MDEP
Multinational Design Evaluation Programme

MULTINATIONAL DESIGN EVALUATION PROGRAMME

Annual Report

Covering Activities from July 2024 to June 2025

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Foreword from the Management Board Chair

It is a distinct honour and privilege to have served as Chair of the Management Board of the Multinational Design Evaluation Programme (MDEP) for more than three years, since 2022. During this period, the Programme has undergone an important reform that laid the foundation for strengthening its role as a unique platform for co-operation among nuclear regulatory authorities worldwide.

Since its reform in 2022, a series of comprehensive measures have been introduced with the aim of improving overall effectiveness, enhancing transparency and ensuring that MDEP remains responsive to both emerging challenges and the rapid evolution of modern technologies. These steps were designed not only to refine the Programme's working methods, but also to establish a more robust and forward-looking framework that can support the safe and sustainable development of nuclear power globally.

The progress achieved would not have been possible without the active engagement and constructive support of the member countries, as well as the dedicated efforts of the MDEP Secretariat. Through their commitment, co-ordinated actions have been taken that strengthened the exchange of experience, expanded opportunities for mutual learning and deepened co-operation among all participants. This collective effort has significantly contributed to reinforcing the culture of safety and building trust between regulators, industry and the broader international community.

I would like to highlight a number of key milestones achieved during 2024 and 2025. While fully recognising the significance of all working groups within MDEP, it is important to note that particular attention during this period was devoted to two strategic areas of development: the establishment of a working group on high-temperature gas-cooled reactors, and the launch of a working group on small, medium and modular reactor technologies.

The preparatory work for these initiatives, which began at the end of 2023 and continued throughout 2024, was comprehensive and inclusive. It culminated in an international workshop that gathered distinguished experts from leading international organisations, including the International Atomic Energy Agency (IAEA), the Generation IV International Forum (GIF), and the World Nuclear Association (WNA), as well as representatives from countries already preparing to commission their first reactor units or actively planning future projects.

This broad participation not only underlines the global interest in innovative nuclear technologies but also demonstrates the unique role of MDEP as a platform that unites regulators, industry, and international partners in advancing safety, fostering co-operation and ensuring that emerging technologies are developed and deployed in a manner consistent with the highest international standards.

Following a thorough and lengthy preparatory process, and in line with the decision of the Management Board, guided both by the priorities of regulatory authorities and the needs of the nuclear industry, two new working groups were formally launched at the end of 2024. This achievement represents a significant milestone, as these groups are tasked with developing and consolidating approaches aimed at enhancing the safe utilisation of new reactor types.

The timely establishment of these working groups, in direct response to the emergence and deployment of innovative technologies, underscores both the continued relevance and the strategic importance of MDEP's mission. By proactively addressing these developments, MDEP reaffirms its role as a forward-looking platform that ensures safety remains at the heart of technological progress in the nuclear field.

In this context, it is important to highlight the progress already being achieved within these newly established groups. With regard to the Working Group on Light-Water Small, Medium and Modular Reactors (LW-SMMR/LBWG), its first meeting was held on 25-27 November 2024. During this meeting, representatives from Argentina, the People's Republic of China (China), Russia and Türkiye came together, established initial working relationships, defined the key objectives of the group, and presented information on their

respective technologies, regulatory approaches and national experiences. The discussions also allowed participants to identify priority issues requiring further in-depth examination.

Over the subsequent six months, the working group engaged in intensive preparatory work, collecting the necessary data, consolidating best practices and identifying new challenges that call for joint attention within the framework of its activities. This preparatory stage culminated in the second meeting of the LW-SMMR/LB WG, held on 27-29 May 2025. The event was marked by a constructive and fruitful exchange of views on a broad range of topics, including probabilistic safety assessment, the application of the Vienna Declaration, mechanistic source term, risk-informed approaches and spent nuclear fuel management. These fundamental issues were acknowledged as central themes to be addressed in the working group's future activities and will serve as a foundation for its continued work.

Turning now to the Working Group on High Temperature Gas-Cooled Reactors (HTGR WG), its first meeting was convened on 18-20 November 2024. Much like the LW-SMMR/LB WG, this meeting brought together representatives from Argentina, China, Russia and South Africa who established working contacts, outlined the principal objectives of the group, and exchanged perspectives on regulatory approaches and national priorities.

A particularly valuable aspect of the discussions was the sharing of practical experience and design information. China presented details of its operating HTGR technology, while Russia and South Africa provided insights into their respective design projects. Special attention was devoted to issues of fuel types and associated safety considerations, as well as to material selection in the context of safety-grade classification for structures, systems and components. The participants also initiated discussions on the development of potential international benchmarks.

The following meeting of the HTGR WG was scheduled for September 2025, during which the results of the analytical and preparatory work was presented and exchanged, which was carried out over the course of more than half a year.

This continuity of effort reflects the commitment of the group to building a solid foundation for advancing safety and harmonisation in the field of high temperature gas-cooled reactor technologies.

I am confident that the activities of these two newly established working groups will yield tangible and positive results, making a valuable contribution to the overall framework of nuclear safety. Furthermore, I am hopeful that their work will attract new members interested in innovative technologies, thereby expanding the reach and impact of MDEP.

In addition, it is important to acknowledge that the work of the other established groups continues to advance. In April 2025, the third VVER Working Group Workshop was held in Budapest, bringing together representatives from all countries engaged in the development and operation of VVER reactor technologies. This event proved to be of particular significance, as this reactor type is not only widely deployed across the globe, but also features prominently in future nuclear development plans. Against this background, the comprehensive understanding and continuous improvement of safety throughout the design, construction and operation of nuclear power plants with VVER technology remain both necessary and of the utmost importance.

MDEP, as an international and responsible programme, continues to maintain close interaction with other key global initiatives, including the IAEA's Nuclear Harmonization and Standardization Initiative (NHSI) and the activities of the WNA in the field of harmonisation. Such engagement is an integral component of MDEP's work, ensuring alignment with broader international efforts, avoiding duplication and reinforcing the collective commitment to advancing nuclear safety and regulatory coherence worldwide.

The activities undertaken within the newly established working groups, focused on the latest technologies in the field of nuclear energy, together with the strong interest demonstrated by a wide range of countries, clearly confirm the relevance and importance of the work carried out under the framework of MDEP.

In the face of current global challenges, difficulties and uncertainties, it is particularly vital to facilitate the exchange of information among all stakeholders and to actively promote the Programme's outcomes, key achievements and major initiatives in the area of nuclear safety.

I consider it a great privilege to contribute to this important and meaningful endeavour, which is dedicated to strengthening and advancing the highest levels of international nuclear safety for the benefit of present and future generations.

Alexey Ferapontov
MDEP Management Board Chair

Table of contents

Executive summary 7

1. Introduction 9

2. Programme goals and outcomes 11
2.1. Programme goals 11
2.2. Programme outcomes during the reporting period 11

3. Programme implementation 13
3.1. Membership 13
3.2. Organisational structure 13
3.3. MDEP Library 13
3.4. Common Positions 14

4. Interactions with other organisations 15
4.1. CNRA 15
4.2. CSNI 15
4.3. IAEA 15
4.4. GIF 16
4.5. Industry 16
4.6. World Nuclear Association 16

5. Current activities 17
5.1. VVER Working Group (VVERWG) 17
5.2. HPR1000 Working Group (HPR1000WG) 19
5.3. HTGR Working Group 19
5.4. LW-SMMR/LB Working Group 19

6. Interim results 21

7. Next steps – Future of the Programme 23

Appendix 1. List of abbreviations and acronyms 25

Appendix 2. Revised or new documents and publications 27

Executive summary

The Multinational Design Evaluation Programme (MDEP) is a multinational initiative whose purpose is to leverage the resources and knowledge of national regulatory authorities that are currently, or will shortly be, undertaking the review of new reactor designs. Current MDEP members are the regulatory authorities of Argentina (ARN), the People's Republic of China (NNSA), Hungary (HAEA), the Russian Federation (Rostechnadzor), South Africa (NNR) and Türkiye (NDK). The Nuclear Energy Agency (NEA) performs the Technical Secretariat function in support of MDEP. The International Atomic Energy Agency (IAEA) also takes part in the work of MDEP. This programme incorporates a broad range of co-operative activities including exchanging regulatory experiences and concerns, increasing multinational convergence of safety goals, safety standards, guides and continuously improving regulatory frameworks and approaches. A key concept throughout the work of MDEP is that national regulators retain sovereign authority for all licensing and regulatory decisions.

This report includes all MDEP activities from July 2024 to June 2025. In addition, the report presents MDEP's organisation, goals, history, working groups, initiatives, results and future perspectives. Appendices 1 and 2, finally, offer a list of abbreviations and acronyms as well as a list of new and revised publications.

Substantial progress has been made on the overall MDEP goals of increased co-operation and enhanced convergence of regulatory requirements and practices. In addition, the topic of lessons learnt from the Fukushima Daiichi accident has been incorporated into MDEP activities in all Design Specific Working Group (DSWG) programme plans, and the relevant issues have been appropriately addressed by all designs under MDEP. Accomplishments to date provide confidence that the MDEP membership, structure and processes offer an effective and efficient method for accomplishing co-operation in regulatory reviews for new reactor designs. At the level of the working groups, the key accomplishments for the July 2024 to June 2025 period are the following:

- The VVER Working Group (VVERWG) updated its workplan for 2024-2025, which was approved by the Management Board (MB). The third VVERWG workshop with industry was held in Budapest on 8-9 April 2025 with the participation of around 100 experts from regulators, industry, vendors and international organisations. VVERWG also started preparation of initiating a new TESG on Risk-Informed Regulatory Activities (RIRA), drafted a workplan which will be submitted to MB for review and approval at 9th MB meeting in September 2025.
- The HPR1000 Working Group (HPR1000WG) is planning to hold its workshop with industry in 2025-2026 and reviewing the progress made since its establishment in order to explore possible directions for future collaboration.
- The Working Group on High Temperature Gas-Cooled Reactors (HTGR WG) held its kick-off meeting on 21-22 November 2024 following the brainstorming workshop held on 18-20 March 2024 and started to regularly hold meetings at which GIF also participate to exchange information. Moreover, HTGRWG published the proceedings of the brainstorming workshop.
- The Land-Based Light-Water Small Medium and Modular Reactors (LW-SMMR/LB WG) initiated its work after the kick-off meeting held on 25-27 November 2024 and started regularly gathering to discuss cross-cutting issues in safety assessment of LW-SMMRs. On 9 September 2024, the LW-SMMR/LB also published its workplan for 2024-2025, which specifies the group's goals, objectives and planning. Furthermore, the group started working on drafting technical reports on source term and PSA acceptability criteria for LW-SMMR.

At the inter-organisational level, MDEP interacts and works closely with national nuclear regulators on exchanging up to date regulatory experiences and practices, with the NEA Committee on Nuclear Regulatory Activities (CNRA), with the IAEA, with the World Nuclear Association (WNA) via its Working Group on Co-operation in Reactor Design Evaluation and Licensing (CORDEL) and with various industry groups through a number of initiatives such as Working Group Industry Workshops and new working groups.

1. Introduction

MDEP is a multinational initiative through which national nuclear regulatory authorities co-operate to leverage their collective resources and knowledge in a review of new reactor power plant designs. A core principle of the programme is that such co-operation supports better informed regulatory decision making, while each regulator retains sovereign authority for licensing and regulatory decisions.

MDEP delivers its work primarily through working groups that implement their programme plans with specific activities and goals, and the working groups have established the necessary interfaces both within and outside MDEP members. Accomplishments to date provide confidence that the MDEP membership, structure and processes provide an effective and efficient method of accomplishing increased co-operation in regulatory design reviews for new reactor designs.

Launched in 2006, MDEP has been extended multiple times due to its effectiveness. Following the conclusion of three design programmes in 2021 (EPR, AP1000, APR1400) and the transfer of the Vendor Inspection Co-operation Working Group (VICWG) to the NEA Committee on Nuclear Regulatory Activities, a new governance structure was implemented in 2022. In this context, MDEP work has continued on active designs (VVER, HPR1000), and from 2024 has launched two new working groups dedicated to innovative nuclear technologies: on Light-Water Small and Medium Modular Reactors/Land-Based (LW-SMMR/LB) and on High Temperature Gas-Cooled Reactor (HTGR).

This annual report covers all MDEP activities from July 2024 to June 2025. In addition, the report presents MDEP's organisation, goals, history, working groups, initiatives, results and future perspectives. Appendices 1 and 2, provide (i) a list of abbreviations and acronyms; and (ii) a list of new and revised publications.

2. Programme goals and outcomes

2.1. Programme goals

Building on the governance principles set out in Section 1, the main objectives of the MDEP effort are to enable increased co-operation of national safety authorities within existing regulatory frameworks and develop mutually agreed practices that enhance the safety of new reactor designs. The enhanced cooperation among national nuclear regulators aims to improve the effectiveness and efficiency of the regulatory design reviews undertaken as part of each country's licensing process, while supporting the sharing of up-to-date regulatory approaches and, where appropriate, harmonising regulatory requirements. The work draws on and contributes to the broader international safety framework that include IAEA safety standards.

2.2. Programme outcomes during the reporting period

During the reporting period MDEP advanced its objectives of enabling increased co-operation through the sustained technical engagement in its working groups.

MDEP continues to provide a forum for regulatory bodies to co-operate on design evaluations and inspections. This co-operation supported the timely exchange on technical questions and the sharing of experience among participating authorities, thereby helping to strengthen the safety focus of design reviews and to share lessons learnt relevant to national decision making.

Beyond the existing working groups, MDEP facilitated peer-to-peer connections among regulators to enable the rapid exchange of information and informal discussions on key issues. For example, the DSWG members have benefitted significantly from the questions shared among the regulators, leading to more informed and harmonised regulatory decisions. MDEP interactions have supported the confirmation of prior findings, enhanced the safety focus of design reviews, identified previously unnoticed safety issues, and broadened the scope of the review.

MDEP has made improvements in communicating information regarding the members' regulatory practices through the development of an MDEP Library which serves as a central repository for all documents associated to the programme. Moreover, ongoing interactions with stakeholders through MDEP have built links with regulators, industry, Standard Development Organisations (SDOs) and other international organisations which have been beneficial in reviewing different reactor designs.

3. Programme implementation

3.1. Membership

In order to enhance the effectiveness and efficiency of this programme and to guarantee the targeted and actionable outcomes, the participation in the MDEP is intended for national safety authorities of interested countries that already have commitments for new build or firm plans to have commitments in the near future for new reactor designs. MDEP's current members are: Argentina, China, Hungary, Russia, South Africa and Türkiye. The IAEA also takes part in the work of MDEP.

3.2. Organisational structure

Since 2022 a new governance structure for MDEP has been implemented. This structure involves the formation of an MDEP Management Board (MB), as a main governance body, with the NEA assuming the role of its Technical Secretariat. During the period from July 2024 till June 2025, the Management Board held its 7th and 8th meetings: on 20 September 2024 and on 2 December 2024, respectively.

At its 7th meeting, the MB approved the work programme of the LW-SMMR/LB Working Group. At the 8th meeting in December 2024, the Board reviewed the outcomes of the kick-off meetings of the HTGR and LW-SMMR/LB Working Groups and endorsed the plans for the VVERWG industry workshop, which was held in April 2025.

Figure 3.1 illustrates how the programme is currently organised.

3.3. MDEP Library

In part, MDEP information is communicated among the members through the MDEP Library which serves as a central repository for all documents associated with the programme. The NEA provides the technical support for development and maintenance of the MDEP Library on a password-protected website. The website provides two levels of access which are: 1) general access open to every member, and 2) restricted area access for each MDEP working groups' member regulators participating in that specific group. Publicly available documents related to MDEP are available on the MDEP page of the NEA website (www.oecd-nea.org/mdep). As a general rule, information exchanged as part of the MDEP in meetings and the MDEP Library is for the sole use of the participating national regulatory authorities. The members of the working groups also follow the communications protocol to share new information related to new reactors with other members prior to its public release. A large portion of the information shared may not be proprietary or sensitive; however, all participating members must protect and properly handle the information which an originator considers to be proprietary or sensitive.

MDEP WGs have documented their work and results. All these materials are archived in the MDEP Library for future use.

This electronic library is restricted to the national regulatory agencies of the member countries that have been or currently are participating in MDEP. The library is managed by the NEA Secretariat. According to the MDEP Terms of Reference, permission to access the information should be sought through the NEA Secretariat, which handles requests according to an agreed protocol.

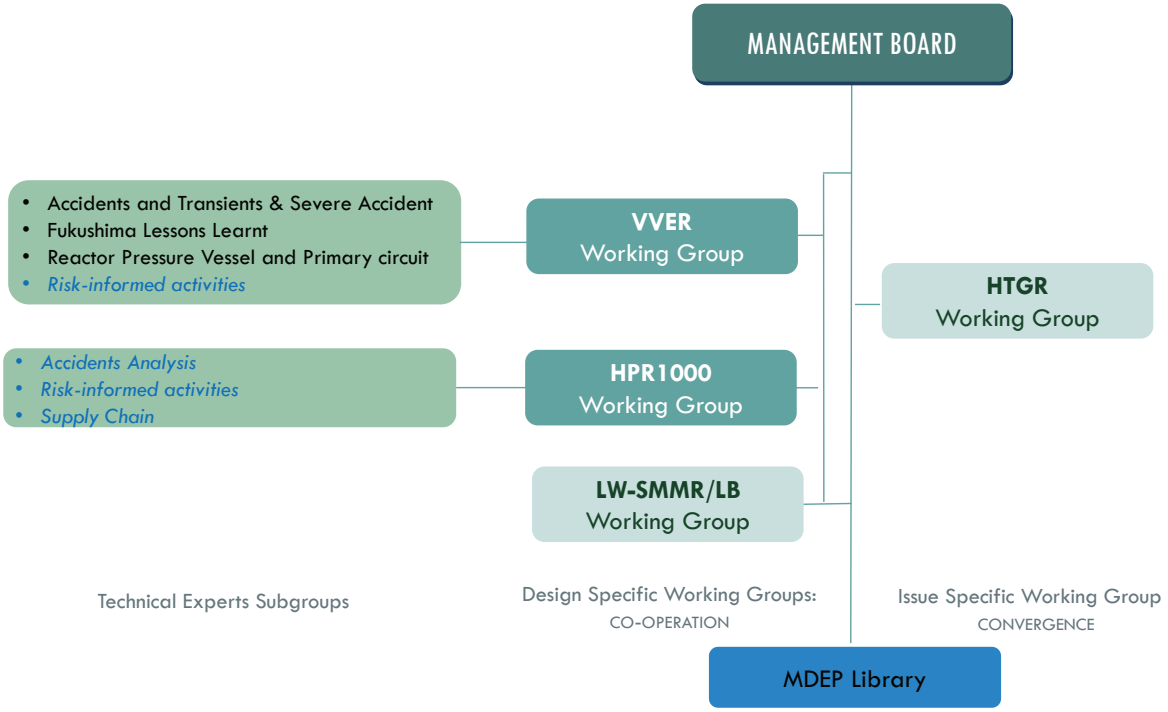
On 14 December 2021, the MDEP Policy Group (PG) agreed that the NEA would manage access to the MDEP Library by non-MDEP countries. For access requests to non-proprietary information held in the library, it was agreed that the NEA Secretariat could use its discretion. For access requests to proprietary information received from non-MDEP countries, the NEA Secretariat must either request permission from the originating country to allow access or direct the requestor to the originating country. In all instances, the NEA Secretariat will advise the CNRA of requests from non-MDEP members for access to the library and the subsequent provision of information. This will ensure that a much wider group of national regulators will benefit from MDEP. The MDEP Library will continue to be a central repository for MDEP.

3.4. Common Positions

MDEP has developed a process for identifying and documenting Common Positions (CPs) on specific issues among member regulators, based on existing international nuclear safety requirements and standards, national regulatory guidance, international best practices, and inputs from group members. Design Specific CPs document common conclusions that each of the working group members have reached during design reviews. Discussions among the members and sharing of information in these areas help to strengthen the individual conclusions reached.

Generic CPs apply generically to the new type of reactor rather than only to one specific design. Generic CPs document regulatory practices and positions that each of the working group members find acceptable. The CPs are intended to provide guidance to the regulators in reviewing new or unique areas, and will be shared with the IAEA, and other standards organisations, to be considered in standards development programmes. After a CP is agreed within a working group, it is presented to the MB for endorsement. Upon endorsement by the MB, the proposed CPs are made publicly available on the NEA MDEP website in order to keep external stakeholders informed of the work completed within MDEP and the up-to-date knowledge gained for the licensing of new types of reactors. Those CPs will become commendable practices, recommended by the MDEP. There is no obligation on the part of any regulatory body to follow them. A key concept throughout the work of MDEP is that national regulators retain sovereign authority for all licensing and regulatory decisions. If a regulatory body chooses to formally adopt a CP, it will be through that country's regular processes.

Figure 3.1: **MDEP organisational structure as of June 2025**



4. Interactions with other organisations

MDEP strives to maintain an awareness of, and interacts with, other organisations that are implementing programmes to facilitate international co-operation on new reactors. Interactions focus on ensuring that MDEP does not duplicate efforts and benefits from the outputs of these organisations.

A key outcome of MDEP's co-operation with external organisations was the MDEP Conference and workshops. To date, MDEP has organised five conferences, providing a forum for stakeholders, including industry representatives, SDOs and other international organisations to share the results of their engagement with the programme and to deliver presentations on ongoing activities related to new reactor licensing. During the reporting period, MDEP also organised working group meetings with external participation. On 21-22 November 2024, the HTGR Working Group held its kick-off meeting, with contributions from the IAEA and GIF. On 8-9 April 2025, the NEA, with the support of the Hungarian Atomic Energy Agency (HAEA), convened the third VVERWG Workshop with Industry in Budapest. The event gathered around 100 participants who shared insights and experiences related to VVER-1200 technology and design.

4.1. CNRA

In 2023 the Committee on Nuclear Regulatory Activities (CNRA) also launched a new Framework and is currently reviewing the activities of the newly established working groups. It is expected that the CNRA Working Group on Policy and Licensing (WGPL) will be a focal point of interactions between MDEP and the CNRA and its working groups and will assist in co-ordinating communications and requests between the two activities to ensure that the MDEP's efforts take full advantage of the work already being done by the CNRA. The WGPL is focusing on issues related to policy and licensing for operating nuclear reactors and for proposed new reactors (including those under construction) in NEA member and partner countries. To avoid overlap of activities between the groups, WGPL focuses on general procedures and guidance, while MDEP focuses on design specific issues.

4.2. CSNI

In 2023, the Committee on the Safety of Nuclear Installations (CSNI) Expert Group on Small Modular Reactors (EG SMR) published a technical opinion paper titled "Research Recommendations to Support the Safe Deployment of Small Modular Reactors". This document served as a key resource for the MB in developing the programmes for two brainstorming workshops focused on HTGR technology and LW-SMMR, aimed at identifying priorities for future activities of the two new working groups. Beginning in March 2024, a regular information exchange was established between MDEP and EG SMR to co-ordinate ongoing and planned activities related to SMRs, ensuring alignment and optimising resource use.

4.3. IAEA

The IAEA takes part in the work of MDEP through participation in the MB, HTGR WG and in any possible future issue specific working group meetings. In addition, the generic CPs developed in MDEP are shared with the IAEA for consideration in the IAEA standards development programme.

4.4. GIF

From 2024, initial communication was established with the Generation IV International Forum (GIF), in particular with its Risk and Safety Working Group (RSWG). RSWG members took part in both brainstorming workshops as Chairs, speakers and observers, and shared their experience and views in development of safety criteria and guidance for the advanced and innovative technologies. After the HTGR Working Group launched at the kick-off meeting in November 2024, to which GIF participated, there has been a regular information exchange between the RSWG and HTGR WG.

4.5. Industry

The MDEP working groups are very interested in understanding the perspectives of the design vendors, codes and standards organisations, component manufacturers as well as the challenges they face in dealing with numerous regulators and regulatory systems. The MDEP working groups interact with industry groups and invite them to participate in selective portions of meetings and other activities. For example:

- The VVER Working Group continues to engage actively with the Russian nuclear industry, inviting representatives from Rosatom, Rosenergoatom, and design organisations such as Atomenergoproekt, Atomproekt, and Gidropress to participate in its meetings and subgroups. This co-operation provides valuable insights into safety-significant design solutions. On 8-9 April 2025, the VVERWG held its third workshop with industry, which focused on: the evolution of VVER-1200 designs and long-term passive heat removal systems for DEC conditions; passive heat removal systems of V-491 and V-509 designs; and design differences with comparison to reference design and to Main Coolant Pump. The workshop also benefitted from the active participation of industry representatives from other member countries, fostering a broad exchange of perspectives.
- The HPR1000 Working Group meets with Hualong Nuclear Power Technology Co., Ltd and the HPR1000 licensees in China. The HPR1000WG also considers organisation of the first workshop with industry in 2025-2026.

4.6. World Nuclear Association

The WNA's CORDEL acts as the industry counterpart to MDEP. Since both MDEP and CORDEL have expressed interest in and have established a goal of furthering harmonisation of reactor designs, regulatory practices, and industry and international standards, the MDEP MB has agreed that co-ordination of efforts with CORDEL is appropriate in some cases, e.g. on innovative technologies. While co-ordinating efforts in areas of mutual interest, MDEP members will always retain their individual and independent regulatory roles and positions. CORDEL was participating in meetings of the MDEP VICWG. And the MDEP Technical Secretariat provided updated information on MDEP activities during the CORDEL regional workshop in 2022.

While MDEP is a regulatory forum and CORDEL is an industry organisation, both parties agree they can benefit from communication and cooperation where the organisations share common goals. Both MDEP and CORDEL maintain strong interests in the harmonisation of new reactor designs and design reviews, regulatory safety standards and practices, and related industry and IAEA standards. MDEP values continued interaction to assist in achieving these goals while each organisation functions in a manner consistent with its appropriate roles and responsibilities.

5. Current activities

The activities of MDEP have been implemented through design specific and issue specific working groups. The members of the design specific working groups share information and co-operate on specific reactor design evaluations and construction oversight, while the members of the issue specific working group scrutinise technical and regulatory process areas within the programme of work. Each working group has a lead and co-lead regulator designated as chair and vice chair, and has developed a programme plan, which identifies specific activities, schedules and contacts.

The working groups leverage national regulatory resources by sharing information and experience on the regulatory safety design reviews with the purposes of enhancing the safety of the design and enabling regulators to make timely licensing decisions. The working groups achieve this goal through:

- Exchanging experiences and lessons learnt on licensing process implementation, design reviews, and design-related construction and commissioning activities.
- Working to understand the differences in regulatory safety review approaches in each country to support potential adoption of other regulators safety design evaluations, where appropriate.
- Identifying and understanding key design differences including those originating from regulatory requirements and then documenting the reasons for differences in regulatory requirements.
- Documenting common MDEP positions on aspects of a safety review.
- Documenting the group's activities in Technical Reports to ensure knowledge transfer.
- Communicating and co-ordinating communications on MDEP views and CPs to vendors and operators regarding the basis of safety evaluations and standardisation.

Design-specific working groups typically focus on issues that present particular challenges for their members, unique to each design. However, certain topics are addressed across multiple working groups. Notably, the lessons learnt from the Fukushima Daiichi accident and hydrogen management are such topics. The MB also decided that compliance with the first principle of the Vienna Declaration should be a required outcome for each working group dedicated to a specific design or technology.

5.1. VVER Working Group (VVERWG)

The VVER Working Group comprises regulatory authorities from China, Hungary, Russia, and Türkiye. The members of the working group are reviewing plants at various stages of design and construction. In Russia, Leningrad-II Nuclear Power Plant unit 1 is operational, while unit 2 received its operational licence and reached minimum controlled power levels at the end of August 2020, subsequently entering commercial operation on 23 October 2020. Units 3 and 4 obtained construction licences in 2024 and the first concrete day for unit 4 was on 15 March 2025. Novovoronezh-II Nuclear Power Plant unit 1 is operational, and unit 2 entered commercial operation at the end of October 2019. Kursk-II Nuclear Power Plant unit 1 is undergoing commissioning licensing, and unit 2 is currently under construction. Siting licenses for Smolensk-II Nuclear Power Plant units 1 and 2 have been issued. In Türkiye, at Akkuyu Nuclear Power Plant units 1, 2, 3, and 4 are under construction. In China, four VVER-1000 units are operational at Tianwan Nuclear Power Plant with VVER-1200 unit 7 under construction. The first concrete date for VVER-1200 unit 8 was the 25 February 2022. Additionally, two VVER-1200 units at Xudapu Nuclear Power Plant are under construction, with first concrete dates of 28 July 2021 and 19 May 2022, respectively. In Hungary, a VVER-1200 unit 5 is under construction at Paks Nuclear Power Plant, and the Construction License Application for unit 6 is under review.

Accomplishments and plan of work

The VVER Working Group (VVERWG) currently includes three Technical Expert Subgroups (TESGs) addressing specific technical issues: the Fukushima Accident Lessons Learned (FUKU TESG), Reactor Pressure Vessel and Primary Circuit Components (RPV&PC TESG), and the joint TESG on Severe Accidents and Accidents & Transients (SA&TA TESG). These groups meet regularly to exchange information and share experiences related to regulatory activities, approaches, and legal frameworks concerning new designs in their respective countries.

The joint TESG on SA&TA shared safety review findings, provided consolidated comments, and drafted two technical reports: on lessons learnt from review of preliminary safety analysis report; and on long-term heat removal from the containment under severe accident conditions. The reports were preliminary approved by MB at its 8th meeting. Additional topics were investigated, i.e. approaches to accident management. The group has also outlined questions for the VVERWG's workshop with industry, covering details on technical measures related to long-term heat removal, startup performance tests and design changes compared to the reference plant. For future work, the TESG is considering an investigation into source term evaluation.

The TESG on Reactor Pressure Vessel and Primary Circuit Components (RPV&PC) has been working on a technical report covering topics such as the evaluation of surveillance programmes for RPV integrity, the qualification of a first-of-a-kind (FOAK) component, and the qualification of non-destructive testing (NDT), welding personnel, and special processes.

The TESG on Fukushima Lessons Learned (FUKU TESG) is finalising a CP on the Vienna Declaration.

Figure 5.1: **Paks-II Nuclear Power Plant 3D model**

Source: JSC Atomenergoproekt.

Additionally, the group has initiated preparations for a potential new TESG on Risk-Informed Regulatory Activities (RIRA) and drafted the workplan which will be submitted to the MB for review and approval at its 9th meeting in September 2025.

5.2. HPR1000 Working Group (HPR1000WG)

The MDEP HPR1000 Working Group (HPR1000WG) was approved by the MDEP Policy Group in September 2017. The group is focused on safety design reviews of Hualong Nuclear Power Technology Co., Ltd. HPR1000 design. The HPR1000WG includes the regulatory authorities of Argentina (ARN), the People's Republic of China (NNSA) and South Africa (NNR). The United Kingdom (ONR) left the Working Group towards the end of 2022.

Five HPR1000 units are currently (June 2025) operational – Fuqing units 5 and 6; Fangchenggang units 3 and 4; and Zhangzhou unit 1. Seventeen HPR1000 units are under construction – Zhangzhou units 2, 3 and 4; Taipingling units 1, 2, 3 and 4; Sanao units 1 and 2; Changjiang units 3 and 4; Lufeng units 5 and 6; Ningde units 5 and 6; and Shidaowan expansion units 1 and 2. Sixteen more HPR1000 units remain in a status "approved by the State Council" – Jinqimen units 1 and 2; Xuwei units 1 and 2; Sanmen units 5 and 6; Saoao units 3 and 4; Zhaoyuan units 1 and 2; Fangchenggang units 5 and 6; Taishan units 3 and 4; and Huaneng Xiapu units 1 and 2.

Accomplishments and plan of work

During this reporting period, the HPR1000WG members have continued to share information and experience on regulatory issues and the status of HPR1000 projects in their respective countries. With China advancing into the construction phase and other members actively contributing to the group's activities, the MB invited the working group to review its achievements to date and explore potential directions for its future activities at its September 2024 meeting.

5.3. HTGR Working Group

To launch the new Working Group on high temperature gas-cooled reactor (HTGR), MDEP organised a virtual brainstorm workshop on 18-20 March 2024; around 300 registered participants from 29 countries and two international organisations participated in the workshop. Following the workshop, a HTGR Working Group programme plan was drafted and approved by the MB at its 6th meeting on 9 June 2024 in Ankara, Türkiye.

The first HTGR WG meeting was held on 21-22 November 2024 with the participation of regulatory bodies, TSOs, IAEA, GIF, researchers and nuclear power plant designers. The meeting underlined three areas, namely, compliance with the first principle of Vienna Declaration, fuel qualification and material selection and committed to leverage existing expertise and collaboration in these areas. The second meeting was held online on 4-5 September 2025.

5.4. LW-SMMR/LB Working Group

To initiate the new Working Group on Light-Water Small and Medium Modular Reactors/Land-Based (LW-SMMR/LB), MDEP organised a hybrid brainstorming workshop on 10-11 June 2024 in Ankara, Türkiye, with approximately 40 participants attending in person and 40 joining online. Attendees included representatives from national nuclear regulators, technical support organisations (TSOs), LW-SMMR/LB designers, and research institutes from 23 countries.

Following the brainstorming workshop, a workplan was developed to establish a new working group on LW-SMMR/LB and the WG started to regularly meet to exchange information. The first LW-SMMR/LB WG meeting was held on 25-27 November 2024 in Paris. During the meeting, the following topics were addressed: the application of the first principle of the Vienna Declaration, SMMR regulatory frameworks,

source-term considerations, new materials for LW-SMMRs, safety-assessment approaches and spent fuel management strategies, PSA acceptability criteria and methodologies, and risk-informed approaches to regulation and safety.

The second LW-SMMR/LB WG meeting was held on 27-29 May 2025 in Ankara, Türkiye with the participation of regulatory bodies, TSOs, designers and researchers. The participants discussed creation of a joint task group with the HTGR WG Vienna Declaration, specific LW-SMMR/LB safety considerations, new materials for LW-SMMR, safety assessment approaches, and spent fuel management strategies and organising a workshop on Risk-informed Approach. The LW-SMMR/LB WG started drafting two technical reports on Source Term and on PSA Acceptability Criteria for LW-SMMR.

Figure 5.2: **Nuclear Power Plant with RITM-200**

Source: JSC Atomenergoproekt.

6. Interim results

MDEP is considered a long-term programme with interim results. Interim results are those products that document agreement by the MDEP members and are necessary steps in working towards increased co-operation and convergence. The interim results for this reporting period include:

- The completion by LW-SMMR/LB of a programme plan and provisionally approved by the 8th MDEP MB in September 2024.
- The publication of the Proceedings of the HTGR WG workshop held on 18-20 March 2024. (see proceedings available at www.oecd-nea.org/mdep/documents/ProceedingsHTGRWS_FINAL.pdf
- The third VVERWG with industry held in a hybrid format in Budapest, Hungary on 8-9 April 2025.
- The completion by VVERWG, and provisionally approved by the 9th MDEP MB in December 2024, of the following documents:
  - Technical Report on lessons learnt from review of Preliminary Safety Analysis Report (PSAR)
  - Technical report on long-term heat removal from the containment under severe accident conditions
- The facilitation of the third VVERWG workshop with industry on 8-9 April 2025 in Budapest, Hungary.

3rd VVERWG's workshop,
8-9 April 2025, Budapest, Hungary.

7. Next steps – Future of the Programme

The Multinational Design Evaluation Programme (MDEP), established in 2006 for a five-year period, has undergone two extensions due to the value it provided to its members. In 2019, the Policy Group decided to transition MDEP's structure by 2022, as certain working groups (EPRWG, AP1000WG, and APR1400WG) were nearing completion of their planned activities. The VVER and HPR1000 working groups remain active, continuing under the governance of the MDEP MB.

Since 2022, the VVER and HPR1000 working groups have maintained collaboration under a streamlined MDEP framework, co-ordinated by the NEA as the Technical Secretariat. The 5th MDEP Conference, held in April 2023, reviewed the Programme's achievements and assessed new areas for cooperation, especially in emerging technologies. The conference emphasised enhancing early integration of regulators' feedback into design processes, fostering closer industry-regulator collaboration and promoting MDEP as a platform for new designs.

In 2024, two brainstorming workshops were held on new designs to explore opportunities for MDEP to bring industry and regulators together to discuss innovative designs. Following these discussions, two new working groups were developed, namely, the High Temperature Gas-cooled Reactor Working Group (HTGR WG) and the Light-Water Small and Medium Modular Reactor Working Group/Land-Based (LW-SMMR/LBWG). Both groups proved to be suitable platforms for bringing different stakeholders together as IAEA, GIF, designers and regulators participated in these meetings for this period of reporting. Both HTGR WG and LW-SMMR/LB WG are holding regular meetings with participation of industry and other stakeholders.

MDEP remains open to new members, particularly countries embarking on nuclear power programmes, constructing or planning agreements for MDEP-design reactors, or exploring advanced technologies such as LW-SMMRs and HTGRs. Expanding membership will benefit both current and new participants, fostering broader regulatory collaboration. The primary criteria for joining MDEP include a commitment to share expertise and contribute the annual fee. To facilitate this, the MB has reviewed and refined the accession process, which can be initiated either through the Technical Secretariat or an existing member country.

Furthering its scope, MDEP is also exploring the creation of an International Safety Assessment School, with discussions underway regarding collaboration with various universities. These initiatives reflect MDEP's ongoing efforts to evolve, ensuring its relevance in supporting regulatory co-operation for new reactor designs and technologies.

Appendix 1. **List of abbreviations and acronyms**

CNRA	Committee on Nuclear Regulatory Activities (NEA)
CORDEL	Co-Operation in Reactor Design Evaluation and Licensing
CP	Common Position
DSWG	Design Specific Working Group
EPRWG	EPR Working Group
FANR	Federal Authority for Nuclear Regulation (United Arab Emirates)
FOAK	First-of-a-kind
GDA	Generic design assessment
HTGR	High temperature gas-cooled reactor
I&C	Instrumentation and controls
IAEA	International Atomic Energy Agency
LOCA	Loss-of-coolant accident
MDEP	Multinational Design Evaluation Programme
NDK	Nuclear Regulatory Authority (Türkiye)
NEA	Nuclear Energy Agency
NNSA	National Nuclear Safety Administration (China)
ONR	Office for Nuclear Regulation (United Kingdom)
PC	Primary circuit components
PG	Policy Group
PSA	Probabilistic safety assessment
RPV	Reactor pressure vessel
SDO	Standard development organisation
SMMR	Small medium and modular reactor
TESG	Technical Experts Subgroup
TR	Technical Report
UAE	United Arab Emirates
VICWG	Vendor Inspection Co-operation Working Group
VVER	Water-water energetic reactor
VVERWG	VVER Working Group
WNA	World Nuclear Association

Appendix 2. **Revised or new documents and publications**

High-Temperature Gas-Cooled Reactor (HTGR) Workshop Proceedings, March 2024, www.oecd-nea.org/mdep/documents/ProceedingsHTGRWS_FINAL.pdf.

VVERWG Programme Plan 2024-2025, www.oecd-nea.org/mdep/documents/MDEPVVERWGProgarmmePlan2024_2025.pdf.

MDEP LW-SMMR/LB WG Programme Plan 2024-2025, www.oecd-nea.org/mdep/documents/MDEPLW-SMMRWGProgrammePlan2024_2025_final.pdf.

MULTINATIONAL DESIGN EVALUATION PROGRAMME

The Multinational Design Evaluation Programme (MDEP) was established in 2006 to develop innovative approaches to leverage the resources and knowledge of the national regulatory authorities that are currently or will be tasked with the review of new nuclear power reactor designs. MDEP members are the regulatory authorities of Argentina, Canada, China, Finland, France, Hungary, India, Japan, Korea, Russia, South Africa, Sweden, Türkiye, the United Arab Emirates, the United Kingdom and the United States. The Nuclear Energy Agency serves as Technical Secretariat for MDEP. The International Atomic Energy Agency also takes part in the work of MDEP.

NUCLEAR ENERGY AGENCY

The OECD Nuclear Energy Agency (NEA) was established on 1 February 1958. Current NEA membership consists of 34 countries: Argentina, Australia, Austria, Belgium, Bulgaria, Canada, Czechia, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Luxembourg, Mexico, the Netherlands, Norway, Poland, Portugal, Korea, Romania, Russia (suspended), the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Türkiye, the United Kingdom and the United States. The European Commission and the International Atomic Energy Agency also take part in the work of the Agency.

The mission of the NEA is:

- to assist its member countries in maintaining and further developing, through international co-operation, the scientific, technological and legal bases required for a safe, environmentally sound and economical use of nuclear energy for peaceful purposes;
- to provide authoritative assessments and to forge common understandings on key issues as input to government decisions on nuclear energy policy and to broader OECD analyses in areas such as energy and the sustainable development of low-carbon economies.

Specific areas of competence of the NEA include the safety and regulation of nuclear activities, radioactive waste management and decommissioning, radiological protection, nuclear science, economic and technical analyses of the nuclear fuel cycle, nuclear law and liability, and public information. The NEA Data Bank provides nuclear data and computer program services for participating countries.

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