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Use of nuclear power sources in outer space

Development of an international technically based framework of goals and recommendations for the safety of planned and currently foreseeable nuclear power source applications in outer space

Report of the Working Group on the Use of Nuclear Power Sources in Outer Space

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* A/AC.105/C.1/L.287.



I. Introduction

1. At its fortieth session, in 2003, the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space adopted a workplan, for the period 2003-2006, for developing an international technically based framework of goals and recommendations for the safety of nuclear power source (NPS) applications in outer space (A/AC.105/804, annex III) (hereinafter referred to as “the framework”).
2. The objective of the workplan was to establish the objectives, scope and attributes of the framework. The possibility of developing the framework through a flexible partnership with the International Atomic Energy Agency (IAEA) was to be investigated, with a view to benefiting from that organization’s relevant expertise and well-established procedures for developing safety standards.

II. Review of multi-year workplan activities

3. The workplan adopted by the Subcommittee in 2003 was amended in 2005 to allow for holding a joint workshop with IAEA in 2006. The activities conducted under the revised workplan are summarized below:

<i>Year</i>	<i>Activity</i>
2003	Adopted a schedule of work. Invited national and regional space agencies to present information to the Scientific and Technical Subcommittee in 2004 and 2005 on the content of relevant national (including bilateral or multilateral) space NPS programmes and planned or currently foreseeable applications. Invited national and regional space agencies to present information to the Subcommittee in 2004 on the space applications enabled or significantly enhanced by NPS.
2004	Reviewed information from national and regional space agencies on the content of relevant national (including bilateral and multilateral) space NPS programmes and planned or currently foreseeable applications. Reviewed information from national and regional space agencies on the applications enabled or significantly enhanced by space NPS. Reviewed IAEA-specific processes and mechanisms (including their time frame, resources and administrative requirements) that IAEA could use to participate with the Subcommittee in developing space NPS technical safety standards. Prepared a draft outline of the objectives, scope and attributes for an international technically based framework of goals and recommendations for the safety of planned and currently foreseeable space NPS applications. Prepared a draft set of potential implementation options for establishing an international technically based framework of goals and recommendations for the safety of planned and currently foreseeable space NPS applications. Based on its discussions, the Working Group on the Use of Nuclear Power Sources in Outer Space advised the Subcommittee, at its forty-first session, to inform IAEA of the possible options for participation by IAEA, recognizing that additional work was required to further develop and evaluate the options and the specific role of IAEA.

<i>Year</i>	<i>Activity</i>
2005	Reviewed information from national and regional space agencies on the content of relevant national (including bilateral and multilateral) space NPS programmes and planned or currently foreseeable applications. Prepared a final outline of the objectives, scope and attributes of an international technically based framework of goals and recommendations for ensuring the safety of planned and currently foreseeable space NPS applications. Prepared for a joint technical workshop with IAEA.
2006	Held a joint technical workshop with IAEA. Prepared a draft report of the joint technical workshop for submission to the Subcommittee and IAEA. Held discussions with IAEA concerning the details of the implementation options. Prepared a draft of the present report.
2007	Prepared the final version of the present report, including the recommended implementation option, a new workplan and a draft document preparation profile.

III. Framework objectives, scope and attributes

A. Objectives

4. The first objective of the workplan for the period 2003-2006 was to establish the objectives, scope and attributes of the framework. This was largely achieved in 2005 and finalized after the discussions at the joint workshop with IAEA in February 2006.

5. The objective of the proposed framework would be to present a set of general guidelines relating to the safety aspects of the launch and operating life cycle of NPS in outer space. The framework would provide high-level guidance and reflect international consensus on the appropriate level of safety that should be achieved for all activities relating to the various phases of the life cycle of NPS in outer space. Such a framework would make recommendations for the safety of activities relating to those phases of the life cycle of NPS in outer space. It would provide a technical foundation for the development of national standards and allow national programmes flexibility in adapting such standards to specific NPS applications and national organizational structures. A sound and technically based international safety framework could provide reassurance to Governments and the general public worldwide that NPS for use in outer space will be designed, handled and used in a safe manner and could facilitate bilateral and multilateral cooperation on missions utilizing NPS.

B. Scope

6. The framework would address practices that could be implemented during the design, launch, operation and other relevant phases of the life cycle of NPS in outer space to promote their safe use. Guidelines would be established for the design of NPS for use in outer space in general, but their detailed application would depend on the particular design and application and the risks posed by them. Most activities during the development, manufacturing and transportation of NPS for use in outer space would be adequately addressed in national and international standards relating to ground-based nuclear installations and activities. Unique considerations relating

to those operations could be addressed in the safety framework for NPS applications in outer space.

C. Attributes

7. The safety framework should be general and qualitative in nature, technically valid and relatively independent of evolving technology. The guidelines set forth in the framework should reflect broad international consensus. The framework would be intended for those who make decisions relating to the use of nuclear power.

IV. General discussion and observations of the Working Group

8. Historically, NPS for use in outer space have been developed and used in spacecraft applications where unique mission requirements and constraints on electrical power and component heating precluded the use of non-nuclear power sources. Such missions have included interplanetary missions to the outer limits of the solar system, for which solar panels were not suitable as a source of electrical power owing to the long duration of the mission at great distances from the Sun. The designs of NPS for use in outer space have included radioisotope (for example, radioisotope thermoelectric generators) and fission reactor systems. In addition, small radioisotope heater units have been used to provide local heating of spacecraft components. The presence of radioactive materials in space NPS and their consequent potential for harm means that safety is always an inherent part of their design and application.

9. The activities of the members of the Working Group from 2003 through 2006, including the joint workshop with IAEA, allowed them to share:

(a) Views and information between national, regional and international agencies, participating member States and IAEA;

(b) The latest information on ongoing, planned and currently foreseeable NPS applications in space;

(c) The unique design considerations for NPS applications in space;

(d) Information on NPS in relation to space debris;

(e) The scope, attributes and objectives of a space NPS safety framework, most notably the minimum essential elements of such a framework from the perspective of both radioisotope and reactor applications;

(f) Observations and questions relevant to the implementation options under consideration by the Working Group.

A. Planned and currently foreseeable nuclear power source applications in space

10. According to current knowledge and capabilities, NPS are the only available energy option to power some space missions and significantly enhance others. Some ongoing and foreseeable missions would not be possible without the use of NPS.

11. NPS have been used in space for more than four decades. Fission reactors have not been flown for several years and no specific plans exist for using them in the near future. However, space reactors are expected to be needed for scientific and exploration missions, specifically for the Moon and Mars. Earth orbital missions requiring high power (e.g. communications, inter-orbital space tugs) are also foreseeable.
12. Radioisotope power systems (including radioisotope heater units) are currently in use and their continued use is planned.
13. Missions to Mars are planned by national, regional and international space agencies that might use space radioisotope power sources (including radioisotope heater units).
14. The environments for space NPS applications (from launch through operation to retirement) are radically different from the environment for terrestrial applications.
15. Space reactors are very different from terrestrial reactors in design and operation. The specific environments (both operating and potential accident conditions) create very different safety design and operation criteria.
16. Space mission requirements lead to unique mission-specific designs for space NPS, launch systems and mission operations.

B. Objectives, scope and attributes of a space nuclear power source safety framework

17. A number of reasons were expressed for having an international safety framework for space NPS. These included:
 - (a) The necessity of having common safety criteria for space missions using NPS;
 - (b) Providing assurance that space NPS safety was being addressed appropriately;
 - (c) Providing a common basis for cooperative international space missions using NPS.
18. The view was expressed that such a framework could provide a basis for future, possibly binding, agreements.
19. Common elements deemed essential for an effective safety framework were identified: the framework should be internationally accepted, provide high-level guidance and address both radioisotope power systems and reactor systems. It should further promote the establishment or use of national safety processes that were credible, reliable and transparent. Such national processes should include both technical and programmatic elements to mitigate risks arising from the use of NPS through all relevant phases of a mission.

C. Implementation options for a space nuclear power source safety framework

20. Two implementation options were considered by the Working Group for establishing a space NPS safety framework, as follows:

(a) Cooperation between the Scientific and Technical Subcommittee and IAEA to develop a safety framework;

(b) Development of a safety framework in a multilateral effort involving interested national, regional and international agencies, followed by a review to be conducted by the Subcommittee with various levels of IAEA involvement.

21. Regarding the above two implementation options, the following general observations and key issues in coordinating the processes of the Subcommittee and IAEA were raised:

(a) General observations and comments included the following:

(i) Comprehensive space NPS safety frameworks exist and are in use in two member States. Some member States have been cooperating recently to develop a plan for a regional space NPS safety framework;

(ii) Terrestrial aspects of space NPS activities fall within the scope of existing IAEA safety standards;

(iii) IAEA is in the process of combining three existing publications in the IAEA Safety Fundamentals series into one. These IAEA Safety Fundamentals are intended to form the foundation for all other documents in the Safety Standards Series, including in the categories "Safety Requirements" and "Safety Guides";

(iv) The currently consolidated IAEA draft Safety Fundamentals were not developed with space NPS applications in mind. The degree of their potential relevance to developing an international space NPS safety framework would need to be studied;

(v) For all current IAEA safety standards, the Agency has the expertise (either within IAEA or by engaging technical consultants) and resources to provide for the implementation of such standards, including peer reviews, education and training;

(vi) IAEA currently does not have space NPS expertise. In the event it were to participate in the development of a space NPS safety framework, IAEA would need to engage space expertise from those with space NPS experience within the space community, including the Working Group;

(vii) If IAEA were to co-sponsor a space NPS safety framework, then IAEA and the Subcommittee would need to agree on arrangements for maintaining expertise and providing for the implementation of the framework;

(viii) Other implementation options may exist.

(b) Some specific observations pertinent to a cooperative safety framework development by the Subcommittee and IAEA were made, as follows:

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- (i) The safety standard development process established by IAEA is recognized as providing an effective mechanism for achieving technically sound safety standards that reflect an international consensus;
- (ii) Publication of an international space NPS safety framework co-sponsored by IAEA and the Subcommittee would benefit from the international standing and technical competence of both organizations. Such a safety framework would be likely to be widely recognized and help in the development of national safety frameworks (including standards) for space missions involving NPS;
- (iii) A cooperative development of the safety framework by the Subcommittee and IAEA would require the Subcommittee and IAEA to coordinate their respective document development processes with the objective of co-sponsoring a safety framework for space NPS;
- (iv) A successful development of the safety framework by the Subcommittee and IAEA requires further elucidation, including coordination of the work and decision processes of IAEA and the Subcommittee; agreement on the language or languages to be used for conducting a collaborative framework development; provision of resources for supporting the development of a safety framework (interpretation and translation services, publication, meetings, etc.); and the organization and management of the work programme.
- (c) Some specific observations pertinent to a multilateral safety framework development were made, as follows:
- (i) Three alternative approaches were identified for the participation of IAEA with the Subcommittee in reviewing a safety framework developed by a multilateral group of agencies and experts. In the first approach, the Subcommittee would invite IAEA to conduct a technical assessment of the framework to assist the Subcommittee in its consideration of the framework. In the second approach, IAEA (making use, as appropriate, of its review and approval processes) would cooperate with the Subcommittee in conducting a technical assessment of the framework. In the third approach, a technical representative of IAEA would first assist the multilateral group's development of a space NPS safety framework and then support the Subcommittee in the review of the framework. Any successful multilateral safety framework development would require:
- a. An IAEA mechanism for endorsing, publishing or supporting any space NPS safety framework developed outside IAEA's existing safety standard development process. IAEA participation in any of the approaches could be noted in an introductory paragraph accompanying either the assessment of a multilateral space NPS safety framework or the actual development and review of such a framework;
- b. The safety standard development process established by IAEA could serve as an effective model for use by a multilateral group of national, regional and international agencies and experts on how to achieve a consensual technically sound space NPS safety framework, but the IAEA structure and mechanisms would not be available for this process;

c. IAEA participation in any of the approaches could help to ensure that potential conflicts between a multilaterally developed space NPS safety framework and existing terrestrial nuclear safety standards were identified and avoided or adequately explained;

d. Similar to a cooperative development of the safety framework by the Subcommittee and IAEA, the multilateral safety framework development also requires agreement on the language or languages to be used for conducting a multilateral framework development and provision of resources for supporting the development of a safety framework (interpretation and translation services, publications, meetings, etc.).

D. Discussion with the International Atomic Energy Agency

22. As a result of the Working Group's deliberations and discussions at the joint workshop, several questions were addressed to IAEA, as follows:

(a) Are there any restrictions within the IAEA statute or prior determinations by the Board of Governors that could prevent the Agency from acting in collaboration with the Subcommittee in the common development and support of a safety framework for space NPS? If there are no such restrictions, what would be the proper procedure for the Subcommittee to request IAEA to undertake such an activity?

(b) What other forms of consultancy or review support would IAEA be prepared to provide to the Subcommittee or a multilateral group of national, regional and international agencies and experts in the development of a safety framework for space NPS?

(c) Recognizing that IAEA has not formulated safety standards for space NPS and that specific aspects of an international space NPS safety framework could differ from generally accepted terrestrial practices (e.g. the use of highly enriched fuel in space reactors), would IAEA be prepared to make the necessary policy decisions, resource allocations, possible adjustments to the terms of reference for its safety standards committees and related actions to cooperate with the Subcommittee or a multilateral group in preparation of a space NPS safety framework? What would be realistic time frames for such actions?

23. In response to those questions, IAEA provided the following answers (see A/AC.105/L.264):

(a) In accordance with its Statute, IAEA would be pleased to cooperate with the Subcommittee in the development and support of a safety framework for NPS in outer space. To that end, IAEA was prepared to assign staff from its Secretariat to participate in such activities, in particular to join technical meetings and working groups that the Subcommittee might wish to establish;

(b) IAEA might, in addition, provide independent peer review services. In that event, IAEA would convene a team of international experts and provide a team leader from its Secretariat. The cost of such a review would, however, need to be borne by the Subcommittee;

(c) In relation to the formulation of nuclear safety standards, the current vision and strategy approved by the IAEA Board of Governors in March 2004 did not include NPS in outer space. That matter would however be brought to the attention of the Commission on Safety Standards at its nineteenth meeting, to be held in Vienna on 6 and 7 June 2006;

(d) Further to the foregoing, the Secretariat of IAEA would suggest that the focus might be on elaborating a technical safety framework for NPS in outer space prior to establishing the specific safety standard to be associated therewith. In that connection, it was noted that the human and financial resources necessary for the development of safety standards for NPS in outer space were not currently envisaged and therefore would need to be secured, possibly by extrabudgetary contributions from member States. Such modalities could be discussed in the near future.

V. Findings and recommendations of the Working Group

A. Findings

24. The Working Group confirmed and emphasized the need for NPS for several types of space mission and the potential benefit of an international safety framework for the use of NPS in space applications.

25. The Working Group highlighted the special environment for space NPS and the resulting different safety requirements for space and terrestrial NPS applications.

26. The Working Group established the objectives, scope and attributes of an international technically based framework of goals and recommendations for the safety of planned and currently foreseeable space NPS applications.

27. The Working Group investigated implementation options for the framework involving IAEA participation.

28. The Working Group achieved a better understanding of the respective mechanisms of IAEA and the Subcommittee for the making of safety standards and the decision-making process and characterized the advantages, drawbacks and peculiarities of the different implementation options.

B. Recommendations

29. The Working Group recommended that a partnership between the Subcommittee and IAEA should be pursued to develop a space NPS safety framework. It was noted that a number of challenges (as described in chap. IV above) would have to be overcome for successful development of the framework.

30. In responding to those challenges, it was brought to the attention of the Working Group that the recent experience of the Subcommittee in developing space debris mitigation guidelines might offer two significant lessons relevant to the development of a space NPS safety framework. Firstly, the development of the framework should draw notably on the expertise of member States that had

substantial experience in implementing safe applications of space NPS. Secondly, development of the framework could be facilitated by agreement on a set of considerations established at the beginning of the framework development process.

31. In recognition of the above, the success of the joint workshop organized by the Subcommittee and IAEA in February 2006 and the Subcommittee's experience in developing space debris guidelines, the Working Group recommended to the Subcommittee the formation of a joint partnership with IAEA to develop a framework that would achieve the objectives, scope and attributes specified in chapter III above, following a schedule and process comparable to that specified in annex I to the present report, and consistent with the following considerations:

(a) The framework would be developed by a partnership between the Subcommittee and IAEA with interested members of the Subcommittee participating in the framework development process, including the establishment of the workplan;

(b) Any guidance document related to the framework development (including an IAEA document preparation profile if used as the vehicle for directing the implementation effort) and any changes to those documents would require approval by the Working Group and the Subcommittee;

(c) The partnership between the Subcommittee and IAEA would operate using the consensus rule;

(d) The Subcommittee and IAEA would not independently take steps that could have an impact on the development of the framework without first consulting each other;

(e) The framework development process would take into consideration United Nations treaties and principles on outer space and other applicable conventions and international law;

(f) The framework development process would also take into consideration relevant international recommendations (such as those of the International Commission on Radiological Protection);

(g) The framework would be issued as a joint product of the Subcommittee and IAEA;

(h) The development of the framework would take advantage of the safety experience and best practices of member States and international organizations with space NPS applications;

(i) The framework would be in accordance with currently employed safety policies, processes and procedures (i.e., best practices);

(j) The framework could be utilized as a guide for national purposes; it would remain voluntary and not legally binding under international law;

(k) Any future modification to the framework would be developed and approved using a joint development process between the Subcommittee and IAEA comparable to the process used to generate the original framework.

Annex I

Representative timeline of Scientific and Technical Subcommittee, International Atomic Energy Agency and joint Subcommittee/Agency activities

<i>Date</i>	<i>Activity of the Subcommittee</i>	<i>Joint activity</i>	<i>Activity of IAEA</i>
February 2007	Adopt a schedule of work	Complete a draft document preparation profile	
April 2007			Approval of document preparation profile by IAEA Steering Committee
May 2007			Approval of the document preparation profile by IAEA Commission on Safety Standards
June 2007		Resolve any differences between the Subcommittee's workplan and IAEA's final document preparation profile	
June 2007 to June 2008		Development (drafting and consultation meetings)	
February 2008	Confirm resolution of any differences between the Subcommittee's workplan and IAEA's final document preparation profile; review progress on draft framework		
July 2008			Approval of draft framework by Steering Committee
August 2008	Submission of draft to the Secretariat for review by member States		
November 2008			Approval by the Commission on Safety Standards for submission to member States for comments

<i>Date</i>	<i>Activity of the Subcommittee</i>	<i>Joint activity</i>	<i>Activity of IAEA</i>
December 2008 to March 2009			Member States comments
February 2009	Member States comments		
April 2009		Revision of draft by taking into account the comments of member States	
May 2009			Approval of the revised draft by Steering Committee
June to July 2009		Technical editing	
September 2009			Endorsement by the Commission on Safety Standards
October 2009	Submission to the Secretariat for review by member States		Submission to IAEA Publications Committee
February 2010	Review and endorsement by the Subcommittee of the final framework contingent on IAEA approval of the framework with no changes		
Second quarter 2010		Target publication date	

Annex II

Recommended multi-year workplan

Workplan for developing a safety framework for space nuclear power sources

1. [At the forty-fourth session of the Subcommittee], the Working Group on the Use of Nuclear Power Sources in Outer Space recommended that the Subcommittee and IAEA should form a partnership to develop a space nuclear power source (NPS) safety framework. As part of this recommendation, the Working Group prepared both the following workplan and a corresponding draft document preparation profile (IAEA's counterpart to the workplan of the Subcommittee), contained in annex III to the present document. The present workplan outlines the approach and schedule for developing the space NPS safety framework (hereinafter referred to as "the framework").

Approach

2. The Subcommittee and IAEA will form a joint partnership to develop a framework that will achieve the objectives, scope and attributes specified in chapter III of the present report, following a schedule and process comparable to that specified in annex I to the present document.

3. To facilitate timely preparation of draft and final documents for review and discussion by the Subcommittee during its February meeting, the Working Group, in coordination with the Secretariat, will organize and hold, as required, intersessional drafting meetings convenient to both Working Group and IAEA participants.

4. The joint partnership will draw upon the expertise of member States that have substantial experience in implementing safe applications of space NPS and develop the framework in a manner consistent with the following set of considerations:

(a) The framework will be developed through the partnership between the Subcommittee and IAEA with interested member States of the Subcommittee participating in the framework development process, including the establishment of the workplan;

(b) Any guidance document related to the framework development (including an IAEA document preparation profile if used as the vehicle for directing the implementation effort) and any changes to such documents will require approval by the Working Group, the Subcommittee and IAEA;

(c) The partnership between the Subcommittee and IAEA will operate using the consensus rule;

(d) The Subcommittee and IAEA will not independently take steps that could have an impact on the development of the framework without first consulting each other;

(e) The framework development process will take into consideration United Nations treaties and principles on outer space and other applicable conventions and international law;

(f) The framework development process will also take into consideration relevant international recommendations (such as those of the International Commission on Radiological Protection);

(g) The framework will be issued as a joint product of the Subcommittee and IAEA;

(h) The development of the framework will take advantage of the safety experience and best practices of member States and international organizations with space NPS applications;

(i) The framework will be in accord with currently employed safety policies, processes and procedures (i.e., best practices);

(j) The framework could be utilized as a guide for national purposes; it will remain voluntary and not legally binding under international law;

(k) Any future modification to the framework will be developed and approved using a joint Subcommittee/IAEA development process comparable to the process used to generate the original framework.

Schedule of work

2007

Adopt a schedule of work and complete a draft document preparation profile for review and approval by IAEA and member States. Resolve any differences between the workplan of the Subcommittee and the final IAEA document preparation profile. Initiate framework drafting and consultation meetings.

2008

Hold framework drafting and consultation meetings. Review progress on the draft framework and confirm final version of workplan with the Subcommittee. Prepare draft framework for the review of the member States of the Subcommittee and the member States of IAEA.

2009

The Subcommittee will review the draft framework. Hold framework drafting and consultation meetings to revise the draft framework based on the comments received from member States of the Subcommittee and member States of IAEA. Prepare final framework.

2010

Review and endorsement of final framework by the Subcommittee. Publication of the framework.

Annex III

Draft document preparation profile

1. Identification

1. Preparation of a safety guide for nuclear power sources (NPS) in outer space is proposed as follows:

Document category	Safety guide
Working identification	To be determined
Proposed title	Safety Framework for Nuclear Power Sources in Outer Space
Proposed action	New document (prepared in coordination with the Committee on the Peaceful Uses of Outer Space Scientific and Technical Subcommittee)
Published title/date	To be determined/second quarter 2010
Safety Series No.	To be determined
Safety Standards Committee(s)	To be determined
Technical officer(s)	Ches Mason

2. Objective

2. The objective of the proposed safety guide is to present a set of general guidelines relating to the safety aspects of the launch and operating life cycle of space NPS. The safety guide would provide high-level recommendations consistent with an international consensus on the appropriate level of safety that should be achieved for all activities relating to the various phases of the life cycle of NPS in outer space. It would provide a technical foundation for the development of national standards and allow national programmes flexibility in adapting such standards to specific NPS applications and national organizational structures. It would provide reassurance to the global public that NPS in outer space are being, and will be, used in a safe manner and could facilitate bilateral and multilateral cooperation on missions utilizing NPS.

3. Background

3. Over the past five years, the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space (with participation by IAEA) has been working to establish the objectives, scope and attributes of an international technically based framework of goals and recommendations for the safety of planned and currently foreseeable space NPS applications. The Subcommittee recently completed this effort with a recommendation that the development of the framework should be established by means of a partnership between the Subcommittee and IAEA. While the Subcommittee recognizes that IAEA does not have experience in space NPS, the Subcommittee strongly supported the view that development of a safety framework for space NPS would benefit from IAEA's expertise and well-established procedures for developing safety standards.

4. In support of its recommendation of a joint partnership with IAEA to develop a space NPS framework, the Subcommittee adopted several considerations to facilitate the timely implementation and completion of the partnership's efforts. These considerations include the following:

(a) The framework will be developed through a partnership between the Subcommittee and IAEA with interested member States of the Subcommittee participating in the framework development process, including the establishment of the workplan;

(b) Any guidance document related to the framework development (including an IAEA document preparation profile if used as the vehicle for directing the implementation effort) and any changes to such documents will require approval by the Working Group on Nuclear Power Sources in Outer Space, the Subcommittee and IAEA;

(c) The partnership between the Subcommittee and IAEA will operate using the consensus rule;

(d) The Subcommittee and IAEA will not independently take steps that could have an impact on the development of the framework without first consulting each other;

(e) The framework development process will take into consideration United Nations treaties and principles on outer space and other applicable conventions and international law;

(f) The framework development process will also take into consideration relevant international recommendations (such as those of the International Commission on Radiological Protection);

(g) The framework will be issued as a joint product of the Subcommittee and IAEA;

(h) The development of the framework will take advantage of the safety experience and best practices of member States and international organizations with space NPS applications;

(i) The framework will be in accord with currently employed safety policies, processes and procedures (i.e., best practices);

(j) The framework could be utilized as a guide for national purposes; it will remain voluntary and not legally binding under international law; and

(k) Any future modification to the framework will be developed and approved using a joint development process between the Subcommittee and IAEA comparable to the process used to generate the original framework.

4. Interfaces

5. Because the present safety guide addresses a topic new to IAEA, its relationship to existing IAEA documents is limited. Most activities during the development, manufacturing and transportation of NPS for use in outer space are adequately addressed in existing IAEA standards relating to ground-based nuclear installations and activities. While some unique considerations relating to those operations may arise during development of the safety guide, potential issues or

conflicts will likely be minimal since the focus in the new safety guide will be on the activities associated with and after launch. IAEA staff will coordinate closely with the relevant IAEA committees to ensure that any real or perceived conflicts between the new safety guide and existing IAEA standards for terrestrial activities are adequately explained and qualified such that the final text of the safety guide has no impact on existing IAEA terrestrial standards.

5. Overview

6. The safety guide is intended for those who make decisions relating to the use of nuclear power. Its guidelines will reflect broad international consensus and be general and qualitative in nature, technically valid and relatively independent of evolving technology. The safety guide will address practices that could be implemented during the design, launch, operation and other relevant phases of the life cycle of an NPS in outer space to promote its safe use. Recommendations would be established for the design of NPS for use in outer space in general, but their detailed application would depend on the particular design and application and the risks posed by them.

6. Production

7. Production would follow the following schedule:

<i>Year</i>	<i>Activity</i>
April 2007	Approval of document preparation profile by the Steering Committee
May 2007	Approval of the document preparation profile by the Commission on Safety Standards
June 2007 – June 2008	Development (drafting and consultation meetings)
July 2008	Approval of draft by the Steering Committee
November 2008	Approval by Commission on Safety Standards for submission to member States for comments
December 2008 – March 2009	Member States comments
April 2009	Revision of draft by taking into account the comments of the member States
May 2009	Approval of the revised draft by the Steering Committee
June – July 2009	Technical editing
September 2009	Endorsement by the Commission on Safety Standards
October 2009	Submission to Publications Committee
Second quarter 2010	Target publication date