG) on Cassini/Huygens

Safety Framework Background (continued)

Recognizing the experience of IAEA in developing international standards for nuclear safety, COPUOS/STSC invited the IAEA to work cooperatively in the development of the safety framework.

A joint Workshop was held in February 2006 to develop the objectives, scope and general attributes of the proposed framework.

Development of the framework began in June 2007 by a Joint STSC/IAEA Expert Group (JEG).

Objectives of the Safety Framework

The safety framework intends to:

- Provide high-level guidance on the safety aspects of all phases of nuclear power source applications in outer space
- Reflect international consensus on the appropriate level of safety that should be achieved
- Be technically based, providing the technical foundation for the development of national standards
- Allow national programmes flexibility in adapting such standards to specific nuclear power source applications and national organizational structures

Approach for Framework Development

The safety framework is being developed by the Joint STSC/IAEA Expert Group (JEG) and:

- takes into consideration UN treaties and principles relevant to outer space, and applicable conventions;
- takes into account relevant international recommendations, such as those of the International Commission on Radiological Protection (ICRP);
- takes into account best safety practices; and
- will be issued as a joint publication of COPUOS/STSC and IAEA.

Schedule for Framework Development

- 2007
 - Adopt a framework development schedule
 - Initiate framework drafting and consultation meetings
- 2008
 - Hold framework drafting and consultation meetings
 - Prepare draft framework for review by STSC and IAEA
- 2009
 - Hold framework drafting and consultation meetings
 - Revise draft framework based on STSC and IAEA member state comments
 - Prepare final framework
- 2010
 - Review and endorse final framework
 - Publish framework

Joint Expert Group (JEG) Participants

Algeria	Italy
Argentina	International Atomic Energy Agency
Brazil	Japan
Canada	Nigeria
China	Russian Federation
European Space Agency	Saudi Arabia
France	South Africa
Germany	United Kingdom
Hungary	United States of America
Iran	

Organization of Draft Safety Framework

1.0 INTRODUCTION

1.1 Background

1.2 Purpose

1.3 Scope

2.0 SAFETY OBJECTIVE

3.0 GUIDANCE for GOVERNMENTS

3.1 Safety Policy, Requirements, and Processes

3.2 Justification for Space Nuclear Power Source Applications

3.3 Mission Launch Authorization

3.4 Emergency Preparedness and Response

4.0 GUIDANCE for MANAGEMENT

4.1 Responsibility for Safety

4.2 Leadership and Management for Safety

5.0 TECHNICAL GUIDANCE

5.1 Technical Competence in Nuclear Safety

5.2 Safety in Design and Development

5.3 Assessment of Risk

5.4 Accident Consequence Mitigation

6.0 GLOSSARY OF TERMS