The below table comprises the observations and recommendations made by the IAEA Technical Working Group on Nuclear Power Plant Operations (TWG-NPPOPS) during its third meeting, conducted 11-12 May 2021.

|  | Observations | Recommendations | Sections |
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| 1. **Operational Excellence** | | | |
|  | There are several approaches to excellence in the nuclear industry—operational or other. One example is nuclear safety culture. Considered as a whole, these approaches differ in many aspects.  The IAEA and WANO have unique, but related mandates.  The IAEA is an inter-governmental organization, accountable to its Member States. WANO is an industry-based organization, accountable to its member organizations.  There are discussions in the industry on how business (financial) success is achieved through operational excellence and how excellence in safety supports this success.  Risk informed decision making is accepted generally in the nuclear industry. However, there are countries where regulatory bodies are reluctant to accept justifications based on risk informed decision-making process. | Invite WANO and other international stakeholder(s) as appropriate to collaborate on a white paper communicating a common understanding of excellence, including, for example who ‘owns’ excellence; the utility?, the plant?, suppliers?, the individual?. Also include business excellence and risk informed decision making.  ***TWG Comment***   * *By applying their unique operational mandates and each tapping their stakeholder communities, collaboration to seek operational excellence might be more effective.* * Consider beginning the discussion by describing the gap to be closed by the IAEA’s work. | NPES  OSS |
|  | WANO and the IAEA improved their cooperation in the last decade.  There are projects where WANO and IAEA work directly together to support operating NPPs and new NPP projects. Examples include operational readiness, new unit assistance, ageing management, equipment reliability, the transition from operation to decommissioning and internal safety oversight. However, there are areas where collaboration can be further harmonized. | Invite WANO collaboration to identify and communicate areas for cooperation through mapping their activities to identify potential new synergies. Consider including other peer international organization if / when appropriate.  ***TWG Comment***  *Consider the utility’s perspective and associated burden on them.* | NPES  OSS  NIDS  DERS |
|  | Effective leadership and organizational culture contribute significantly to Operational Excellence as manifested, for example, in human performance.  Operational performance monitoring and corrective action programmes are examples of metrics indicative of leadership effectiveness. However, both are lagging indicators. | The TWG supports ongoing work to define leading indicators of effective leadership and would welcome an update as well as how it is engaging WANO. At least two activities are currently underway:   * New NES publication on Leadership in Nuclear Organizations * NSNI/OSS planned revision of TECDOC 1141 how that work incorporates this recommendation. | NPES  OSS |
|  | There are a number of reactors transitioning from operation to decommissioning.  There is a need to help operators of these reactors to organize the transition in effective way, considering safety, human resources, regulatory requirements, etc.  The IAEA and WANO currently collaborate on support related to the transition to decommissioning. | The TWG supports current and new activities related to operational excellence on Back-End of the fuel cycle and would welcome an update from the DIR-NEFW or NFCMS & DERS Heads during a future meeting. | NPES  OSS |
|  | Many industry workers with deep expertise and technical knowledge leave the industry or retire. The same is true for vendors, designers and contractors.  New knowledge is coming in the nuclear industry, such as big data applications and maintenance innovation.  Governments are wrestling to attract new talent to NPPs.  Knowledge transfer starts from designers through construction to operators. | The TWG supports ongoing Agency work in this area and would welcome a presentation on IAEA activities – including the work and recommendations of other TWGs as appropriate – in HRD and knowledge transfer to the new generation – tools, mentoring and other support mechanism as well as their impact in the MS during a future meeting. | NPES  NKM |
|  | SMR deployment is approaching and limited demonstration is underway in some Member States. | The TWG supports ongoing Agency work in this area and would welcome an update on the status of work on SMRs, including relevant safety levels and related EPZ considerations during a future meeting.  ***TWG Comments***   * *Detailed support efforts to facilitate SMR construction, commissioning, operation, (including maintenance, ISI, organizational arrangements, etc.), physical protection, testing passive systems, etc. may be needed in the near future.* * *The IAEA could investigate the potential options relating to relationships between vendor and operator for standardized SMRs* | NPTDS (lead)  Others as appropriate |
|  | Other industries apply new digital technologies to support their processes. AI, advanced manufacturing, and the analysis and use of big data are becoming more common.  The nuclear industry has started to apply these solutions, however in some countries, regulatory acceptance faces difficulties. However, some changes are being observed e.g. in maintenance applying innovative solutions. | The TWG supports the Agency’s work in this area and would welcome an update on the status of Member State support linked to innovative solutions to support operating NPPs such as AI, advanced manufacturing, supply chain, etc. The update should include work to engage regulatory bodies on the topic of innovation in the context of operating NPPs. | NPES  RAS |
| 1. **Harmonization** | | | |
|  | One of the dominant constraints on nuclear power deployment is the limitations on harmonization.  Recognized barriers to harmonization include:   * Strict Liability & Nuclear Waste Management (i.e. Joint Convention) * Lack of clarity regarding the legal Design Authority * IP Ownership * Diverse legal systems in different countries * Absence of ‘forcing function’ from vendors and operators (compared to successes, some of which are listed below)   It is recognized that the problems of “backfitting” harmonization on existing facilities is challenging.  Examples of successful harmonization include:   * Owners Groups * Aviation, Oil & Medical Industry * INPO / WANO * Radioactive Material Transport – IAEA | Continue to facilitate open discussion and debate between government, regulator and industry—for example, by including as a key topic in relevant conferences and meetings—to focus on harmonization of standards and legal regimes, with particular reference to new build, SMRs and newcomer / developing country approaches. | NPTDS  NIDS  OSS |
|  | Conduct one or more meetings and develop output/s as appropriate to compare relevant Codes and Standards to achieve a common understanding of the status of relevant harmonization efforts. | NPES  OSS |
|  | Given the limited experience base of newcomer countries (or industries) and the significant experience of the vendors the relationship between them is critical to achieve safe, efficient construction and operations.  The modus operandi of these relationships has varied with different countries over the last 40 years. | Describe possible newcomer / expanding country relationships with vendor countries in an agency publication, with member countries sharing the merits of possible relationships. | NIDS  NPES |
|  | Many countries are using the concept of a “Reference Machine” as the basis for contracting for EPC NPP. There is however no clear definition of what could constitute a Reference Machine. | Conduct one or more meetings and develop output/s as appropriate to identify and close any ‘gap’ in a common / standard definition of a “Reference Machine” (or Reference Plant). | NPES |
|  | Given the need for countries to have common basis for the documentation submitted for the licensing of imported / exported NPPs… | Conduct one or more meetings and develop output/s as appropriate to explore format and content of engineering documentation that support, for example, licensing applications. Pursue standardization opportunities as appropriate. | NPES  RAS |
|  | There is a view in certain countries and/or by certain stakeholders that the IAEA Milestone approach is well applied for large reactor deployment and theoretically excellent, but adaptation of this approach might be needed to support the future roll out of standardized SMRs in developing countries. | The TWG supports the Agency’s work in this area and would welcome an update on the status of Member State support linked to the optimization of the IAEA Milestones Approach, including the means and methods of implementation, in the context of standardized SMR deployment in developing Member States. | NIDS  NPTDS  NSNI |
|  | Access to international suppliers and goods (including software applications) as well as supply chain health and effectiveness remain a serious challenge to the nuclear industry.  Continued discussions on supply chain could reinforce harmonization of design and regulatory requirements, market rules, etc. across reactor types and countries. | The TWG supports the Agency’s work on Member State support linked to supply chain health, effectiveness and sustainability and would welcome an update on the status during a future meeting. | NPES |
| 1. **Stakeholder Engagement** | | | |
|  | A trilemma exists in the energy sector namely: affordability, carbon friendly and supply security / reliability.  Meanwhile, public perception of nuclear power is not currently data or science driven.  From Operational Excellence Breakout  The IAEA operates several forums for regulatory bodies and also for the nuclear industry.  There are no joint regulatory-industry forums which would enable open discussions between all stakeholders.  Regulators and industry share common goals including the safe, secure, reliable and efficient operation of NPPs. | Establish an international working group to address stakeholder engagement challenges, including public perception.  ***TWG Comments***   * *Social media can be a means to deliver quick and effective explanations and responses to comments* * *Videos, i.e. delivered via YouTube and integrated into a Social Media campaign, can explain nuclear power in plain language to a wide variety of audiences including youth.* | NPES |
|  | Establish a platform for MS to provide information and data from utilities (e.g. carbon saved)  [**From the Operational Excellence Breakout]**  Launch a high-level Interface Platform that fosters engagement between diverse stakeholders, including regulatory bodies and operators to discuss important topics for the future.  ***TWG Comment***  *Considering its mandate and diverse stakeholder community; the IAEA is ideally positioned to host this integrated engagement platform.* | NPES  RAS |
|  | Conduct an International Technical Workshop on Public Perception of Nuclear Power in the Energy Mix. | NPES |
|  | Policy and other decision makers do not always recognize the importance of nuclear as a **carbon friendly provider** and how that fits in the future.  Power plants, as a standalone electricity provider is becoming a dated concept. Future societal energy needs are likely to be grounded in integrated **partnerships** with other technologies (H2, renewables, storage etc.) | Implement an international – or national if appropriate – Technical Workshop, and a supporting platform if appropriate, on Stakeholder Perceptions of Nuclear Power to foster and / or strengthen connectivity between diverse stakeholder groups, including industry, regulatory bodies, non-nuclear technologies, government and policymakers.  ***TWG Comments***   * *Establishes links between the nuclear with other technologies at national and international levels* * *Establishes links between MS to exchange experience and information* | NPES |
|  | Stakeholder engagement must include a **sustainability** component that appropriately considers nuclear power’s long-term role in sustainable energy systems. This consideration must include, for example, skills, attractiveness of the organization and societal acceptance. | Launch International Bootcamp for Youth Engagement aimed at sustainability and the long-term value brought by nuclear power. (with WNA and/or other partners) | NPES |
|  | The TWG supports ongoing activities to develop Member State capacity related to the creation and application of tools such as presentations, challenges, and workshops that engage students, young employees, etc. and would welcome a quantified update on the status of this work during a future meeting. | NPES |