

The Nuclear Safety Information Sharing Enhancement through the MRV Principles under UNFCCC

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Abstract

Many countries use nuclear energy as a policy to reduce domestic greenhouse gas emissions. As agreed upon in the Bali Action Plan, those who deploy nuclear energy and technologies shall follow the principles of measurement, reporting, and verification (MRV principles) when submitting national communication reports. The implementation of the MRV principles would encourage the Parties to disclose the information of using nuclear technologies and nuclear energy in a way that can benefit other countries in the UNFCCC as they strive to advance their technology and methods. The

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information disclosure and sharing could contribute to the establishment of the early-warning mechanisms for when nuclear accidents have cross-border effects. This article will explain the principles of MRV in UNFCCC, its usage in four different sectors—national communication, mitigation acts, project-based mechanisms, financial mechanisms—and the reporting issues of implementing the MRV in the nuclear sector. We will discuss the MRV usage principles under the UNFCCC, Kyoto Protocol, Bali Action Plan, and other conventions for nuclear safety. The findings in this paper could assist Member Parties comply with its UNFCCC obligations.

Keywords:

UNFCCC, nuclear security, measurable, verifiable, reportable, Kyoto Protocol

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Nuclear power technologies are widely adopted as a substitute for fossil fuels to reduce domestic emissions. There are currently 433 nuclear reactors in the world, producing 14% of global electricity¹⁾ and generating 45% of global carbon-free electricity. As shown, nuclear power plants emit zero greenhouse gases and are a great choice for achieving a low-carbon-emission society with cleaner air quality. This reduction measure of using nuclear power technologies, an anthropogenic emission reduction measure to replace coal power, could reduce the accumulation of CO₂ in the atmosphere. Without nuclear power, global carbon dioxide (CO₂) emissions are estimated to increase to ten percent (10%) of total emissions and would add 1,200 million tons of additional emissions that would need to be reduced to achieve the Kyoto targets by 2008-2012.²⁾ Nuclear safety refers to all actions taken to prevent nuclear and radiation accidents and to limit the scope of adverse consequences. In order to prevent adverse consequences during a nuclear accident, the first course of action is to shut down the reactor as quickly as possible to maintain stability. Operators shall also use any equipment to prevent the release of toxic radioactive substances during such accidents. But along with these two actions, there are also other steps countries take as recourse. Such different actions would be beneficial if shared among countries and governments as they seek to regulate their safety standards and measures to secure the health of people and environment.³⁾

After more and more countries began using nuclear energy as an alternative to fossil fuel, the global community adopted the Convention on Nuclear Safety (CNS) in 1994 as a commitment to ensuring the safety of land-based nuclear power plants, and the storage facilities and treatments of radioactive substances. Since its adoption,

1) Nuclear Energy Institute, Resources and States, world statistics, available at http://www.nei.org/resourcesandstats/nuclear_statistics/worldstatistics/ (visited on October 25, 2011)

2) OECD, *Nuclear Energy and the Kyoto Protocol* (2002), pp. 22 .

3) International Atomic Energy Agency, Governmental, *Legal and Regulatory Framework for Safety: General Safety Requirements, Part I* (2010), pp. 10

74 states have ratified as members, all striving to achieve and maintain "nuclear security worldwide through enhancement of national measures and international co-operation."⁴⁾ Although the Convention is not designed to guarantee the safety measures of land-based power plants, the CNS uses the obligation of fulfilling the common goal of higher safety as an incentive for all its members to prepare their nuclear security standards, strategies and operation procedures for peer review by the contracting Parties. The implementation measures reports shall follow national legislation and regulation conducted by the CNS. However, the CNS and the Meetings of the Contracting Parties have not standardized the requirements on the standards and methodologies for preparing the implementation measures for nuclear installations, materials and radioactive substances.

Due to the lack of capacities to monitor, analyze and prevent the trafficking of unlawful nuclear materials, the International Atomic Energy Agency (IAEA) provided extra safety standards on radioactive substances and waste management, and also established an International Physical Protection Advisory Services (IPPAS) to strengthen security.⁵⁾ The safety standards are without binding forces, but with the option to voluntarily adopt. To maintain secure transportation and storage of radioactive substances, peaceful physical usage of nuclear energy, and "prevent unlawful taking and usage of nuclear materials," some countries have also agreed to the establishment of the Convention on the Physical Protection of Nuclear Materials in 1979.⁶⁾ These voluntary integrations of IAEA and IPPAS safety standards on nuclear facilities signify the non-compliance reporting obligation of the CNS. In cases where Contracting Parties do submit their implementation report to the Convention, however, the purpose to achieve and maintain international nuclear security struggles in vain because even as the fundamental element for information sharing and cooperation, the reports still have no standard review process on which to follow up. The CNS needs to implement

4) Convention on Nuclear Safety, Article 1, (a). 1963 UNTS 293; S. Treaty Doc. No. 104-6 (1995); 33 ILM 1514 (1994).

5) Mathew Bunn & George Bunn, "Strengthening Nuclear Security Against Post-September 11 Threats of Theft and Sabotage," *Journal of Nuclear Materials Management* Vol. 30 (2002), pp. 4.

6) Convention on the Physical Protection of Nuclear Materials, 1456 UNTS 101; TIAS 11080; 18 ILM 1419 (1979).

several decisions on safety standards for installations, radioactive substances and waste management as such compulsory standards on reporting measures will benefit from international peer review and also help reach the objective of the CNS. It will also contribute to transparent and accessible information sharing on nuclear power facilities and radioactive substances treatments. Otherwise, they might need further assistance from other international decisions or treaties decided upon by individual countries.

Two major nuclear events have led to the establishment of cooperation agreements that pushed for information sharing among individual countries. After the Chernobyl nuclear power plant accident in 1986, the global society adopted two conventions to deal with the accident. The Convention on Early Notification of a Nuclear Accident⁷⁾ established a notification system for nuclear accidents and required states to report an accident's location, time, radiation release and other essential data for assessing the radiological affect of the accident on other countries, especially neighbouring states. The states also agreed to the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency⁸⁾ to establish an international framework to provide prompt assistance to mitigate negative consequences in the event of a nuclear accident or radiological emergency. Although these two conventions have different levels of reporting obligations, the information-sharing component can help reduce potential damages after an unclear accident or radiological emergency.

After the Fukushima nuclear accident in 2011, Taiwan and Mainland China signed the Cross-Strait Nuclear Safety Corporation Accord on 24 October 2011 to create cooperation measures for promoting nuclear security on both sides of the Taiwan Strait, particularly preventing nuclear events and radiological hazards in this area. The cooperation includes exchanging the experiences in making regulations, standards, and evaluations on nuclear installations and operations. However, the governments do not have a mutual obligation to develop and submit nuclear security reports—the standards, methodologies, tools and reports for evaluation also are not decided on by representatives from both sides of the Strait. The standards and methodologies for peer review still rely

7) Convention on Early Notification Of A Nuclear Accident, 26 September 1986, IAEA INFCIRC/335, 1986, 25 I.L.M. 1370 (1986).

8) Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, 26 September 1986, IAEA INFCIRC/ 336, 25 I.L.M. 1377 (1986).

heavily on sovereign regulations, leading to different regulations and methodologies, an increased chance of conflict of interest, and increased negotiation expenses as it takes much longer to reach a consensus on the terms to maintain nuclear security along the Strait.

The UNFCCC Regulations and Nuclear Energy

The UNFCCC was established in 1992 with the goal to stabilize “greenhouse gas concentrations in the atmosphere at the level that would prevent dangerous anthropogenic interference with the climate system.”⁹⁾ The UNFCCC classified the Parties into Annex I and non-Annex I groups. The Annex I group is constituted of mostly industrialized countries, and is committed to “take the lead in combating climate change and the adverse effect.”¹⁰⁾ As required under Article 4.2, they are also expected to “take corresponding measures to mitigate climate change.”¹¹⁾ As nuclear power technologies are becoming widely adopted as a substitute for fossil fuels to reduce domestic emissions, the UNFCCC has recognized them as domestic emission mitigation measures. As a means to achieve its objectives, the UNFCCC has adopted an information-sharing system to monitor the progress, and also to keep all Parties informed as they work toward establishing methods to mitigate greenhouse gas concentrations and limiting climate change.

In 1994 the UNFCCC required all Parties to “develop, periodically update, [and] publish”¹²⁾ national communication reports and “make [them] available to the Conference of the Parties” for international peer review. Based on Article 4 and Article 12, the national communication shall include “nation inventories of anthropogenic emission by sources and removals by sinks of all greenhouse gases”¹³⁾ and “any other information that the Party considers relevant to the achievement of the objective of the Conven-

9) United Nations Framework Convention on Climate Change, Article 2, 9 May 1992, 1771 U.N.T.S. 107, S. Treaty Doc. No. 102-38, ATS 2 / 31 I.L.M. 849 (1992).

10) *Id.*, Article 3. para. 1.

11) UNFCCC, *Supra* note 8, Article 4.2.

12) *Id.*, Article 4.

13) UNFCCC, *Supra* note 8, Article 4, para. 1, subpara. (a).

tion and suitable for inclusion in its communication.”¹⁴⁾ These reports shall also use comparable methodologies¹⁵⁾ that are defined and announced by the Conference of the Parties (COP) meetings. Countries are thus asked to disclose the performance of the nuclear power plants and the reduction consequences on the nation’s communication report. Despite the fact that the monitoring and reporting on the operation of the nuclear power plants are not the objective of the UNFCCC, the commitment to publish and share nuclear-energy development information through national communications and international peer review of all Parties shall help other Parties lower greenhouse gas concentrations in the atmosphere.

The Kyoto Protocol and Nuclear Energy

The effort of substituting fossil fuel with nuclear power technologies is the current method for reaching the UNFCCC’s objective of reducing greenhouse gas emissions. This method not only reduces the accumulations of carbon dioxide in the atmosphere, but also mitigates domestic anthropogenic emissions. The Kyoto Protocol (KP),¹⁶⁾ which was promulgated in 1998 as a supplementary protocol under the UNFCCC, commits 38 industrialized countries and the European community to report their progress on reducing greenhouse gas emissions. The major feature of the KP is that it sets binding targets for GHG emissions reductions for its participating members. It also allows those committed countries to implement relevant reduction actions through flexible mechanisms such as the GHG emission reduction credits, clean development mechanism (CDM), and joint implementation (JI) to achieve their quantified emission limitation and reduction commitment (QELRC).

Clean Development Mechanism (CDM) is a mechanism that allows industrialized

14) *Id.*, Article 12, para.1, subpara. (c).

15) *Id.*

16) Kyoto Protocol to the United Nations Framework Convention on Climate Change, 16 February 2005, U.N.T.S. 30822, 37 I.L.M. 22 (1998).

countries to invest in sustainable development projects in developing countries.¹⁷⁾ Through these investments, developing countries may achieve less GHG emissions, and the amount reduced can be applied to the industrialized country's QELRC after undergoing a strict verification process.¹⁸⁾ The concept of CDM is "cost-effective," which means to pursue a wanted outcome no matter how much it costs. Compared to developing new more advanced technology, investing and transferring existing technologies and facilities to developing countries costs industrialized countries less and still allows them to earn the same number of carbon credits. This reasonably creates a win-win situation for both the industrialized and developing countries involved. The International Energy Agency (IEA) also proposed the "Shared Goals" in 1997 to enhance the contributions on energy supply variety, sustainable usage of energy and sustainable environment development.¹⁹⁾

Based on Decision 1 of COP.11, Annex I Parties shall engage in domestic emission reductions prior to acquiring GHG emission reduction credits. In order to reach the assigned reduction commitments, Annex I Parties can invest in project-based flexible mechanisms in other non-Annex I countries and exchange certified emission reductions (CERs) from their investments from nuclear facilities projects. The credits exchanged from these project-based mechanisms could assist the investors from Annex I Parties in reaching their reduction commitments and also assist the non-Annex I countries in reaching their sustainable development goals. Recognition of the positive impact of economic growth from usage of renewable energies and the potential benefits for promoting nuclear power technologies to developing countries, industrialized countries proposed that new nuclear facilities should be registered under the Clean Development

17) Kyoto Protocol, Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol [hereinafter Report of the CMP], 1st sess., Montreal, 28 Nov.-10 Dec. 2005, Report of the COP/MOP on its first session, Decision 3/CMP.1, Modalities and procedures for a clean development mechanism [hereinafter CDM] as defined in Article 12 of the Kyoto Protocol, 6-29, and Decision 4/CMP.1, Guidance relating to the CDM, FCCC/KP/CMP/2005/8/Add.1 (30 Mar. 2006)

18) *Id.*

19) *Supra* note 20, at 19.

Mechanism and Joint Implementation as a mechanism for mitigating GHG emission.²⁰⁾ They also recognize that if the COP allowed the new nuclear facilities activities to be registered by the CDM Executive Board, those related activities shall follow the regulations of the UNFCCC and Kyoto Protocol, and the decisions made by the COP meetings. However, the proposal has not been adopted by the Conference of the Parties (COP) meetings.

Because the UNFCCC Parties have not agreed to this proposal yet, whether a nation uses nuclear power plants becomes a sovereign decision.²¹⁾ Nuclear power technologies could not be counted as domestic mitigation activities for Annex I Parties to achieve their reduction commitment under the Kyoto Protocol, nor could it be recognized as project-based mitigation measures in non-Annex I Parties. However, they still could be considered a substitute energy resource for all Parties, especially those heavily reliant on foreign imported energies. The Kyoto Protocol does not regulate and evaluate the nuclear power projects between Annex I and non-Annex Parties; however, Parties that decide to use nuclear power plants as their alternative energy option would be required to follow UNFCCC regulations and disclose all related information for publishing the updated national communication.

The requirements on submitting national communication reports are designed to verify whether the Parties complied with its domestic mitigation and adaptation obligations under the UNFCCC. Since many countries reduce their domestic GHG emissions by using nuclear power technologies, these substitute actions shall be considered as domestic mitigation measures and also be prescribed in national communications for review by the COP meetings. Especially since there are currently 195 parties under the UNFCCC but only 74 Contracting Members to the CNS as of 29 June 2011, the coverage and influences on nuclear security information sharing in the UNFCCC are stronger than CNS because of its larger membership. These project-based mechanisms

20) UNFCCC, Ad Hoc Working Group on Further Commitments for Annex I Parties Under The Kyoto Protocol, 6th Sess., 21 ~ 27 August 2008, Accra, Report of the Ad Hoc Working Group on Further Commitments for Annex I Parties Under The Kyoto Protocol, III, Analysis of means to reach emission targets and identification of ways to enhance their effectiveness and contribution to sustainable development, 13, FCCC/KP/AWG/2008/5 (29 September 2008).

21) International Atomic Energy Agency, *Nuclear Power for Greenhouse Gas Mitigation Under Kyoto Protocol: The Clean Development Mechanism* (2008), pp. 6.

could assist the investors from Annex I Parties in reaching their reduction commitments and also assist the non-Annex I countries in reaching their sustainable development goal.

MRV principles in Climate Change Regime

MRV in the UNFCCC stands for measurable, reportable and verifiable activities on mitigation, which can be inferred from Decision 1, COP13th and adaptation, but still lack of precise definition or explanation.²²⁾ Measurement is generally associated with quantification and qualification of mitigation commitments, for they can be evaluated objectively and easily be reviewed. Further, anything that is measurable is reportable. An effective report contains reliable data should be transparent and standardized. The verification process is used for assessing the accuracy and accountability of reported information. Thus, by making mitigation actions measurable, reportable, and verifiable, the reduction consequence can be clearly expressed and discreetly examined.

Implementation of MRV principles would help the Parties to effectively disclose information on their use of nuclear technologies and energy. Parties should adopt methodologies authorized by the COP to publish its national communication report when they use nuclear energy to reduce their domestic CO₂ emissions and when they comply with reduction commitments under the climate change regime. These reports should use comparable methodologies and also MRV principles to assist Annex I Parties in enhancing their reduction commitments under the Kyoto Protocol, and also technology transfer, financing and capacity-building activities.

Application of MRV principles can, with some wording inconsistency, also be inferred from Articles 4, 7 and 12 in the UNFCCC, and Articles 5, 7, 8 in the Kyoto Protocol. It requires all parties to submit their national communication on their inventories and activities in accordance to MRV principles, which will provide comparable methodologies to develop their national communication periodically for

22)Harald Winkler, "Measurable, Reportable and verifiablw: the keys to mitigation in the Copenhagen deal," *Climate Policy* Vol. 8, No. 6 (2008), pp. 537-347

international peer review, as required under Article 4.1(a) and Article 7.2(d). The overall purpose of applying MRV principles in their national communications submitted to the UNFCCC is to ensure that the mitigation action steps taken are measurable, reportable and verifiable among different national circumstances. As well, to achieve QELRCs, in conducting national appropriate mitigation acts (NAMAs) and providing relevant assistances, countries are asked to establish a system so that every act, process, and outcome can be measured, reported, and verified. Using MRV principles will allow the information disclosure and sharing system to contribute to the establishment of early warning mechanisms when nuclear accidents have cross-border effects. The reporting system can also lead to further cooperation on nuclear security and accident warning systems

The Bali Action Plan (BAP), decided on the 13th Session of COP, closely links NAMAs with MRV principles. To ensure the quantity and the quality of the outcome and prevent any dishonesty, the countries shall carry out those mitigation acts aimed at raising transparency by emphasizing MRV principles. The project-based mechanism and financial mechanism are relevant issues to mitigation acts, since the previous one is created under KP to mitigate the GHGs, and the latter one is to support and enable mitigation acts. Decision 1.1(b), (i) and (ii) aim to carry out a more complete, more effective and more continuous outcome through a long-term cooperation, that involves strengthening both international and national mitigation and adaptation acts that correspond with the MRV principle.

In the Kyoto Protocol, there are several other regulations that call for MRV principles. The measurable principle states in Article 5.2 that all Parties shall abide by methodologies accepted in COP.3 to estimate anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol. Article 7 of the KP also states that Annex I Parties shall submit their national communications (under Article 12) with its annual inventory of anthropogenic emissions by sources and removals by sinks of greenhouse gases not controlled by the Montreal Protocol. Where such methodologies are not used, appropriate and comparable adjustments shall be applied according to methodologies agreed upon by the CMP.1. The verifiable regulations in KP provided in Article 3, Article 6, Article

8.1–8.3 and Article 12.7 regulate that all national communications shall be reviewed in a way pursuant to relevant COP and CMP guidelines and decisions by expert review teams.

In all, MRV principles roughly cover the above four areas, national communication, mitigation acts, project-based mechanism, and financial mechanisms. However, due to the reason that MRV principles are not clearly defined, regulations in each area diverge. The objective of the MRV principle is to achieve the aim of the Convention more completely, effectively, and continuously. The implementation of the MRV principles would encourage Parties to disclose information on using nuclear technologies and energy and could contribute to further cooperation on nuclear security and accident pre-warning. Under the MRV principle, Annex I parties shall build up a system that enhances their mitigating commitments (QELRCs) and national appropriate mitigation acts (NAMAs). Non-Annex I parties also shall follow the principle to do NAMAs, and once those non-Annex I parties follow the MRV principle, Annex I parties shall support those acts with relevant technologies, funding, and capacity building.²³⁾ Discussions about MRV principles are popular in recent COPs, especially in the 15th and the 16th sessions, but little progress has been made. What can be predicted is, in a post-2012 regime, the MRV principles will make the obligations of each country clear. With this in mind, developing a complete MRV reporting system and establishing its contents and procedures should be a priority.

Nuclear safety and MRV

The purpose of nuclear risk assessment is technical safety optimization and the internal communication within the plant and with all external stakeholders, which include the operators, authorized agencies and citizens. The IAEA already established safety standards and measures to encourage all its members to voluntarily adopt its standards to nuclear facilities and activities and also asks them to disclose their implementation

23) Harald Winkler, “Measurable, Reportable and verifiable: the keys to mitigation in the Copenhagen deal,” *Climate Policy* Vol. 8, No. 6 (2008), pp. 537-547

of the standards in their national communication reports. Because the IAEA and its industrialized members are trying to introduce nuclear energy into the CDM project, they shall seriously consider implementing the MRV standards into their proposal processes. The act of using MRV principles shall not only encourage disclosure and sharing of national standard reports, it will also encourage members to establish their own nuclear safety standards. Although nuclear energy and technology is excluded from the CDM for the current commitment period, the CDM does not exclude host parties from adopting nuclear energy as they only have the right to define whether nuclear energy is sustainable for their energy program.

Neither the UNFCCC nor the KP has made any decision related to nuclear technologies and standards. If the industrialized countries would like CDM to adopt nuclear energy and technologies into their mechanism, the safety standards prepared by the IAEA is a well-developed reference material for the COP to adopt, which will also help save developing expenses and negotiation costs. Even though nuclear technologies could not be counted as a CDM project right now, the COP of UNFCCC could adopt those IAEA safety standards as methodologies and standards for the Parties to develop their national communication and also disclose information on their nuclear energy usage, facilities operations and radioactive treatments. This information is not only related to domestic GHG emissions mitigation measures and carbon sinks but also contains nuclear security information that would contribute to international cooperation on maintaining nuclear installations and preventing safety hazards.

Conclusion and Suggestions

The Contracting Parties agreed to take on reporting obligations stated in Article 5 in CNS²⁴⁾ with the purpose of “establish[ing] and maintain[ing] effective defenses in nuclear installations against potential radiological hazards in order to

24) CNS, *Supra* note 3, Article 5. “Each Contracting Parties shall submit for review, prior to each meeting referred to in Article 20, a report on the measures it has taken to implement each of the obligations of this Convention.”

protect individuals, society and the environment...”.²⁵⁾ The report shall cover the implementation measures taken by the Contracting Parties, including the existing nuclear installations and radiation control. The CNS also has regulations of assessment and verification of safety²⁶⁾ on nuclear installations. However, the CNS and its Meeting of the Contracting Parties have not authorized any standard or requirement based on which all Contracting Parties shall develop its report for international peer review. Verification standards on installations and operations also rely on sovereign legislation and domestic safety requirements, which mean that all submitted reports are developed by self-determined standards and requirements. Without a uniformed standard for submission of reports, international review by the CNS becomes difficult. Contracting Parties are unable to verify their reports, they also cannot benefit from reports prepared by other Contracting Parties. The MRV regulations on the UNFCCC could assist the CNS with establishing a uniform reporting standard. If the states agree that the usage of nuclear technologies belongs to domestic mitigation measures under the UNFCCC, the countries are then required by the UNFCCC to submit national communication reports and shall disclose the related nuclear security information on installation, operation and treatments. The UNFCCC is a well organized subsidiary body of reviewing nuclear security reports. The usage of the MRV principles under UNFCCC is an alternative and external pressure to assist the countries using nuclear energy in protecting individuals, society and environments from the threats of nuclear accidents and radioactive hazards. The UNFCCC also has many more Members than CNS to extend its influences on nuclear security cooperation and implementation obligations. In fact, the CNS has already established its own reporting and verification obligations on the Contracting Parties. Although the IAEA provides the voluntary safety standards and fundamental

25) *Id.*, Article 1, para. 1, subpara. (ii).

26) *Id.*, Article 14. “ Each Contracting Party shall take the appropriate steps to ensure that: (i) comprehensive and systematic safety assessments are carried out before the construction and commissioning of a nuclear installation and throughout its life. Such assessments shall be well documented, subsequently updated in the light of operating experience and significant new safety information, and reviewed under the authority of the regulatory body; (ii) verification by analysis, surveillance, testing and inspection is carried out to ensure that the physical state and the operation of a nuclear installation continue to be in accordance with its design, applicable national safety requirements, and operational limits and conditions.”

safety principles for nuclear installations and radiological treatments, they could also reach the CNS obligations if the Contracting Member States would like to adopt these voluntary safety standards. The UNFCCC Parties are required to comply with the MRV regulations when implementing their obligations.

These reporting obligations will greatly contribute to information sharing between CNS Members and Parties of UNFCCC. For those countries trying to introduce nuclear energy into CDM, information sharing and reporting on nuclear safety measures show the obligation that is necessary to develop national communications and compliance to UNFCCC. Before the COP adopts nuclear energy under the CDM, the reporting standards could also enhance the implementation of nuclear safety standards by IAEA members. The MRV requirements could also enhance the corporation between international organizations and agencies, and bring the different standards or requirements together to achieve a consensus on making nuclear safety standards.

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