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| Department of Technical Cooperation (TC) End-of-Mission Report |

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| **Report Title:** | **End of Mission Report** |
| **Project Number:** | **IRA2012 06** |
| **Project Title:** | **Increasing NPPD's Capability in Planning and Implementing Activities Related to Design and Construction of Two New Pressurized Light Water NPP Units in Bushehr with Emphasis on Safety** |
| **Name of Expert:** | **Vitalii Kolomiiets, Oszvald Glocker, Oscar A. Mignone** |
| **Dates of Mission:** | **From 23.Apr.2016 to 25.Apr.2016** |
| **Counterpart:**  *Please provide full contact details for the Institute and main counterpart* | **Mr. Mehran Ziasheikholeslam**  **Nuclear Power Production and Development Company of Iran**  **Nuclear Power Production and Development Company of Iran**  **P.O. Box 14155-4494, No. 7 Tandis St.; Africa Ave**  **19156 Tehran**  **Iran, Islamic Republic of**  **Tel.: 0098 21 22058825** |

**Terms of reference:**

*Describe the specific objectives of the assignment and the duties to be performed by the expert as they relate to the objectives.*

As IAEA Expert Team Members, and with explicit reference to NPPD's contract for Bushehr's two new pressurized light water reactors,

* to support and contribute to the coordination of activities of the IRAN NPPD organization in **Design Knowledge Management** **(DKM)** programme establishment and to analyse current situation in the area:
  + - National and international responsibilities for ensuring design knowledge
    - Regulatory perspectives and requirements on design knowledge management
    - National licensing requirements for design documentation and validation
    - Importance and responsibility for design authority — the concept, approaches and problems
    - Vendor responsibilities for design knowledge management
    - Assessing and maintaining competence of the design authority
    - Advanced integrated design management systems and approaches
    - The design change process in different countries (vendor, regulator, utility perspectives)
    - Design basis validation: approaches, challenges, future directions
    - International peer reviews of design basis of new facilities, best practices, and lessons learned
    - Nuclear facility business models for outsourcing and associated risks of design knowledge loss
    - Importance of periodic safety reviews and license renewals to revalidate the design basis
    - Knowledge transfer from vendor to utility-owners during the new-build process
    - Challenges presented by commercial interests with respect to design basis over the lifecycle
    - Design knowledge management challenges faced by new-build projects
    - Current technologies and approaches to plant information management
    - Preserving information and data on facility operating, maintenance and design change history
    - **Plant Information Model (PIM)** as a tool to manage facility configuration information
    - The needs, areas of application, challenges and issues related to implementation of data support systems at NPP
    - Configuration Management
* Identify **Design Knowledge (DK)** and **Design Basis Information (DBI)** needed to be handover and preserved and which can be used as basis or part of plant information system needed for safe operation and future **Long Term Operations (LTO)** (Safety requirements, Preliminary Safety Analysis Report / Final Safety Analysis Report elements, Start-up and Equipment tests results, Design specification and drawings
* Be responsible for implementation and delivery presentations on request (agreed with TO), facilitation of discussion, group work leading and development of recommendations as for the DKM programme at NPPD.

**Duties performed by the expert:**

*Describe the work carried out to meet the terms of reference as set out above. Please include any technical, logistical, administrative and other problems encountered, and any other considerations of importance. Please include also the Agenda and List of persons met.*

*NOTE: Figures, tables and annexes should be mentioned in the body of the text and should be numbered in the order in which reference is made to them (e.g. Fig.1, Fig. 2, Table 1, Table 2, Annex 1, Annex 2, etc.). All attachments should be clearly labeled.*

**DAY 1 – 23.Apr.2016**

* Opening by NPPD Technical Director Engineering, Mr. Hossein Derakshande, welcoming the IAEA team. List of NPPD participants is attached as **Annex D1.1**
* Opening by IAEA Head of Mission, Mr. Vitalii Kolomiiets, thanking for the hospitality, making some hints on the Agenda, and expressing the goal to have productive and enriching sessions. Mission Agenda is attached as **Annex D1.2**.
* Round brief presentation of all attendees, i.e. IAEA Experts and NPPD Attendees.

**D1 - NPPD Briefing by Technical Engineering Director Mr. Hossein Derakshande**

This IAEA Expert Mission on DKM was requested and organized by NPPD Technical Engineering Department

**NPPD Expectations**

* Transfer of Design Knowledge from EPC Contractor to Licensee (Design Authority)
* Integrated Design Management in Licensee in EPC contract
* How Could be Decomposed the General Requirements and Normative to requirements of SSC and Trace them
* How could be tailored International experience for Capture and Manage Design Knowledge and Information

This presentation is attached as **Annex D1.3** to this Report

**D1 - NPPD Presentation by Knowledge Management Manager Mr. Amir Rahnama**

**NPPD Knowledge Management program**

* The presentation described the main elements of the NPPD Knowledge Management program, which started to be implemented recently. NPPD expressed that they are in the beginning, and that they need to promote an improve as much as possible
* Presentation displayed the knowledge, dimensions of KM, and the process, as per IAEA guidance.
* The needs of NPPD in KM were described, as well as the establishment stages of NPPD KM programme.
* Efforts are made in involving all NPPD departments in KM activities and training activities in KM functions are being implemented. Several meetings already held.

***NPPD Question to IAEA Experts:*** *regarding if the evaluation of the intended knowledge writing should be made before the employee writes the knowledge input.*

***IAEA Experts Answer:*** *All Experts answered that the best approach is to leave the employees to write the knowledge input and after that to perform the evaluation to further classify the knowledge.*

* Achievements were described, i.e. Number of users, 155 in NPPD and 40 in BNPP (project management department). Written knowledge, managers, 1, experts 100
* A need to improve the system was addressed by increasing managers participation

This presentation is attached as **Annex D1.4** to this Report

**D1 - IAEA Presentation by Head of Mission Mr. Vitalii Kolomiiets**

**Expert Mission Objectives**

The presentation was composed by a brief outline of IAEA activities, and the general objective for this particular mission, namely:

***To assist NPPD/BNPP-2,3 on improvement of the nuclear knowledge management (NKM). Provide recommendation for the further development and integration of the DKM programme into business processes and the day-to-day activities as well as to discuss role and responsibility of the Design Authority and stakeholder’s involvement (Responsible Designers)***.

**The key Objective for the meeting are**:

* To consider current approaches to the management of design knowledge and
* To develop recommendations and practical guidance for improvements in this area

**The specific objectives of the meeting are:**

* To better understand the main issues and challenges and different perspectives on DKM and CM issues;
* To discuss DKM concept :Design Authority, Responsible Designer - Roles and responsibilities within Iran nuclear organizations,
* Interface/ communication between DA and the Design organizations (vendor, subcontractor, TSO, etc.) after plant hand over
* To analysis of scope and structure of Design Basis Information (DBI) important to safety

This presentation is attached as **Annex D1.5** to this Report

**D1 - IAEA Presentation by Expert Oscar A. Mignone**

**DKM Stakeholder Involvement and Responsibilities for Design Knowledge Transfer**

Based on the IAEA Milestones for implementing a nuclear program, the presentation highlighted that a full scope knowledge management system should be in place when the contract is signed with the EPC Contractor for building the nuclear power plant

By using references to recognized IAEA guidance on capabilities and responsibilities of Owners/Operators and project management for nuclear facilities, the presentation displayed the Stakeholders main responsibilities, the specific concepts of the organizations involved, the stakeholders and their interaction with KM.

Thus, the presentation indicated the Licensee responsibilities and the EPC Contractor responsibilities related to KM management, and the design basis information picture.

Special remarks were included in the Licensee and EPC contractor have to in relation to KM, and in the need for the Licensee to follow the EPC Contract trying to absorb as much design knowledge as possible.

This presentation is attached as **Annex D1.6** to this Report

**D1 - IAEA Presentation by Expert Oscar A. Mignone**

**Communication Strategy with Vendor and Responsible Designers**

Based on the IAEA TecDoc 1510, the strategies on KM were briefly described in such a way to introduce the relevant communication strategy for implementing KM programs.

The need of an open communication strategy that goes up, down, horizontal was discussed,

The lessons learned gathered in relation to communication strategy were displayed, highlighting the concepts of clarity, reality, results, managers buy.in, convince to the people, communication, visibility and persistence.

A brief review of the contractors documents that support Licensee knowledge augmentation was made, which was followed by communication elements needed to reinforce knowledge acquisition, such as technical reviews, on-the-job training / mentoring, technology transfer, technical and dissemination work-shops, factory inspection & testing, construction supervision, and commissioning testing. Finally, the knowledge flow and transfer between EPC Contractor and Licensee was explained, encouraging NPPD for an active participation.

This presentation is included as **Annex D1.7** to this Report

**D - 1 IAEA Presentation by Head of Mission Mr. Vitalii Kolomiiets**

**DKM General, Concept, Life Cycle**

Presentation started with important remarks:

* 25% of events are caused by configuration errors, deficiencies
* Loss of DK due to interoperability cost Us capital facilities 15.8 B$ in 2002

Presentation addressed DKM Issues, general, specific, DKM Advantages, and Design knowledge over life over cycle of nuclear facility.

Other important statements were as follows:

* Very good that EPC contractor share the DK with Utility to have feedback on the operating plant. Specific model information for Czech and Hungary was written in the Bid Invitation Specifications.
* Bulgaria Belene NPP design review by Owner’s Engineer of legacy documents and found many (2000) deficiencies
* During a recent conference, Rosatom Chairman Mr. Kirienko emphasized talking about DKM over the complete NPP life-cycle

***NPPD Question:*** *DKM should be located in the plant or in the headquarters*

***IAEA Answer:*** *Design Authority part should be in the NPPD (strategic decision making and approval function) and in the NPP (day-to-day, as a design integrity holder). Design Authority recommended established initially in Headquarters. Some countries could have different technologies, one centralized D.A. with dependences in locations. All strategic decisions for design changes that involve safety, seismic, and essential safety systems be handled from headquarters, while the minor changes and the confirmation control from the site.*

* DK scope, EPC contractor will not give the “why design is like that”
* Reference plant is one of the key safety principles, proven engineering practices, if design is very new, there could be some issues (i.e. Finland experience)

***NPPD Question****: relationship between Licensee DA and the Plant Designer*

***IAEA Answer****: During operation, Licensee is the responsible for changes, you may ask the designer. If you do not have the full capability you cannot be the DA*

* The Summary and conclusion were appreciated by the Attendees,

1. Design Knowledge starts developing as soon as a new nuclear facility is considered
2. There are many organizations that will be generators of design knowledge
3. The amount of design knowledge that needs to be retained is very large.
4. The Design Basis is a subset of design knowledge
5. Design knowledge needs to be available to the operating organization throughout the life cycle of the plant to ensure that any design change to the plant is made with the necessary understanding of why the original design is as it is.
6. Maintenance of design knowledge must be the specific responsibility of the operating organization (DA) once a facility is licensed to operate.
7. Maintenance of design knowledge must be a specific management function of all the organizations (RD) involved in the early phases of a nuclear project
8. Design Authority (DA) should facilitate an IT system integration of managing DK for the anticipated lifecycle of the nuclear facility through adoption of the PIM
9. DA should ensure that Constructors and Installers have access to the PIM system, to facilitate reliable and accessible DK.
10. DA has the prime responsibility for safety. This also includes maintenance of an adequate DKM

This presentation is included as **Annex D1.8** to this Report

**D1 - IAEA Presentation by Expert Oszvald Glöckler**

**Considerations for Managing Design Basis Knowledge**

The presentation included description of the fundamental principles, the KM basis, the typical questions on KM, and the challenges and opportunities.

In order to clarify the meaning of design basis, the presentation included definitions by US 10 CFR 50.2, INSAG 19, and IAEA, accompanied of a related discussion.

Description of the organizations that hold design basis knowledge at first licensing was made, together with explanation of issues that can be present at first licensing.

Important remarks were indicated in relation to the contributors to changes on the design basis, highlighting the attention to proper design knowledge management needs.

***NPPD Question:*** *what is the difference between modernization and modification*

***IAEA Answer:*** *no main difference, but modification may refer to smaller scope, while modernizations projects may include complete system replacement with new technology. In either case, need to make sure that design basis are kept intact*

***NPPD Question:*** *Time interval for safety reviews*

***IAEA Answer:*** *Typically**10 years. EdF follow the 10 year outage scheme, however some countries are asking for more frequent safety reviews*

***NPPD Question:*** *any source for OPEX changes during Significant Event Reports (SER) or Significant Operation Experience Report (SOER)*

***IAEA Answer:*** *There is operating experience in the IAEA reporting system, and EU clearing house, information is publicly available, all VVER countries met in Russia for the Stress Test, and after that in Bruxelles. WANO, and other mechanisms such as Utility Groups, i.e. Candu Owners Group (COG) knowledge transfer program, this program worked very well. Take into account bi-lateral agreement with an Utility that has a similar type reactor, and create a specific dedicated group*

This presentation is attached as **Annex D1.9 Parts 1 & 2** to this Report

**D1 - IAEA Presentation by Expert Oscar A. Mignone**

**Contract management and lessons learned**

The presentation illustrates briefly basic elements related to contract management, such as contract review, dissemination of contract information to internal company offices and departments, owner expectations on EPC contractor, communications between owner and EPC contractor, contractor subcontracting, contract performance evaluation, and contract close out. Each subject previously indicated was accompanied with a slide with five to six bullets of lessons learned from real experience in handling different type and size of contracts implemented in the nuclear industry.

The presentation focused in an adequate preparation of the owner to know by heart the contract contents, and to define clearly its expectations related to contractor performance, including guidelines for a set of key performance indicators, as an usual industry practice.

Communications were highlighted as a key success factor for proper contract execution.

***NPPD Question:*** *who is the responsible for organizing the contract review?*

***IAEA Answer:*** *the project manager is main responsible of organizing the contract review assisted by the contract manager and the legal staff.*

This presentation is attached as **Annex D1.10** to this Report

**DAY 2 – 24.Apr.2016**

**D2 - NPPD Presentation by Davoud Hosseini**

**NPPD Issues and challenges related to DK and DBI transfer, decisions, and corrective actions**

The presentation included many useful remarks to the KM and DK.

* Introduction, Tools, people, processes, Design Knowledge needed as per INSAG 19, Terminology & definition, TecDoc 1335, 1651, design bases, design basis, design basis reconstitution, Relevant NKM and CM publications
  + KM = (Information + People) \* Sharing
* Issues and challenges related to DK and DBI transfer, with attention with standards local vs the one from Nuclear Vendor, considering that turnkey contract will reduce possibilities of transfer as project is progressing
* NPPD Actions performed, study documents and publications, verify WANO, solving BNPP1 issues, by performing some modelling, calculations, by codifying implicit knowledge, by using Project Management Book of Knowledge for performing projects, attending conferences, collaborating with companies in other fields
  + Very important Pilot project for re-constituting information bnnp-1
  + Agreements with universities and research institutes
* Very good considerations were addressed for BNPP 2,3 DB and DBI

***IAEA Experts Opinion:*** *Very good presentation. Very good approach to the design reconstitution, reverse engineering has been used by other utilities with VVER plants, i.e. structures, piping to be subject to new higher seismic factor, in other PWR plant Western design, all design basis have to be reconstituted. NPPD will have the possibility to overcome situations from BNPP-1. The screen of R&D organizations in Iran is very important. Every engineering work has to be under NPPD and the company should deliver the design knowledge, to create some databases to store the comprehensive picture,*

***IAEA Expert Question:*** *The approach to qualification, certification of other vendors, is very strict in qualification of product, by using third party certification. Are you planning any kind of audits? Are you going to verify the qualification of suppliers?*

***NPPD Answer:*** *We have an appendix to contract establishing requirements for reviewing the supplier to agree the vendor to produce products for NPPd. The procedure will include audit for that supplier, and after audit, the company will be included in the vendor list.*

***IAEA Expert Question:*** *How many people included in your action plan BNNP-2,3?*

***NPPD Answer:*** *OCE company 200 p and another local company 200p, contractor agree to work with them, and OCE is like a NPPD tool*

***IAEA Expert Question:*** *What is your quality assurance approach?*

***NPPD Answer:*** *NPPD will use integrated management system as per IAEA GS-R-3*

***IAEA Experts Final Opinion:*** *important that NPP Management team need to be involved and following up the process. NPPD may delegate activities, but never delegate the control, and exercise adequate oversight on external engineering organizations*

*Create the vendor list, including R&D institutions and universities, and map all knowledge identifying who can cover each element, writing the core capabilities, identify potential gaps, and define actions plan to cover the gaps.*

This presentation is attached as **Annex D2.1** to this Report

**D2 - IAEA Presentation by Expert Oszvald Glöckler**

**Establishment of an Organization for Design and Engineering Activities in New Build NPP – Case Study**

The presentation reflected a case study in which a Vendor Country proposed to a Customer Country to establish an engineering organization for nuclear new build plants, including the creation Design Authority and the accumulation of design knowledge.

* Presentation include several relevant items, such as, roles and definitions, project stakeholders, Organization of Execution of Engineering for New NPP, scope, engineering for nuclear side, considerations on design Authority, design engineering, procurement, engineering, support services, Interfaces with other divisions, QA, Procurement, Doc Control, Project control, Assumptions, reference NPP available, technology transfer, Project control, factors: TT, localization of engineering, equipment & material supply, experience of staff, Customer Country aspects, monitor scope, schedule, budget, priorities, manage risks,
* Description was made on the engineering organization, use info from project controls, take actions on staffing, subcontracting, mobilization, demobilization, procurement of design activities as needed, and about the QA program and Quality Surveillance and Support
* Explanations were made about the Nuclear Utility taking the of DA and having support from local engineering companies, Design Agencies. Then an useful description of the activities under D.A. responsibility was made.
* The sources of potential design changes from design of the reference plant were described and the importance of feed-back was highlighted

***NPPD Question:*** *Which is the way of reporting between Operation and D.A.*

***IAEA Expert Answer:*** *suggested continuous feedback from operation direct to D.A. that it is useful for the D.A. and also for the Vendors*

***NPPD Question:*** *What is the purpose of selecting reference plants?*

***IAEA Expert Answer:*** *Whenever possible is advisable to have as reference an operating plant in another country with successful record of performance, knowing the maintenance issues, the improvements, it is good for all stages of new build, including for licensing, for localization, typical length of outages, obsolescence*

***NPPD Question:*** *Which document related to code and standards can create changes respect to ref plant?*

***IAEA Expert Answer:*** *One reason are local standards of codes, most important doc is contract, and the basis for licensing set by the regulator*

***NPPD Question:*** *Which structures can be the same between ref plant and new plant?*

***IAEA Expert Answer****: Reactor core, fuel, nuclear systems, if environment conditions are different, you may need more reinforcements in the building, I&C and human machine interfaces may be re-designed, all post-fukushima improvements have to be looked at,*

***NPPD Question:*** *The Customer identify changes to ref plant, what scope to be considered****?***

***IAEA Expert Answer****:**everything what is in the engineering packages, physical security, if the conditions are different*

***NPPD Question:*** *selection of ref plant was based on reactor and turbine, and no ref plant in the contract. However changes are included in the contract*

***IAEA Experts Answer:*** *usually with proven technology design such as VVER plants, no modifications are expected to Reactor, Primary Circuit, Safety Systems, and just minor adaptations may be required in Turbine Hall. The Balance of Plant is usually subject to more modifications. However, if the design technology changes are already included in the contract, the best is start the project with minimal modifications. If in the future safety requirements may impose some changes, these can be managed under full control.*

This presentation is attached as **Annex D2.2 Parts 1 & 2** to this Report

**D2 - IAEA Presentation by IAEA Mission Head Vitalii Kolomiietz**

**DKM Applications – Case Studies**

The presentation showed DKM cases in several organizations, i.e. EdF (France), NIIAEP (Russia), Empresarios Agrupados (Spain), Intergraph (USA), Snerdi (China), Atomenergoproekt (Russian, in close cooperation with Gidropress, absorbed by NIIAEP) Neolant (Engineering IT company working close with Russian organizations)

* **EdF**, largest world Utility, France, 58 PWRs, UK 14 AGRs, 1 PWR, Covers the full design process, 5500 engineering persons, Operator and Global Architect engineer, Relies on Responsible Designer
  + Leveraging DK, Training, 85% personnel have training each year, Design feed back integration, Design management solutions, CAD and Asset Management
  + Info support to facilities, K do not stored in structured way
  + Req’s management, as starting point for DB, significant part of DK,
* **Empresarios Agrupados**, Spain, 1000 persons, created in 1971, Architect Engineering and Construction Management Company, excellent Plant Information Model, PIM, for managing the O&M of 3 nuclear plants in Spain, and corporate DB
  + Total information environment during the whole life cycle, Data-centric approach, with the 3d model as core database, Document management system, interconnection headquarter and plant servers, security issues
  + Access to 3-D Models and P&IDs
  + Cable management, PRAC, power + I&C cables, routing, reliability,
* **NIIAEP** Russia, Multi-D approach to DKM, PIM for Virtual construction, all plant info in one DB, 3D for plant design, 4D with schedule, 5D with physical volumes, 6D Human resources, 7D machines and mechanisms, 8D, cost
  + IT providers, Aveva, Siemens, Intergraph, Bentley, Dassault, NIIAEP created a CAD integrator
  + Chain help, very good tool for managers, any problem is written up, and then it will go to supervisor, 1 day to solve the issue, and then to other supervisor, if not resolved to the company manager
  + Catalogue of equipment and material, huge lists of suppliers manufacturers, type of production, contact names,
  + Week and daily tasks, based on 3d model, base for field engineering, large center room,
  + Operation & maintenance support, 3D for studying how to go into the containment, possibly to do a dismantling virtually, links to spare parts
* **Intergraph**, key solution provider, Engineering, 3-D, smart plan foundation
  + CMIS Scope, Requirements Management, DB, DM, Change M, O&M, ITAACs, Commissioning & Test, Engineering DB, architecture, Handover and uploading DK centralization
  + Configuration management applications
* **SNERDI** China, All engineering loop, evolving process, from CAP1000 to CAP1400, Semi-digital, to digital, to smart system, DK and QM platform
  + Feed back system
* **Atomenergoproekt** Russia, PIM – Integrated project management system, project management system engineering, design, construction communicate through web portal with operations
  + O&M, bar codes for equipment, very useful for routine inspection, parameters stored on system
  + PIM VVER TOI (information oriented design)
* **NEOLANT** Russia, young company with many IT models, plus work with conventional plants, design reconstitution, laser scanning, photographs to plant, data is interlinked through several layouts, completed several projects, Beloyarska, completed the design, needed for decommissioning
  + collision detection, spherical photos >> 3D model
  + week and daily tasks,
  + PIM 3D functions & architecture, radiation safety >> equipment doses, maintenance planning
  + Info support for decomm projects
* **DKM applications, need to integrate DB**

This presentation is attached as **Annex D2.3** to this Report

**D2 – IAEA Presentation by IAEA Expert Oscar A. Mignone**

**Design Knowledge Handover Strategy**

The presentation displayed the EPC Contractor/General Designer as main sources of DK, in the following broad areas: a) Engineering & Design, b) Safety Cases, Safety Analyses, c) Manufacturing Inspections, d) Site Field Engineering, e) Construction Modifications, f) Functional Design Changes, g) Commissioning Results Analysis, and h) Feedback from As-built structures, systems, components and As-commissioned systems.

The presentation included hints and recommendations for the Owner on how to behave and capture knowledge by working together with the contractor along the project phases, i.e. design, safety procurement and manufacturing, construction, commissioning.

Moreover, the presentation included recommendations related to the Owner readiness to capture and store intelligently the design information, by developing and implementing a human resource plan, performing engineering and design technical reviews, performing manufacturing and construction oversight, participating in the commissioning activities, creating Web portal and libraries, and populating the libraries with adequate international and national publications and books. The presentation highlighted also the convenience of agreements with National and International Universities and Institutions, and the association with the World Association of Nuclear Operators and VVER Owners Group.

***NPPD Question:*** *what do you do if the contractor send all information at the same time?*

***IAEA Expert Answer:*** *you need to have the Contractor delivery schedule of document packages, and then to align your people to make sure can cover the workload, giving priority to the documents to be approved, you may need the help of some consultant, or eventually international organizations. Very important to have a structured check list for technical review, that it is going to be useful for you and for the EPC contractor*

***NPPD Question:*** *how you resolve the answers to the EPC Contractor if you have too many documents to review?*

***IAEA Expert Answer:*** *by working in documents to be approved by Owner related to safety and plant performance on first line of priority, and in second line of priority documents that do not have safety or performance implications, but that still need Owner approval. You may leave aside for a while the documents for information, and whenever you have time, their review will be an excellent opportunity to learn for young engineers.*

***NPPD Question:*** *Is there any IAEA requirement for transferring DK from Contractor to Owner?*

***IAEA Expert Answer:*** *There are recommendations about transferring DK from Contractor / General Designer to the Licensee for creating the D.A. However, the DK transfer is governed by the contract between Owner and Contractor.*

This presentation is attached as **Annex D.4** to this Report

**D2 - IAEA Presentation by Expert Oszvald Glöckler**

**Maintaining core knowledge competence; Example of I&C systems**

The presentation shows a case study showing the reference document IAEA NUCLEAR ENERGY SERIES No. NP-T-3.12 that IAEA is making available to the industry.

The presentation refers to documents are available in IAEA link, and a large list of standards referenced that are very useful for the I&C applications and projects.

The presentation highlighted

* The structure of the document was briefly explained:
  + Motivation
  + Objectives
  + Intended audience
    - Primary target audiences, description, including utility decision makers, new users, and licensing authorities, Benefits for I&C experts
  + Technical structure
    - References, Guides, Codes, Standards
  + Overview of Instrumentation & Control Systems for NPP
    - Significance of I&C Systems, Challenges posed by I&C Technology, Functional Approach, Physical Approach, Lifecycle Approach
  + Current Challenges
    - Introduction of new technologies, Safety, Security, and Licensing driven issues, Harmonization of standards and licensing practices, Economic driven issues, Ageing
    - Knowledge Management
    - Infrastructure development for new nuclear plants

***NPPD Question:*** *Cable aging monitoring is done by calculation?*

***IAEA Expert Answer:*** *There is an IAEA document on managing the ageing of cable insulation, how to develop a program, prepare sample of cables that can be tested as plant go on, the best is to install specimen sets of cables in typical locations. Main stressor is the temperature, which ages very much the insulation. In addition, theoretical calculations, or laboratory tests to accelerate ageing can be used. In general, there is little effect for vibration, the most important is the temperature.*

***NPPD Question:*** *is laboratory needed for testing?*

***IAEA Expert Answer:*** *Yes, you need to have your standards, and test the samples accordance with the standards requirements*

***NPPD Question:*** *What is the scope for ageing analysis?*

***IAEA Expert Answer:*** *Structures, systems, components ageing is part of the ageing management program for license renewal, these are not replaceable, I&C is replaceable. Safety systems have to be monitored for ageing.*

***NPPD Question:*** *What are the IAEA I&C standards?*

***IAEA Expert Answer:*** *The new IAEA I&C standard is SSG-39 (which will replace the current standard NS-G-1.3)*

This presentation is attached as **Annex D2.5** to this Report

**D2 - Discussion Round Table**

**Discussion on Regulatory Body**

***IAEA Q: H****ow is the regulatory body is involved in BNPP2,3*

***NPPD A:*** *The Regulatory Body is an independent organization, IRA (Iranian Regulatory Authority) involved since signing the contract, determination of safety requirements, some documents from Contractor to Regulatory body, some from NPPD, involved in the contract discussions to ensure safety requirements*

***IAEA Q:*** *is the Regulatory Body very much involved since the very beginning?*

***NPPD A: IRA*** *Regulatory Body was involved in site conditions, and in the environmental study, they have representative office at Bushehr, 20 or 30 people.*

***NPPD A:*** *IRA sent people to Russia, to get acknowledgeable with the Plant licensing aspects, ensuring that qualified suppliers participate in the project BNPP2,3*

***IAEA Q:*** *do IRA have TSO that work close with them?*

***NPPD A:*** *IRA has a Russian TSO for consultation and assistance*

***IAEA Q:*** *is the IRA attending factory inspections?*

***NPPD A:*** *the Customer is attending the factory inspections and informing IRA*

***IAEA Q:*** *is any relationship with the Russian Regulatory Body*

***NPPD A:*** *IRA give the normative requirements to NPPD and to the Contractor, and the contractor has to comply with*

**Discussion on Design Authority D.A.**

***NPPD Q****: what is your suggestion for establishing D.A. Responsibility is by NPPD, in the future, after operation, we need the TSO in close relation to with D.A.*

*NPPD needs some tools, companies like OCE that do design review, under coordination of NPPD, NPPD specify one job for that company, and in the future a group can do job for two plants. However, Consultant in the future will may need to do other jobs, i.e. construction of other plants*

***IAEA A:*** *NPPD will be the holder of the license, and the D.A. is part of NPPD, and it has to be established here as a coordination group, in order to start interacting with IRA. The plant is responsible of integrity, and IRA will go to the plant to check the CM program, etc. In the continuation of D.A. concept, a group should be assigned to plant, to keep design configuration. From the headquarters it will be oversight and coordination.*

*The TSO will be at the Plant, based on design basis it can recommend modifications.*

***NPPD Q:*** *who is a responsible designer in our case?*

***IAEA A:*** *The Vendor is the responsible designer*

***NPPD Q:*** *after Russians leave, in operation a TSO will be formed, and after 10 Years the Consultant will prepare a team as D.A. and they should share operating experience, people will be familiar with design changes, design review, commissioning activities.*

***IAEA A:*** *1) D.A. and R.D. is a function. 2) Original Designer, will go from now until end of construction, they hold the D.A. role. 3) idea is that when you receive license for nuclear fuel load you become D.A. (that means that the function should already be working at that time), 4) now in procurement, construction phase, you have some consultancy companies,*

***NPPD Q:*** *Consultant OCE is one body of NPPD, is not an independent company, it is a close relationship.*

***IAEA A:*** *you are mentioning that TSO will appear for supporting all plants.*

***NPPD Q:*** *during construction, the consultant will follow construction, after 10 Years then we will have a TSO, we will ask the consultant to prepare a group for that.*

**DAY 3 – 25.Apr.2016**

**D3 - NPPD Presentation by Davoud Hosseini**

**Consolidation of Design Information & Life Cycle supporting solution**

The presentation displayed NPPD information on Design Information Management

* Requirement Management & CM, including SSC Requirements, Design & Licensing Basis, Industrial codes and standards, Economic requirements, Owner specified requirements
* Design and project verification and validation, Scheme from IAE, Unit test design during manufacturing, During construction Inspection and test requirements
  + Validation of requirements during engineering, procurement and construction
* Development of Web portal, as per IAEA
* Elements of KM system, Integrated plant information system
* 3DMS solution for design documents management, feature of sw to be established at Owner
* General requirements for BNPP-2, Time, Cost, Scope, Quality, HSE, Resource, Supply, Risk,
* Requirements for Contractor IMS, contractor will have jurisdiction of the system until the Plant is turned over to NPPD, after that, NPPD will administer the system
* The classification of documents is based on IEC standards

***IAEA Question:*** *Is the IMS is developed by the contractor?*

***NPPD Answer:*** *The IMS is developed by the Contractor and administered by him until Plant completion, after that the IMS is transferred to NPPD*

***IAEA Input:*** *Requirements management is well considered in this presentation, need to ensure that national and international requirements are covered****.***

This presentation is attached as **Annex D3.1** to this Report

**D3 - NPPD Presentation by Mazaheri Majid**

**Information system to support KM in TSO company, support to BNPP1 and BNPP2**

This information system described in this presentation is fully independent of the EPC Contractor, it works only in the TSO, with the aim to be a broad integrated system to avoid losing information

Its name is PMIS: Project Management Information System, and it is developed by an Iranian company. Until now, the first module implemented covers engineering

* PMIS Modules are Engineering, Procurement, Construction, Project Management, Management support
* Engineering document management, include timesheets
* EDMS SW, as an example, the SW follows the work-flow, deliverable goes to reviewer, comment sheet, go back to the originator, revision of doc, after that to reviewer, and approval.
  + SW can provide Reports, budget, activity based cost
* KM SE, similar to BNPP-1, broken down by disciplines, assign experts to disciplines, when someone writes something, it goes to reviewers, that gives marks 1 to 5, if score goes over than 3, then it is accepted and it will be stored in the system.
* Good documents derive in good knowledge. Good procedures are KM supporters
* Company portal allows document search, with security passes on individual levels
* Weak points
  + Lack of usage of common format and common coding system
  + Unfamiliarity of staff on KM
* Recommendations, encouraging the staff, requiring the staff to record knowledge,

***IAEA Question:*** *how many people can access the system?*

***NPPD Answer:*** *currently 120p*

***IAEA Question:*** *is implemented a cyber security system?*

***NPPD Answer:*** *individuals need needs a password to access, but access levels depend on the individual function*

***IAEA Question:*** *has NPPD access to the system?*

***NPPD Answer:*** *NPPD heads have access to all parts of the system*

***IAEA Input:*** *The system seems to be very good and in accordance with industry practices. Very**important to ensure that NPPD people can access to the system in their corresponding function. A warning is that disaggregated knowledge may be difficult to integrate. There will be pockets of knowledge in many organizations. NPPD needs to be the mastermind integrator and final repository of all knowledge of BNPP 2,3*

***IAEA Input:*** *implement procedures to give rights and obligations to the staff, to upload documents and knowledge on regular basis. Avoid losing information from the EPC Contractor, and consider the interface with Iranian contractors, trying to have their pieces of knowledge into the system*

***NPPD Remark:*** *The company has shares from NPPD and the directors are named by NPPD*

***NPPD Remark:*** *the identification code is the KKS used initially by Siemens and adopted by Rosatom. NPPD normally give to the subcontractors their coding system, and the instructions and formats for performing drawings, specifications.*

**D3 - IAEA Presentation by Expert Oszvald Glöckler**

**Design Reviews**

The presentation was based on an IAEA draft document not published yet, that provides high level theoretical guidelines

* Design review types, BIS and NPP selection, conceptual, basic, and detail design, design reviews during construction, comm’g, operation incorporating feed-backs
* Essential elements of design reviews
* Special design reviews
* Design verification / Review, Inputs, process, assumptions, methods, outputs

***NPPD Question:*** *If during the project you have ref plant and you already have reviewed the design, which is the action to follow?*

***IAEA Answer:*** *you do not need to review it again if it is similar design, you may do the design review when you start to operate the plant to ensure that changes did not alter the design configuration*

***NPPD Question:*** *in what cases it is needed to do alternate calculations?*

***IAEA Answer:*** *in turnkey contracts, there is no need and the problem is that you do not have the tools. You may ask the EPC Contractor for a different method, but it does not have too much sense*

***NPPD Remark:*** *Contract will require the Contractor to use alternate calculations*

***IAEA Input:*** *Contractor will give assurance that they have followed a design process, and un-likely will give you an alternate method*

* Specific type, regulatory review, a) Siting requirements, Construction licensing, 10Y license review, Decommissioning authorization, Post Fukushima improvements

***NPPD Question:*** *are post-Fukushima lessons required to be considered in new design?*

***IAEA Answer:*** *yes, IAEA is recommending that, ENSREG/EC reviewed preparedness in the EU stress test, and it is all vendors’ interests to include lessons learned from Fukushima.*

* Performance and Efficiency focused review

This presentation is attached as **Annex D3.2** to this Report

**D3 - IAEA Presentation by Expert Oscar A. Mignone**

**Configuration Management**

The presentation on Configuration Management (CM) refers to the IAEA TecDoc 1335 (already quoted in NPPD presentations). In addition, other IAEA guidance was referred.

It was emphasized that Configuration Management is a great differentiator for the nuclear industry, with requirements much above to the ones used in conventional power plants or petrochemical process plants. The presentation covered:

* CM basic scheme
* CM Objectives and essential General Principles
* CM advantages and challenges were briefly described
* Typical examples from practical experience were described to support the CM needs
* CM process elements were described, which serve to develop the CM procedure
* CM principles of improvement were also briefly described
* Highlights of CM during the construction period were illustrated
* The CM functional areas were included in the presentation but were left for reference because mostly applicable to the Plant operation
* The interrelation between KM and CM was illustrated by slides providing insights
* Practical cases of CM issues during construction and plant operation were described

***NPPD Question:*** *Do you have a procedure for implementation of CM during construction?*

***IAEA Answer:*** *Usually, Utilities and Contractors prepare the CM procedure for the construction phase in a way that can be a base for the operation. The CM process is enveloping all functions*

***NPPD Question:*** *Did you have audits on the CM process?*

***IAEA Answer:*** *Yes, we had formal audits from Quality Assurance Department, every 6 months or yearly. In addition there were survey checks on very frequent basis that Contractor and Suppliers were using the last versions of design documents, that design documents were approved (and then adherent to the design basis) and that physical performance was in accordance with last version documents. These survey checks were made one or two times per week by Engineering and Quality supervisors*

***NPPD Question:*** *From your presentation, it seems to be that CM is an overall process?*

***IAEA Answer:*** *Yes, CM is an envelope process that has to be followed by engineering, document management, procurement, construction, commissioning, and later, operations and maintenance*

This presentation is attached as **Annex D3.3** to this Report

**D3 - IAEA Presentation by Expert Oscar A. Mignone**

**Challenges presented by Commercial Interests on Design Basis over the Life Cycle**

The presentation displayed commercial assumptions that are usually applied by Nuclear Technology Vendors to keep overall control of their technology and know-how, in such a way that they can propose to Customers long term agreements for assistance during the plant operations. The presentation covered the following topics

* EPC Contractor DK bases that derive in different deliverables
* Contractor usual barriers to transfer DK
* Contractor strategic interests for keeping DK under its full control
* Contractor commercial interests for keeping DK under its full control
* Typical Contractor business plan including tasks to support Customers, indicating quantitative values for a very tentative and illustrative assessment
* Owner options for reducing the Contractor involvement during plant operation and maintenance. These options were already discussed in other presentations
* Thus, some considerations on the DK time sequence displaying that as owner is acquiring DK, then its involvement increases while the Contractor decreases.

***NPPD Question:*** *How to avoid the commercial impact of the technical agreement with main contractor?*

***IAEA Answer:*** *It is very important to have competent people prepared for absorb the DK. You have good requirements for design information and documents in the EPC Contract, then the Contractor should deliver documents as per project schedule. You need to be ready to receive, store and review documents, and as we said, technical reviews are a good base for knowledge augmentation****.*** *This will have a positive effect in increasing NPPD involvement in design issues, and reducing the size of the Contractor needs.*

This presentation is attached as **Annex D3.4** to this Report

**D3 - Presentation by IAEA Head of Mission Vitalii Kolomiietz**

**DKM for New Build Projects DBI scope**

The presentation included conceptual DKM hints plus case studies for further reference

* Issues for the new-build projects
* Issues challenge during re-licensing
  + If important changes are to be made, then interface is needed with the General Designer

***NPPD Question:*** *not having the general designer is good or bad?*

***IAEA Answer:*** *This risk may be converted in opportunity. For Ukraine this allowed to create good capabilities. Now they need the General designer only for special cases*

* + After 30 Years you will have most of the design data, although some could be missing

***NPPD Question:*** *The Regulatory Body may ask for different requirements, and this could affect the process*

***IAEA Answer:*** *Yes, this is true, and your DKM capabilities should allow for resolving these issues****.***

* Limited scope fleet
  + Strategical focus, technology provider could be needed for special issues,
* Medium fleet, Strong TSOs, DA and RD roles accepted,
* Large fleet,
* Licensing process for nuclear installation,

***NPPD Question:*** *The commissioning permit is before nuclear fuel load*

***IAEA Answer:*** *The sequence shown is illustrative, it may need adjustment to the country specifics, and there could be some overlapping, the sequence is not important*

***NPPD Question:*** *Usually commissioning is divided in stages, A, B, C*

***IAEA Answer:*** *Commissioning permit could be adjusted to the country requirements*

* Documents required by the Regulatory Authority in **Slovak Republic**
  + Doc’s required for Site Registration, for Construction License, for Nuclear Fuel permit, FSAR, PSA, for Commissioning permit
* Design Change Management process**, Ukraine** case

***NPPD Question:*** *Design changes only from operation?*

***IAEA Answer:*** *The process includes also changes from engineering and construction*

* Stakeholders,
  + Engineering Organizations, RD
  + OO NAEK Energoatom (DA)
  + NPP delegated DA
  + Regulatory Body has its own TSO, it can hire specific suppliers (seismic, radiation)
* Licensee Design Change Process

***NPPD Question:*** *identifications of design deficiency, could they come from research? Some equipment may be ageing*

***IAEA Answer:*** *Yes, it could be, however these changes need to be carefully minimized*

* Subprocesses, criteria, and milestones, Requirements for records management
  + Licensee DK records requirements
* Conclusion
* **NCR Licensing** base structure
* DK/DBI scope for VVER (in Russian)
  + Hugh amount of documents, full safety analysis report, operations, environmental,

This presentation is attached as **Annex D3.5** to this Report

**D3 – Discussion by IAEA Experts of Conclusions and Recommendations**

The meetings during the IAEA Mission have been very productive, showing a great deal of interest and participation of NPPD participants

The systems being implemented by NPPD in relation to KM and DKM are based on solid industry practices and IAEA guidance. However, as it was recognized by NPPD participants and by IAEA Experts, the systems need further development and refinement for their application.

Many questions and remarks were posed by NPPD attendees during the meetings, and IAEA Experts provided sound responses based on IAEA guidance, International Nuclear Experience and by their own experience in fields of interests. It seems to be that IAEA responses satisfied the queries.

Recommendations were provided in relation to KM, DKM, and DA development and implementation. Communications is a key issue to disseminate knowledge among interested departments and individuals. To avoid knowledge fragmentation is is necessary that NPPD act as “mastermind” integrator of all pieces of knowledge that are going to be distributed in the Contractor / General Designer (main source for the new plant), the Consultant to NPPD, responsible designer for structures, systems and components, and the suppliers and subcontractors.

Depending on NPPD analysis of this mission results, it is very likely that an IAEA follow-up mission could be highly convenient for evaluating future KM, DKM, and DA developments and provide further detailed inputs to consolidate or improve these processes as much as possible.

IAEA Experts considered the convenience that cross-information is exchanged among interested departments and individuals for preparing the next follow-up mission, with some months in advance of the mission date (at least two), in order to allow IAEA Experts to be prepared in the issues that represent greater interest for NPPD.

IAEA prepared a DKM concept plan, which can be useful as a platform for nPPD to develop procedures to cover these essential topics.

In relation to location of the DA, IAEA Experts indicated that this depends on final NPPD analysis and decisions. Some examples from International experience suggest to have the DA located at headquarters for performing top level analysis of the Plant safety, intervene and approve safety design changes and requalification programs, and interacting with the Regulatory Body, while the DA delegated at site will act as design integrator and take care of non-safety related design changes. In addition, the TSO at the Plant will cover the day-to-day support to operations & maintenance, the document management, the configuration management and the equipment reliability programs.

Responding to the query from NPPD about the need of Operational Experience in the Headquarters, IAEA Experts commented that there is a trend in the industry for medium size to large size utilities to have operational experiences basically residing in the Plant for capturing and using their own experience. In parallel, the operational experience in the headquarters is being developed to capture and review experience from international experience, experience from other Utilities, and to centralize information that is being channelled to engineering and design departments for their use in new designs.

**Conclusions**:

*An assessment of the results and impact of the expert’s mission, relevant conclusions, including an evaluation of the degree of success in solving the problems encountered. Provide an analysis and description of any additional training, expert services and equipment that are considered to be necessary if the project’s objectives are to be met. Suggestions or recommendations made concerning future work should take into account the advisory role of the IAEA and the limitation on funds that may exist.*

The IAEA Mission has been very productive for consolidating issues related to KM, DKM and DA, that provided to NPPD useful insights for their current and future developments in this subject. During the 3-day presentation there was always a large audience from NPPD that shows a keen interest by the Counterpart in listening form the International Experts their views on these sensitive issues.

The active attendees’ participation by making questions and commenting on the different topics presented and discussed is another strong sign of interest in these essential subjects for nuclear power plant engineering, construction, operation, and maintenance.

The IAEA Experts presentations and speeches have been very solid, clear, and fully referenced with IAEA publications and supported by industry practical cases. The NPPD attendees thanked very much for the high quality and clarity of the presentations.

NPPD made also very good presentations displaying the situation of KM and of the PIM systems, with detailed indications of the programmes and systems current status, achievements, future developments and also some weaknesses that represent areas of improvement.

IAEA Experts have provided valuable insights on KM, DKM, and DA implementation issues and provided also detailed information by explaining the contents of IAEA guidance documents, describing the challenges, obstacles, suggestions for resolution.

The IAEA Experts presentations were complemented with case studies from the real nuclear life, and these enriched the conceptual aspects being discussed, by adding practicality to the theory for the benefit of the attendees.

Although the Mission scope and objectives covered a large ground for nuclear power plant engineering, procurement, and construction, thanks to the best efforts of both parties the matters were adequately discussed during the 3-day Mission, leaving some line areas that will require future development by NPPD, and eventually by IAEA with a follow up mission.

The fact that IAEA Experts were not aware of the details of the NPPD KM and DKM management systems developments and implementation, created the need of an overall top-down approach by presenting the general contents of IAEA guidance documents applicable to these essential subjects. During the Mission, NPPD counterpart asked for more information on detailed examples, and also about remarks on current decision making process of NPPD in relation to the location of the DA

NPPD explicitly appreciated the IAEA Experts answers to their questions, and the preliminary recommendations that were discussed.

Both parties concluded that NPPD needs to continue implementing KM and DKM process, needs to define and create the DA and provide staffing and capabilities.

Both parties agreed in the convenience of a follow-up mission for assessment of the developments and further guidance for consolidation and improvement of the KM, DKM, and DA processes.

**Recommendations**:

NOTE*: Each group of recommendations is a separate table. Please enter each recommendation in a separate row in the table. To enter a new row within each table, press the "TAB" key.*

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| **Recommendations to the Counterpart Institution and National Counterpart:** |

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| **Process Recommendations** |
| 1. Periodic and frequent oversight by the NPPD Direction of the Knowledge Management System to review status, progress and achievements |
| 1. Desirable to establish a metric system to assess advances in the KM system implementation (i.e. number of documents, number of meetings, number of knowledgeable personnel) |
| 1. Reinforce the implementation of the NPPD Knowledge Management system by increasing the NPPD managers participation in the Knowledge acquisition, dissemination, sharing, and storing knowledgeable activities. |
| 1. Implement the NPPD Direction monitoring and control of the above recommendation, by adequate metric to measure increasing managers involvement |
| 1. Implement DKM concept (Design Authority, Responsible Designers) |
| 1. As a part of the DKM concept create and develop the NPPD Design Authority for BNPP2,3, defining roles and responsibilities, and staffing the NPPD Design Authority accordingly |
| 1. Defining the responsibilities of the Consultant Organization as Responsible Designers according to DKM concept in charge of technical reviews and project overview for the BNPP 2,3 engineering, procurement and construction, establishing the reporting lines to NPPD project manager for BNPP2,3 |
| 1. Ensure that the organizational set-up for the Design Authority, and the consultant responsibilities (Responsible Designers) in capturing knowledge and managing and storing documentation are well documented |
| 1. Define clear structure and communication strategy for stakeholders involvement in DKM programme. |
| 1. Review the implementation of the Document Management System to ensure that it will be ready to be populated with massive amount of documents provided by the EPC Contractor. Train and assign staff to the Document Management Function. |
| 1. Communication among DKM participants should be encouraged and KM experts should be proactive in disseminating DK advances and interchange experience with peers |
| 1. As there will be pieces of knowledge in many organizations. NPPD needs to be the mastermind integrator and final repository of all knowledge of BNPP 2,3. Besides, NPPD should avoid the creation of isolated pockets of knowledge by trying to integrate them into the KM organization |
| 1. NPPD should develop the Design Change process, which needs to be based on the Contractor design change process during the BNPP2,3 execution, however this process should be implemented and consolidating by overviewing the Contractor activities in order to be ready when NPPD start the units operation. |
| **Organizational Recommendations** |
| 1. NPPD should define the NPPD engineering and design staff who is going to be assigned to the Contractor / General designer offices in Russia for the purpose of acquiring DK, and this assignment plan should be discussed and agreed with the Contractor for prompt implementation |
| 1. As soon as the NPPD staff assignment plan is ready, NPPD should start its implementation, the sooner, the better. |
| 1. As the Technical Reviews of Contractor / Designer design documentation have a dual scope, 1st ensure NPPD expectations are fulfilled, 2nd facilitate staff DK augmentation, NPPD should organize the Technical Reviews, by defining a process and preparing a procedure that ensures that NPPD and the Consultant work in synchronization for this important function |
| 1. NPPD should plan and organize external work-shops for DK dissemination, and these work-shops should count on the Contractor / Designer invited speakers to provide first-hand information to NPPD participants. An initial preliminary plan should be prepared and discussed with the Contractor / Designer for further implementation. |
| 1. In any case, NPPD should start implementing internal DK dissemination workshop with no presence of the Contractor / designer, in order to equalize internally the existing DK information, and be prepared to interact with the Contractor / Designer when the external works-shops take place |
| 1. NPPD should identify the scope of the eventual follow-up IAEA mission, in such a way that the preparation by the IAEA experts is adequate in content and time to address specific NPPD needs |
| 1. NPPD should then present the request to IAEA for the follow-up mission, at the earlies convenience, in order to allow IAEA to make the consequent planning, in such a way that the important KM and DKM that NPPD is managing can have adequate Expert input, guidance, and support. |

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| **Recommendations to the Government:** |

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| None at this stage |

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| **Recommendations to the Agency:** |

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| 1. Keep the interactions with NPPD in such a way to follow-up developments in KM, DKM, and DA implementation 2. Be ready to organize and conduct a follow-up mission before 2016 end, within 6 months time |