International Nuclear Security Peer Reviews

Making the IAEA IPPAS General and Sustainable

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This report reviews the critical elements of a generalized and sustainable peer review system and provides recommendations that, if implemented, will strengthen the International Atomic Energy Agency (IAEA) International Physical Protection Advisory Service (IPPAS) and place the international peer review in a new relation with the national assessments of operators' compliance with their licenses of operation. A nexus of international peer reviews, national assessment, and active participation of the nuclear industry and other operators should be the goal to ensure optimal performance of each stakeholder. Recommendations focus on actions that member states could consider to enable the IAEA to lead generalized and sustainable international nuclear security peer reviews modeled after the present IPPAS system.

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During the past decade, the international community and the nuclear security summit process have given high priority to strengthening nuclear security worldwide. International peer reviews of national nuclear security regimes and of physical protection of nuclear and other radioactive materials have been identified as of key value for continuous improvement of nuclear security. The International Atomic Energy Agency (IAEA) offers a number of advisory services and peer reviews for various purposes. The International Physical Protection Advisory Service (IPPAS) is the prevailing peer review service for nuclear security implementation, in parallel with other services. IPPAS has evolved through the past ten years into a broadly accepted service available to all states. However, general and recurring periodic application of IPPAS will require a significant strengthening and increased capacity of the system to enable general and periodic and systematic implementation.

The value of an international review of a national nuclear security regime and how physical protection is implemented for nuclear material, radioactive isotopes, facilities, and locations has been identified as one of the important measures needed to strengthen nuclear security as a whole. The availability of an international peer review, as it is implemented in individual countries, is increasingly recognized. A wider use of IPPAS missions is one of the commitments included in the Strengthening Nuclear Security Implementation initiative.[1]

This report reviews the critical elements of a generalized and sustainable peer review system and provides recommendations that, if implemented, will strengthen the IAEA service and place the international peer review in a new relation with the national assessments of operators' compliance with their licenses of operation. General use of IPPAS, or of a revised IPPAS, will require strengthening the supporting infrastructure, for example, increasing the availability of experts that meet established criteria for knowledge and skills in a certified process. In addition, operators should actively support excellence in nuclear security. Confidence building among states and with the public will require significantly enhanced communication of nonconfidential findings of the expert team. The aviation industry may provide valuable inspiration from an alternative system for international control, implemented for continued and improved aviation safety and security, *inter alia*, through peer reviews performed by the International Civil Aviation Organization (ICAO) of national aviation control systems. A nexus of international peer reviews, national assessment, and active participation of the nuclear

industry and other operators should be the goal to ensure optimal performance of each stakeholder. The following recommendations focus on actions that member states could consider to enable the IAEA to lead generalized and sustainable international nuclear security peer reviews modeled after the present IPPAS system.

Evolution and Implementation of the IAEA IPPAS

After the many cases of illicit nuclear trafficking in the early 1990s, the recognition that nuclear material had to be protected against theft and other unauthorized access increased. To assist member states, in 1995, the IAEA offered a new service, the International Physical Protection Advisory Service. The Convention on the Physical Protection of Nuclear Material (CPPNM) and recommendations for physical protection of nuclear material, INFCIRC/225, were used as benchmarks. Priority was given to the protection of proliferation-sensitive nuclear material and, with subsequent versions of INFCIRC/225, to the protection of nuclear facilities against acts of sabotage. The fifth revision of INFCIRC/225, which was published by the IAEA in 2011, takes into consideration the new obligations of the Amendment to the CPPNM, which was agreed upon in 2005 but entered into force only in May 2016, and the four top-tier documents of the IAEA Nuclear Security Series (NSS), one of which is the fifth revision of INFCIRC/225.[2]

Increased use of IPPAS missions may strengthen confidence, both nationally and internationally, that the state's nuclear security regime is effective and that the physical protection implemented at nuclear facilities fulfills the requirements of international guidance, particularly INFCIRC/225/Rev. 5. It may also identify weaknesses, at both the international and national levels, that may be addressed by states or the IAEA. It is necessary, however, to review the system to identify the measures that are needed to give it the capacity required for general application.

IPPAs Guidelines: The Review Basis

Revised IPPAS guidelines were established in 2014.[3] The new IPPAS guide maintains focus on the evaluation of the national nuclear security regulatory regime and the processes that determine its effectiveness. The evaluation is done against relevant international legal instruments, the INFCIRC/225/Rev. 5, and the CPPNM and its 2005 Amendment.

The key objective of the IPPAS is to provide advice to the national competent authorities and other entities, based on an objective assessment of the status of the nuclear security regime versus international legal instruments, IAEA nuclear security guidance, and international good practices. Although the IPPAS guidelines quote the articles in the reference documents of the Nuclear Security Series, they underline that "the mission is not a regulatory inspection or an audit against set codes and standards.

Rather, it is an assessment of the existing practices of a country, in the light of relevant international instruments and IAEA nuclear security publications, and an exchange of experience and accepted international practices aimed at strengthening the security organization and the procedures and practices being followed."[4]

The Modular Approach

An IPPAS national review mission is the recommended starting point for host countries that wish to have their physical protection regime reviewed against requirements and objectives included in international instruments and guidance.

The IPPAS mission may have five review modules: (Module 1) National Review of Nuclear Security Regime for Nuclear Material and Nuclear Facilities, (Module 2) Nuclear Facility Review, (Module 3) Transport Review, (Module 4) Security of Radioactive Material, Associated Facilities and Associated Activities, and (Module 5) Computer Security Review.

The two most commonly used modules are (Module 1) National Review of Nuclear Security Regime for Nuclear Material and Nuclear Facilities and (Module 2) Nuclear Facility Review.

Module 1: The National Review of Nuclear Security Regime for Nuclear Material and Nuclear Facilities includes review of the elements to be included in a national nuclear security regime, with emphasis on national legislation and regulatory systems. Attention is given to government organizations, assignment of responsibilities, and international obligations, as well as roles and responsibilities of the competent authority. The licensing and authorization process, as well as coordination among all state organizations that contribute to nuclear security (e.g., law enforcement agencies, customs and border control, intelligence agencies, and judicial entities) is also reviewed. Basic features of the national system are evaluated, including threat assessment and Design Basis Threat (DBT), the risk informed approach, risk management, and the need to implement a graded approach in response to a variable threat and risk, with a system of defense in depth recognizing that "vital" areas where more sensitive material and technical systems are located need additional protection. Sustainability of the regime, with security culture, quality assurance, and sufficient planning in response to a nuclear security event are other important elements for review.

Module 2: The Nuclear Facility Review addresses features of a physical protection system as implemented at a nuclear facility, location, or site. Such features include the security management program of the facility or location, how threats and targets are identified, the security plan, and contingency plans. Interfaces with nuclear material accountancy and control and nuclear safety are identified as important for the facility

system and accordingly for security. Features related to the organization of security at the site, such as qualifications and training of staff, are identified as essential for the effectiveness of the system. Internal procedures established to ensure trustworthiness of staff, to maintain confidentiality of sensitive information and computers, to report security events, to test performance, and to carry out exercises are other features of the nuclear security system at the site that are evaluated. The allocation of resources as part of a facility's annual budget is another key function for effectiveness of the nuclear security system implemented at the facility.

Further, specific physical protection recommendations or guidance, as documented in IAEA nuclear security recommendations associated with detection of intrusion attempts, the delay of an intruder, and the response to an intrusion remain key functions for the review. Thereby, attention is given to the planning of response, from guards and response forces, but also to the communication system and the availability of equipment, armament, and transportation. As a whole, the effectiveness of the physical protection system of nuclear security is assessed.

The remaining three modules—Transport Review; Security of Radioactive Material and Associated Facilities and Associated Activities; and Computer Security Review—are built up in a similar manner, with direct references to NSS guidance.

All review items are specifically connected to an article or obligation in the four top-tier documents of IAEA Nuclear Security Series. The IPPAS national regime review relates mostly to overarching principles, procedures, and regulatory requirements. This kind of information is, with few exceptions, not confidential, and the findings may be communicated, as appropriate, to a broader audience. In contrast, the facility review will include information and procedures that are more sensitive and therefore needs to be protected against disclosure. Such information should not be shared in any detail with a broader audience.

It may be noted that border control, with the target of detecting nuclear and other radioactive materials out of regulatory control (NSS No. 15), is not covered by a separate module.

Recommended actions: IPPAS missions are sufficiently developed to serve as the basis for a generalized service to states with or without a nuclear energy program and where high-activity radioactive sources are used for industrial or medical purposes. Such a generalized peer review system should focus on the national nuclear security regime, complementing a national assessment and review of facilities, and serve to harmonize implementation in countries. States should adopt a policy of inviting IPPAS reviews on a regular basis

IPPAS Timeline

The IPPAS process spans a considerable time period; from the first stage of planning until the report is submitted may take up to one and a half years. A follow-up meeting regarding the recommended actions is foreseen within one year after the mission. The process anticipates the next IPPAS mission to take place after three to four years, giving an IPPAS cycle a total of four to six years.

An IPPAS mission is normally carried out over a period of two weeks, with five to nine invited experts. In some cases, a technical writer constructs the report from input received from the experts. The process is schematically laid out in Chart 1.

Recommended actions: A suitable IPPAS cycle should be four to six years.

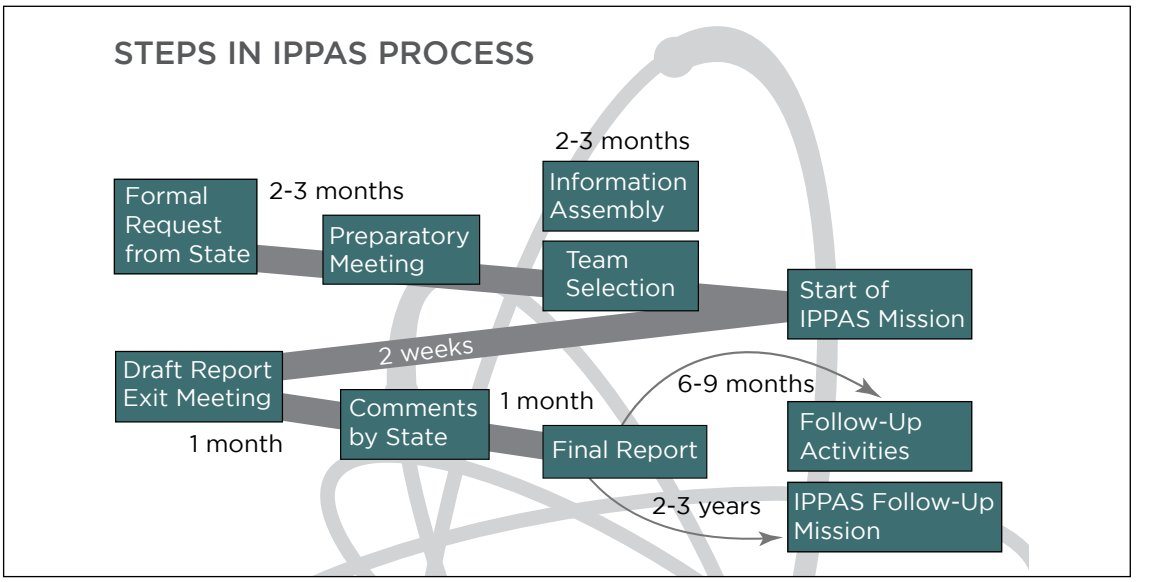

Chart 1: IPPAS Process[4]

Increasing the Capacity of IAEA Nuclear Security Peer Review

As of October 2016, the IAEA had conducted a total of 74 IPPAS missions in 46 states,[6] including one to the IAEA Seibersdorf laboratories. Since 1996, when the first mission was carried out, the IAEA has logged eight years with one to two IPPAS missions, three years with three missions each year, four years with four missions, and five years with five or more missions.[7] On average, the IAEA has carried out 3.6 IPPAS missions yearly from 1996 to 2016. It is noted that several countries with advanced nuclear programs have hosted IPPAS missions, among them three nuclear weapons states: France, the

United Kingdom, and the United States. For implementation during the next couple of years, the IAEA has received IPPAS mission requests from 11 countries, including the fourth nuclear weapon state, China. These records indicate a broad acceptance of the IAEA service, by countries with very significant nuclear programs as well as countries using radioactive sources.

Expanded implementation of IPPAS missions would require a significant increase in the volume of IPPAS missions to be performed per year. There are about 447 operable nuclear reactors in 30 countries, 61 under construction in 15 countries,[8] and 241 operational research reactors in 56 countries.[9] A rough estimate of the volume of IPPAS missions required per year would be based on the estimate that a minimum of 56 countries with a nuclear program would require an IPPAS mission every five years. In addition, countries with high-activity radioactive sources may wish to review their nuclear security regime, including the protection of the sources. Assuming that a minimum of 100 countries have high-activity radioactive sources and 10 percent of them request an IPPAS mission annually (i.e., a periodic review every 10th year), this would result in a total of some 20 missions per year—in about 10 countries with nuclear facilities and 10 countries with high-activity radioactive sources. With the addition of facility-specific peer reviews, the total number of facilities that could be candidates for review would be more than 700, plus the transportation sector.

When planning the IAEA IPPAS program, it will be important to give sufficient priority to countries with new or expanding nuclear energy programs, as well as to countries with high activity radioactive sources.

A reasonable approach to implement a general and sustainable IPPAS program would be to focus on the international peer review of the national regime. Thereby, review of nuclear security arrangements at facilities would be performed as examples of how the national regime and its physical protection requirements are implemented at these operational locations. Facility-specific evaluation (i.e., Module 2) missions would be performed upon special request, since the evaluation of physical protection at facilities would be performed by the national authority. In addition, the nuclear industry may initiate interaction in which nuclear security arrangements are compared among operators. Such exchange of information may serve a useful purpose for the nuclear industry.

Recommended actions: The capacity of the IAEA to carry out IPPAS missions in a general manner (Module 1) should be enhanced. Security implementation at facilities (Module 2) would primarily be performed by the national competent authority. A plan for increasing the capacity of the IAEA with a target of performing about 20 missions per year (10 countries with nuclear energy programs and 10 countries with high-activity radioactive sources) should be prepared and outlined in sufficient detail.

IPPAS Mission Results: Sharing Information

Strengthening nuclear security requires information sharing about status and improvements planned and already accomplished. One important objective of a broad international peer review regime is to build confidence among neighboring countries and with the public that the national regime is effective. For that purpose, substantive information and related dialogue is required. The predominant view is that all information related to an IPPAS mission is sensitive and must be protected as confidential. This is the practice implemented by the IAEA where the entire report is protected as "highly sensitive," the highest level of confidentiality. The host country has full control of the report and decides whether any information should be released to a broader audience.

After an IPPAS mission, the IAEA, sometimes in parallel with the host country, issues a press release with information that the IPPAS mission took place, the dates, and the expert team leader. The press release usually does not contain any information of the findings of the mission.

With that low level of public information, a legitimate observation is that the international review system of today does not provide substantive information regarding the state of health of the national nuclear security regime or its effectiveness.

However, three countries—the Netherlands, Hungary, and Canada—have adopted the approach to make public the review results related to the national regulatory regime. By this action, these countries demonstrate that providing significantly more information than the usual practice is possible and enhances public confidence.

Generalized results, without attribution to facility or country, would provide useful feedback among operators. Once the information is not associated with a country or facility, it may be shared more broadly. Presently, there is no mechanism available to share non-attributed IPPAS results or observations with a broader audience. The actions of the Netherlands, Hungary, and Canada indicate that common ground could be found to share useful information after removal of all sensitive information that otherwise may risk nuclear security effectiveness. In this regard, the IAEA may help in identifying nonattributable information on findings, recommendations, and observations made at IPPAS missions, based on its internal, need-to-know-based access to the IPPAS reports.

The first international seminar on IPPAS experience and lessons learned was conducted in December 2013 in France. A majority of countries that hosted an IPPAS mission participated and shared experiences from their IPPAS missions and made proposals to further enhance the value of IPPAS, including through access to more information

on the results and findings. A better understanding of IPPAS results by a broader audience may accelerate the process to maintain and strengthen the national nuclear security regime.

The nuclear industry and operators of high-activity radioactive sources should be encouraged to initiate a program of interaction and exchange of best practices, in line with models provided for similar interaction within the nuclear safety field.

Recommended actions: States should consider revising their policies on the communication of IPPAS peer review results. A template could be developed to guide a much more substantive exchange of information after an IPPAS mission, recognizing the need to maintain the protection of confidentiality of truly sensitive information. It is also recommended that a more appropriate balance be considered between information that may be shared broadly and information that should be kept confidential, to ensure that confidentiality of sensitive information is maintained, while confidence in the effectiveness of the nuclear security regime is strengthened.

Availability of Experts to Conduct IPPAS Missions

The effectiveness of an IPPAS mission depends on the qualifications and skills of the experts. The availability of skilled experts with sufficient knowledge and experience from national regulatory agencies or implementation of physical protection at facilities will be key to ensure that general use of IPPAS also will meet high and reliable quality requirements.

There are no clear criteria to determine the qualifications of experts. Since the experts are not certified, the assessment of their qualifications may be referred to as the result of an interactive process. Should IPPAS become more widely used by IAEA member states, certified qualification of the experts appears to be of central importance for their trustworthiness.

Although the number of experts who have served in missions has increased, the total number of persons with sufficient qualifications is nowhere near the number needed to support a significantly increased number of missions.

Nuclear Security Support Centers (also referred to as “Centers of Excellence”) may contribute specialized training of IPPAS mission experts or help with the associated certification to ensure their competence. Dedicated efforts are required to contribute further training of mission experts, including to document mission results and to provide feedback reports to the host government.

Recommended actions: States should work toward establishing a reliable and transparent certification system to ensure that experts are duly qualified. A certification

process, accepted internationally, should be implemented to increase both the number and qualifications of experts that may serve in IPPAS teams. Certification would provide reliability regarding experts' competence. Centers of Excellence, or Nuclear Security Support Centers, may be further developed to assume the task of developing and implementing a certification training program.

It is also recommended that countries jointly seek to identify a process of security clearance. While there are several sensitive issues associated with a personnel clearance process, such a process may build confidence and facilitate acceptance of IPPAS missions.

Learning From Other International Review Systems: The ICAO and Aviation Safety and Security

There are other areas in society where activities have a significant impact on human safety and security and are subject to international reviews of standard and quality. The most obvious area is the aviation industry. The records of aviation safety and security are relevant in that regard.

Therefore, the aviation industry may provide useful insight into how international control is implemented for continued and improved aviation safety and security in a generalized and sustainable manner. The peer reviews performed by the ICAO of national aviation control systems may provide useful examples for how the nexus of international peer review, national monitoring through regulatory systems, and the participation of the industry (as producers as well as operators) can ensure optimal functioning of each stakeholder and strengthen the overall system.

It is recognized that there are differences insight into how review processes are structured between the nuclear sector and the aviation industry. These differences may be worth studying as a way to develop an alternative model that may improve both nuclear safety and nuclear security.

Recommended actions: States should initiate a comparison between the prevailing approaches to international and national nuclear security and aviation security internationally and nationally. The peer review system applied by the ICAO should be studied as a model for the generalized nuclear security peer review system. In particular, the interaction between the ICAO and the aviation authorities in states could provide a model for similar interaction in the nuclear sector. A similar comparison could be made for the standards that are used as benchmarks for the review and evaluations that are made.

Incentives for Operators to Invest in Effective Nuclear Security

The participation of the nuclear industry is widely recognized in the process of establishing effective nuclear security, both at the international and national levels. Incentives for the nuclear industry to become more active may be positive. For example, excellence in nuclear security could influence insurance providers, international trade approvals, and long-term credits or tax credits. Security culture seminars could be used to further discuss such proposals.

Recommended actions: States should examine further what incentives may be devised so that nuclear industry becomes more actively involved in the efforts of making nuclear security effective at facilities nationally and globally.

Conclusion

A significant evolution has occurred in the implementation of IAEA IPPAS missions. The missions are now widely accepted as a vehicle for confidence building among states and to some degree with the public. To achieve its full capacity and impact, however, the system needs reforming and strengthening.

A review nexus should be anticipated that is composed of (1) international peer reviews carried out by the IAEA, (2) national evaluations performed by the national competent or regulatory authority, and (3) a mechanism applied by the nuclear industry and other operators for interaction and mutual assessments. Periodic review (e.g., every five years) would significantly contribute to maintaining high priority on nuclear security over time.

Present infrastructure is insufficient to support a generalized nuclear security peer review service for states that operate nuclear programs or use high activity radioactive sources in industry or medicine. Generalized IPPAS service will need increased personnel capacity, certified and transparent processes to qualify experts, and advances in communication and use of the result. Additional opportunities for operators to interact with each other and with authorities may provide for continuous improvement. Further, the identification of potential incentives that would promote and reward excellence in nuclear security arrangements at facilities or other locations may help operators to give the right priority to nuclear security.

To make possible a generalized IPPAS nuclear security review service that is attractive to all states, all stakeholders—The IAEA, states, industry, and nongovernmental organizations—should contribute and support the strengthening of the required support infrastructure.

Author Biographies

Dr. Anita Nilsson is the head of AN & Associates and served as the director of the Office of Nuclear Security at the IAEA and in leadership positions at the Swedish Nuclear Power Inspectorate.

Ambassador John Bernhard served as the permanent representative of Denmark to the IAEA and a legal adviser to the Danish Ministry of Foreign Affairs during his 37-year diplomatic career.

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Endnotes

[1] The joint initiative supported by 35 countries at the 2014 Nuclear Security Summit stipulates regular, periodic use of international peer reviews, for example IPPAS. The initiative was published by the IAEA in 2014 as INFCIRC/869.

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[3] "International Physical Protection Advisory Service (IPPAS) Guidelines," IAEA Services Series No. 29, International Atomic Energy Agency, 2014.

[4] Ibid.

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Nuclear Security Governance Experts Group (NSGEG)

The NSGEG is a multi-sector coalition of experts with diverse nuclear experience that has developed more than 50 recommendations for improving nuclear security. The NSGEG is a project of the Asan Institute for Policy Studies, Partnership for Global Security, and the Stanley Foundation.

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