Multinational Design Evaluation Programme

AP1000 Working Group
Closure Report

Related to: Design-Specific Working Group Activities

MDEP AP1000WG Closure Report
Activities and outcomes 2009-2021

Activities and Outcomes of the
Multinational Design Evaluation Programme (MDEP)

AP1000 Working Group
2009-2021

1) Purpose

This closure report sets down a framework enabling a future working group on the Westinghouse AP1000 design to be re-established with significant grounding that will accelerate its future work programme. This report summarises the successes as well as the challenges and lessons learnt of the AP1000WG and provides recommendations for further work that lays outside the terms of reference of MDEP.

2) History of the Design-Specific Working Group (DSWG)

The interest in co-operating through an MDEP working group on the AP1000 Reactor design safety issues was initially raised in February 2008 by the nuclear safety authorities of Canada (Canadian Nuclear Safety Commission (CNSC)), the Peoples Republic of China (National Nuclear Safety Administration (NNSA)), the United Kingdom (Office of Nuclear Regulation (ONR)), and the United States (United States Nuclear Regulatory Commission (NRC)).

The first meeting took place in Beijing, China February 2009. At this meeting, the group accepted the generic terms of reference for MDEP design-specific working groups and agreed on its objectives to exchange information on the status of their projects and to provide general feedback from the design, construction, and manufacturing reviews. Three topics were chosen for near-term cooperation by the working group: adequacy of design, qualification, and the in-service testing programme for in-containment refuelling water storage tank injection (squib) valves; civil engineering aspects of shield building design; and safety classification and testing of control rod drive latch mechanisms. The first two subgroups held their first breakout sessions during the second AP1000WG meeting to discuss issues and concerns in their subject areas.

During the third meeting in Sanmen County, Zhejiang Province, China, in March 2010 the subgroup addressing squib valves presented the draft of the Common Position (CP) on the Design and Use of Explosive - Actuated (Squib) Valves in Nuclear Power Plants. The subgroup addressing control rod drive latch mechanisms held their first meeting during this AP1000WG meeting.

During the fourth meeting in Bootle in the United Kingdom in May 2011, the AP1000WG added discussion of national follow-up to the Fukushima event to their meetings. In addition, briefings were given on bilateral discussions held on Digital Instrument and Controls (I&C) and on a spent fuel pool criticality issue identified by ONR. This was the last meeting where subgroup breakouts were included in AP1000WG meetings or discussed. Country updates going forward generally covered status of design reviews and construction and updates on initial test programmes, and component vendor issues.

During the fifth meeting in Ottawa, Canada, in July 2012 Westinghouse, the designer of the AP1000, gave a presentation during the meeting on Fukushima-related issues. This was the beginning of a regular practice for the AP1000WG. Westinghouse was invited to each meeting after this point and given the opportunity to present to the members. In addition, the working group discussed setting up technical expert subgroups (TESGs) in three areas:

- Civil Engineering (to cover issues and concerns with shield building construction and modular construction techniques).

- Passive Safety Systems (to cover issues with squib valve design and testing, first of a kind engineering tests, testing, modelling, and verification and validation to support evaluation of adequate operation of the passive emergency core cooling systems).
- Digital (I&C) safety systems.

During this meeting, the idea of discussing commissioning activities was introduced with a plan to explore the opportunity further later in the year.

During the sixth meeting in Beijing and Shanghai, China in September 2012, the working group toured the Sanmen construction site.

At the eighth meeting in Atlanta, Georgia in the United States in September 2013, the Swedish Radiation Safety Authority (SSM) joined the working group. Technical challenges and discussion included squib valve design and factory testing, condensate return, and questions and answers exchanged between NNSA and NRC. During this meeting, the first briefing on commissioning was held to talk about the United States and China bilateral Commissioning Workshop held in July 2013 and the plans for a follow-on meeting in February 2014 was introduced. The working group visited Vogtle Units 3 and 4 construction site at the end of the meeting.

Technical challenges covered during the ninth meeting in Issy-les-Moulineaux, France in April 2014 included the condensate return to the in-containment refuelling water storage tank design change, pressurizer and steam generator support design changes, and questions and answers exchanged between the NNSA and NRC. An update was given on commissioning activities and a plan for the formation of a Digital I&C ad hoc TESG was discussed.

During the tenth meeting held in Beijing, China in September 2014, the technical challenges discussed included a continuation of discussions on condensate return and pressurizer and steam generator support design changes. In addition, the working group discussed containment debris, containment inorganic zinc coating, and a summary of eight major design changes being made on China plants. Vendor issues discussed included issues with reactor coolant pumps and squib valves. Westinghouse answered questions on the pipe rupture hazards analysis, locked rotor hydraulic transient, an error in the reactor engineering model system, main control room noise, main control room heatup and dose issues, and remote shutdown habitability. The final draft of the Fukushima AP10000WG CP and the planned agenda for the Digital I&C TESG meeting planned for October 2014 were discussed. The working group was invited to attend the second bilateral AP1000 commissioning meeting held the same week prior to a planned site visit to Sanmen Nuclear Power Plant.

During the eleventh meeting held in Paris, France in April 2015, technical challenges discussed included condensate return, support design changes, and questions and answers shared between NNSA and NRC. Westinghouse answered questions regarding the reactor coolant pump, squib valves, condensate return, and containment internal structures. An update on commissioning was added to the country update discussions at this meeting. During this meeting the outcome of the Digital I&C TESG held in October 2014 was shared. The working group approved the formal formation of the AP1000 Digital I&C TESG.

During the twelfth meeting held in Rockville, Maryland in the United States in September 2015, the AP1000 Digital I&C TESG announced that they would meet on an as needed basis. Members visited the V.C. Summer Units 2 and 3 construction site.

During the thirteenth meeting held in Paris, France in June 2016, the working group finalised the draft of the CP Addressing Fukushima Daiichi NPP Accident-Related Issues.

In 2017, the Swedish regulator determined that their country would not be moving forward

with use of the AP1000 design and left the working group.

During the fifteenth meeting in Paris, France in April of 2017, India's regulatory body, the Atomic Energy Regulatory Board (AERB) joined the working group. The working group started working on reports dealing with condensate return, squib valves, reactor coolant pumps, and a compilation of questions and answers developed by NNSA and NRC and shared with the working group.

During the sixteenth meeting held in Atlanta, Georgia in the United States in October 2017, the Commissioning TESG met following the AP1000WG general meeting and decided to develop report on lessons learnt in hot functional testing of the China AP1000 units. After the completion of the meetings, the working group toured Vogtle Units 3 and 4.

The AP1000 Digital I&C TESG held a joint meeting with the issue specific Digital I&C Working Group in Beijing, China later in October 2017. Four AP1000WG member regulators participated in the meeting and gave detailed presentations regarding status and construction activities related to AP1000 I&C systems. This was the last meeting of the AP1000 Digital I&C TESG.

During the seventeenth meeting in Boulogne-Billancourt, France in May 2018, the working group finalised drafts of three products including a CP on AP1000 In-containment Refuelling Water Storage Tank (IRWST) Condensate Return Modelling, a Technical Report (TR) on Lessons Learnt with AP1000 Reactor Coolant Pumps, and a TR on AP1000 Squib Valves Design, Construction, Qualification, and Testing Experience. At the close of the meeting, ONR announced that with the cancellation of the AP1000 projects in the United Kingdom, that they would become a non-active member in the AP1000WG following the 17th meeting. Later the same year, the CNSC decided to withdraw from the AP1000WG because of their agency not doing any AP1000 work and no plans for new power reactor construction in Canada.

At the close of the eighteenth meeting in Beijing, China in November 2018, the Commissioning TESG informed the group that they would be meeting on an as needed basis going forward. The working group toured the completed Haiyang units.

During the nineteenth meeting in Paris, France in May 2019 the working group finalised the draft of the TR on International Cooperation on Design, Construction, and Commissioning of AP1000 Reactors. The working group discussed the draft final version of the TR on hot functional testing lessons learnt and decided to add the lessons learnt from startup testing in China to the report. The AP1000WG discussed the status of the AP1000 Digital I&C TESG and determined that the group, which had decided to meet as needed, had met once after making that decision and had no future work planned. Based on the lack of plans for design-specific work, a lack of input from the AP1000WG members on topics the TESG was needed to address, and the existence of the active generic Digital I&C Working Group, the group decided to close the AP1000 TESG.

During the twentieth meeting in Rockville, Maryland in December 2019 the working group decided not to develop a CP on the post loss of coolant accident strainer performance and Debris in-vessel downstream effects that had been planned by the AP1000WG. The basis for this decision was due to the advanced stage of the AP1000 design for most members and the inclusion of limited fibrous material in the base AP1000 design. The basis for this decision and a collection of references on the issue for AP1000 are documented in "**Need for an AP1000 Common Position on Post Loss of Coolant Accident Strainer performance and Debris In-vessel Downstream effects**". The working group finalised the TR on Common Understanding of the Hydrogen Control System for the AP1000 Design. At the close of the meeting, the

working group travelled to Georgia and visited the Vogtle construction site.

Following the twentieth meeting, the working group finalised the drafts of the TR on Hot Functional and Startup Testing Lessons Learnt (developed through cooperation of the AP1000WG and the AP1000 Commissioning TESG) and the TR on Lessons Learnt from Implementation of the CP on First-Plant-Only-Tests (FPOT) for AP1000. During the twenty-first meeting the closure report for the AP1000WG was finalised. The working group also determined the final approach for storage of the working group materials that were to be saved.

Between 2009 and 2021, a substantial number of interactions between the AP1000WG members and the vendors/licensees took place, followed by detailed collaborative analyses of the responses by the AP1000WG members. This work resulted in a series of detailed TRs and CPs discussed above for the AP1000 design. Appendix A includes a list of all TRs and CPs developed by the AP1000WG. The "MDEP Technical Report on International Cooperation on Design, Construction, and Commissioning of AP1000 Reactors", has been limited to the AP1000WG only this is based on a request by members of the AP1000WG.

In 2019, it was considered that the commissioning of new plants could be a topic covered within the scope of the wider forum within Nuclear Energy Agency (NEA). It was concluded therefore that the subgroup should close.

In December 2019, the AP1000WG reviewed the needs for further work of its members and concluded their Programme Plan had been accomplished and that there were no tasks to take forward. These are presented in section 8 of this report. The group considered that these could be of interest to a broader membership and it encouraged the Steering Technical Committee (STC) STC and Policy Group (PG) to consult the NEA Secretariat on the possibility of transferring these issues to be addressed in a regulators forum within NEA.

Although the long-term goals remained unchanged, the following factors needed to be considered regarding future activities:

The MDEP STC and PG required the DSWG and its TESGs to close if:

- The Working Group membership drops to less than three countries that are actively participating; or
- The Working Group has achieved its Programme Plan and could not identify further suitable work under the MDEP framework to continue its activities.

During the twentieth meeting, the AP1000WG members decided that the group and its supporting Commissioning TESG had no continuing work programme or the possibility, within the following two years, of initiating a potential new work programme within the terms of reference of MDEP and thus there was no justification for the AP1000WG or its TESG continuing to meet. The argument for recommending closure of the AP1000WG is laid out in the **Proposal for Closure of AP1000 Working Group**.

The members also determined that the evidence supported decisions to:

- Close the remaining TESG;
- Request the STC to endorse the conclusion that the AP1000WG should hold no further meetings;
- Advise the STC to recommend to the PG that the AP1000WG be closed, having completed its tasks within the framework of MDEP.

Both the MDEP STC and PG accepted the recommendation with a direction that the group produce a closure report highlighting its successes and recommendations for any future work

that lay outside the terms of reference of MDEP. The AP1000WG was closed on 30 June 2021.

3) Successes of the AP1000WG

The working group developed three Common Positions and six Technical Reports addressing some of the more important discussion topics from the AP1000WG meetings. Summaries of these products are listed below. In addition, the group encouraged the appropriate inclusion through discussion and advice of the following within its activities where appropriate:

- Committee on Nuclear Regulatory Activities (CNRA) (WGCS, WGDIC);
- Vendors, utilities and licensees and other applicants/licensees/operators, as applicable.

Further, the working group identified a number of recommendations and inputs to other issue specific working groups and MDEP DSWGs regarding potential generic issues and harmonisation opportunities (including the Technical Report on Lessons Learnt from Implementation of the common position on FPOT for AP1000).

- CP-AP1000WG-01, "Common Position on the Design and Use of Explosive - Actuated (Squib) Valves in Nuclear Power Plants," was developed to communicate a common position among regulators reviewing squib valve designs in order to promote and understand each country's regulatory decision and basis and to aid in the assessment of explosive-actuated valves (squib) valves that are used to perform a safety function within a nuclear power plant.
- CP-AP1000WG-02, "Common Position Addressing Fukushima Daiichi NPP Accident-Related Issues," identifies common preliminary approaches to address potential safety improvements for AP1000 plants as related to lessons learnt from the Fukushima Daiichi accident or Fukushima Daiichi-related issues. In seeking a common position, regulators provided input to this paper to reflect their safety conclusions regarding the AP1000 design and how the design could be enhanced to address Fukushima Daiichi issues. The common preliminary approaches are organised into five sections, namely, new reactors and improvements in safety, external hazards, spent fuel pools, emergency preparedness in design, mitigation strategies.
- CP-AP1000WG-03, "Common Position on AP1000 IRWST Condensate Return Modelling," explains how the members of the MDEP AP1000WG with active regulatory assessments of the AP1000® reactor cooperated and shared information on issues associated with the return of condensate to the IRWST in postulated fault conditions. It also captures CPs reached by the regulators on work done by the Westinghouse Electric Company (Westinghouse or the designer) to address the identified issues that were equally applicable to the AP1000 designs proposed for each country.
- TR-AP1000WG-01, "Technical Report on Lessons Learnt with AP1000 Reactor Coolant Pumps," describes the design, manufacturing and testing of the reactor coolant pump (RCP) used in the AP1000 Nuclear Power Plants (NPPs). The testing includes prototype and commissioning tests. This report focuses on the regulatory practices, cooperative regulatory experiences, and lessons learnt related to the RCPs.
- TR-AP1000WG-02, "Technical Report on AP1000 Squib Valves Design, Construction, Qualification, and Testing Experience," describes the design, qualification, and application of pyrotechnic-actuated (squib) valves used in the AP1000 nuclear power plant. The objectives of this report are to describe lessons learnt from these activities for consideration in future design, construction, qualification, and testing of AP1000 squib valves.

- TR-AP1000WG-03, "Technical Exchanges between NRC and NNSA during the Design, Construction, and Commissioning of AP1000 Reactors," provides a compilation of the question and answer exchanges between the NRC and NNSA. The information exchanges include several documents that are publicly available in the NRC's Agency wide Documents Access and Management System (ADAMS), as well as other documents provided or exchanged during the AP1000WG meetings. It is restricted to AP1000WG members at the request of the members.
- TR-AP1000WG-04, "Technical Report on Common Understanding of the Hydrogen Control System for the AP1000 Design," identifies a common understanding of the regulatory requirements for the Hydrogen Control System for the AP1000 design. This report also identifies differences between the AP1000 design proposed in the People's Republic of China, India, and the United States as it relates to hydrogen management, the rationale for the Hydrogen Recombiner Subsystem, and the use of Hydrogen Passive Autocatalytic Recombiners (PARs) and any related regulatory differences.
- TR-AP1000WG-05, "Technical Report on Lessons Learnt from Implementation of the Common Position on FPOT for AP1000," evaluates the implementation of the Multinational Design Evaluation Group [MDEP] CP Addressing FPOT, Version 1, dated April 2018, CP STC-01 (Reference 1), in the crediting of FPOT and First-Three Plant Only Tests (F3POT) for the AP1000 design. As described in the CP, a FPOT or F3POT performed at one reactor can be credited to another reactor as long as appropriate preconditions are met, and the CP identifies a series of such preconditions. This report describes how each of the preconditions was considered in crediting FPOTs and F3POTs in implementing the AP1000 design across multiple reactors.
- TR-AP1000WG-06, "Technical Report on Hot Functional and Startup Testing Lessons Learnt," discusses lessons learnt from the AP1000 Hot Functional Testing (HFT) and Startup testing performed at Sanmen Unit 1 and Haiyang Unit 1 in the People's Republic of China.

4) Challenges or Limitations

The AP1000WG experienced several challenges and limitations during the time that they met. One of the major challenges that the group addressed was the difference in the regulatory requirements in the different group member's countries. For example, one country's regulations did not get into the details of how requirements were to be met, but another country required an activity to be conducted in a specific way. The group members dealt with these differences by remaining patient and providing detailed explanations so that all understood the differences when they came up. The outcome in many cases was that the difference could drive a change in aspects of the AP1000 design from country to country.

The working group found that the benefits could be limited if there are significant schedule differences between member countries licensing projects. For example, the AP1000WG had a member country just starting their preparations for the safety review at the time the other members were ready to complete their activities. Greater efficiency results where there are multiple parallel licensing reviews providing input to the final product.

The AP1000WG encountered a significant slowdown for the design when the designer declared bankruptcy. Soon after this declaration, countries that had been planning to construct AP1000 plants changed their mind or the process slowed to the point where the regulator did not attend meetings. To compensate for this limitation, the AP1000WG held numerous meetings where only two countries attended.

Another limitation was the changeover of members. Each time a member country sent different individual to participate, there was a learning curve that had to take place. Members of the working group took this in stride and helped to have those new to the group fully participate by bringing them up to speed. As a result, the work of the group was not limited and in many cases, was improved because of input from individuals new to the issue that brought new ideas and a different view.

The requirement for all to speak English at the MDEP meetings allowed many to better communicate, but did, understandably, create a limitation for some. When members experienced communication challenges, this resulted in more detailed conversations to allow all to understand the issues being communicated, the requirement to ask additional questions to fully communicate concerns and making sure all in the group had an opportunity to understand and ask questions. In some cases, such as where the documentation used at the sites are in different languages, there is not as much to be gained through the working group because of the additional work needed to translate between the documents. The working group addressed this by co-operating on other issues and concerns.

Another limitation faced by the AP1000WG was the difficulty for some members to obtain visas to attend meetings or to support travel to the meetings. Those organising meetings should either send out the plans for the meetings well in advance of the meeting and allow the option to delay the meeting if members encounter difficulty with obtaining a visa. For consistent issues with travel, an option is to hold the meeting in the country where members have issues with travel or to have a hybrid meeting to allow for video conference participation.

5) Lessons Learnt

The lessons learnt by the AP1000WG that are of note have been documented in the different CPs and TRs listed in Appendix A. Beyond this, note that in addition to meeting through MDEP, bilateral meetings between two country's regulators were found to be very useful. This was done through a separate process and agreement between the regulators, but the outcome of many of the opportunities were shared within the AP1000WG. Because of these meetings, project managers and inspectors were exchanged between the involved regulators so that their staff had the opportunity to observe other regulator's processes, procedures, and inspections and to learn about the AP1000 design, through participation in the other agency's work or through opportunities to question how the review was done before reviews of the design and of commissioning and initial tests before these efforts were started in their country. These details and lessons learnt were shared with the working group and helped to better the products developed, and to increase the knowledge of other AP1000WG members. In addition to exchanging personnel, technical questions can be exchanged to help reviewers understand processes set up and decisions made in other countries. Although not part of the MDEP process, the AP1000WG shared many of these experiences so that all members gained the benefits of the discussions.

Involving the vendor of the design in a part of the meeting proved to be beneficial to the members. Some members have more access to the vendors depending on their design review processes. However other regulators may not have regular access to vendors and having the vendor attend the meeting provides opportunity for interactions that otherwise would not be available.

6) Interactions with stakeholders

The AP1000WG regularly interacted with Westinghouse, the designer of the AP1000. Starting with the fifth meeting of the working group, Westinghouse gave at least a two-hour presentation at most meetings. Those presentations covered design, construction, and

commissioning status and briefed the working group on plans for the AP1000 going forward including introducing the possibility of new members for the working group. As the sites moved toward operation, Westinghouse shared lessons learnt during development of the design, construction, and testing. Although not a member of the working group, including the designer in part of the meeting was beneficial to all. It gave regulators the opportunity to gain knowledge from the designer that they may not have day to day and knowledge of lessons learnt more quickly. It also allowed the members different perspectives on the issues than they may have learnt from their licensees.

The AP1000WG interacted less frequently with the licensees. Every other meeting was in a country planning to construct AP1000 plants. If there was a plant under construction, the regulator hosting the meeting arranged a tour of the site and a meeting with the licensee. This allowed the working group members to see the status of construction first hand and to discuss issues with the licensees. As a result of the ability to tour the plant in differing stages of construction, the working group members were able to see the parts of the plants involved in the significant issues discussed during meetings, helping all to better visualise and understand the issues.

The TESGs in the AP1000WG met with their counterpart working groups in the CNRA on occasion. This allowed the TESGs to share knowledge on issues encountered in both the digital I&C and commissioning areas in the other reactor designs.

7) Location of MDEP DSWG information and reports

The information regarding all MDEP AP1000WG activities is held within the dedicated portion of the MDEP Library. The MDEP Library is managed by the secretariat, the OECD NEA. According to the MDEP terms of reference, permission to access the information should be sought through the NEA which has an agreed protocol for seeking permission to allow access from the relevant member countries via the MDEP STC and PG.

8) Recommendations generated by the DSWG for further work

The following topics are recommendations for further work from the DSWG that fall within design but are considered outside the terms of reference of MDEP.

They have been set down according to the lifecycle of a nuclear power reactor:

Design

- Major design changes identified later
- Changes needed to address new member countries or regulations

Construction experience

- Major changes to modules or issues with modules working during construction
- Experience with the implementation of the Inspections, Testing, Analyses, and Acceptance Criteria process
- Regulatory issues identified as the plant finishes construction

Commissioning experience

- Sharing of the specific AP1000 commissioning challenges
- Major changes to tests

Operational experience

- Issues encountered with Technical Specifications

- Issues identified because of operational events
- Industry events, equipment performance issues, generic communications applicable to AP1000

Decommissioning

- Need to develop design for decommissioning

The following DSWG TESG topics are recommendations for further work that fall within design but are considered outside the terms of reference of MDEP.

Severe accidents

- Any issues in this area identified as the plants gain operating experience

9) Conclusion

Between 2009 and 2021, NRC, ONR, and NNSA finished their safety assessments for the AP1000 design, and drew the conclusion that the AP1000 design was acceptable according to the regulations of the United States, the United Kingdom, and China. These assessments were outside the terms of reference for MDEP, but the outcomes facilitated the member regulators understanding and provided significant grounding for AP1000WG discussion and cooperation.

The status of the NRC, ONR, and NNSA safety assessments for AP1000 design are listed below:

- NRC finished their safety evaluation and issued the Design Certification Amendment final rule (DCR) for AP1000 design control document. The detailed information is described in www.nrc.gov/reactors/new-reactors/design-cert/ap1000.html.
- ONR finished their Generic Design Assessment (GDA) and issued their Design Acceptance Confirmation (DAC) for the AP1000 Reactor design. The detailed information is described in www.onr.org.uk/ new-reactors/ap1000/.
- NNSA finished their safety review of the Final Safety Analysis Report (FSAR) for the first four AP1000 reactors-Sanmen Units 1&2 and Haiyang Units 1&2 and issued the operating licences for these four units.

The AP1000WG successfully:

- Achieved its main goal of developing co-operation between member regulators on topics of interest and value within the scope of the MDEP;
- Generated several reports on those topics as well as contributing to the MDEP task of determining CPs related to the Fukushima Daiichi Nuclear Power Plant accident;
- Opened a line of communication for regulators who did not normally communicate with the AP1000 designer;
- Identified several MDEP AP1000WG tasks that might be followed when member country build programmes are at the right point;
- Identified a number of tasks that could be progressed in a forum with wider membership;
- Shared these proposals with a wider forum in the CNRA.

This closure report provides a framework to enable MDEP members to re-establish a DSWG for this design with significant grounding to facilitate its future programme of work at the corresponding time.

Appendix A: AP1000WG Products (MDEP Library)

	Title
1	CP-AP1000WG-01 Common Position on the Design and Use of Explosive - Actuated (Squib) Valves in Nuclear Power Plants, December 2010 www.oecd-nea.org/mdep/common-positions/PUBLIC%20USE%20DCP-AP1000-01-%20Squib%20valves.pdf
2	CP-AP1000WG-02 Common Position Addressing Fukushima Daiichi NPP Accident-Related Issues, September 2016 www.oecd-nea.org/mdep/common-positions/cp-ap1000wg-02-common_position_fukushima.pdf
3	CP-AP1000WG-03 Common Position on AP1000 IRWST Condensate Return Modelling, October 2018 www.oecd-nea.org/mdep/common-positions/cp-ap1000wg-03.pdf
4	TR-AP1000WG-01 Technical Report on Lessons Learnt with AP1000 Reactor Coolant Pumps, October 2018 www.oecd-nea.org/mdep/common-positions/tr-ap1000wg-01.pdf
5	TR-AP1000WG-02 Technical Report on AP1000 Squib Valves Design, Construction, Qualification, and Testing Experience, October 2018 www.oecd-nea.org/mdep/common-positions/tr-ap1000wg-02.pdf
6	TR-AP1000WG-03 Technical Exchange between NRC and NNSA during the Design, Construction, and Commissioning of AP1000 Reactors, November 2019 (AP1000WG only)
7	TR-AP1000WG-04 Technical Report on Common Understanding of the Hydrogen Control System for the AP1000 Design, September 2020 www.oecd-nea.org/mdep/documents/Technical_Report_AP1000_Hydrogen_Control_System_Approved_Sept2020_FINAL.pdf
8	TR-AP1000WG-05 Technical Report on Lessons Learnt from Implementation of the Common Position on FPOT for AP1000, May 2021 www.oecd-nea.org/mdep/documents/AP1000_TR_LessonsLearnt_ImplementationCP_FPOT_FINAL.pdf
9	TR-AP1000WG-06 Technical Report on Hot Functional and Startup Testing Lessons Learnt, May 2021 www.oecd-nea.org/mdep/documents/AP1000_TR_hotfunctionaltesting_startuplessonslearnt_FINAL.pdf