**Project Achievement Report**

**Project Number:** IRA2013

**Project Title:** Enhancing the Level of Operational Safety and Reliability of the Bushehr Nuclear Power Plant-1

**Project Objective**: To enhance the owner’s capabilities towards the safe and reliable operation and maintenance of Bushehr NPP-1.

**First year of approval:** 2016

**Project Counterpart:** Mr. Amir Afshin Rahnama

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**Abstract:**  The Bushehr Nuclear Power Plant (BNPP-1) is Iran’s first commercial nuclear power plant having capacity of 1000 Mwe, constructed with support of the Russia and based on WWER technology. Before this IRA2013 project, IAEA provided support under IAEA TC project IRA2012 to the Nuclear Power Production and Development (NPPD), the plant owner, for ensuring the safety of BNPP-1. Further assistance was requested in number of areas including: (1) strengthening capabilities for effective maintenance and outage management, including reinforced ISI and assessment of its results; (2) management of safety and security and owner nuclear oversight; (3) operating experience feedback, Operational Safety Review Team (OSART) mission and follow-up; (4) WWER core fuel management and radioactive waste management; (5) ageing and plant life management for long term operation; (6) accident management and response to nuclear emergencies; (7) technical support activities for independent safety analyses using suitable computer codes, software, techniques and methodologies; (8) training and qualification of personnel, including upgrading of the Bushehr training centre.

**Output Achievements:**

The technical project IRA2013 is the second project in the series of developing and enhancing capability of owner/operator in areas of safe and reliable plant operations; it is continuation of IRA2012. Throughout the project, IAEA organized 15 expert missions, a fellowship, 5 scientific visits and 11 trainings with close consultation with the CPs**.**

**Output 01 - Project Management Team Operational**

Action plans reviewed and updated, needed adjustments and necessary additional measures timely made provided for successful implementation. Requested additional assistance in high priority areas as effective project management and respective training completed very successfully.

This output was achieved through missions of national experts to visit to the Agency to discuss and consult with relevant technical officers on technical cooperation related matters, including programming and implementation.

**Output 02 - Reviewed and improved safety management programme in place.**

Effective trainings of IAEA enhanced NPPD capabilities for independent safety analysis. 20 managers of BNPP-1 have been trained with OSART process, who developed understanding with OSART assessment method, its prerequisites along with familiarization with OSART Mission Results (OSMIR) database. IRA2013 enabled the staff of BNPP-1 to create Emergency Command Centre (ECC), defining emergency zones and required actions for each zone. Emergency preparedness and response documentations is prepared.

**Output 03 - 03 - Technical support programme revised and improved.**

To train the staff of technical support department following workshops were conducted

1. WS on Safety Analytical Long Term of Operation Completed in 2019
2. WS on Assessment of the RPV neutron irradiation embrittlement as well as Analysis of RPV surveillance specimens’ mechanical tests, Completed in 2019.
3. WS on high and low cycle fatigue analysis for strength assessment of reactor coolant system, Completed in 2019

IAEA experts trained more than 25 NPPD professionals in aging management underpinning the information about Safety Aspects of Long-Term Operations (SALTO) and Long-Term Issues (LTO). During these workshops staff acquired understanding and information about Aging Management (AM), SALTO issues AND LTO issues.

These helped in preparing safety assessment in structures, systems, and components (SSCs) on the implementation of ageing management programs in BNPP-1, taking lessons and having discussions on SALTO mission issues.

**Output 04 - Maintenance and outage management programme optimised and updated.**

The team of BNPP-1 further successfully trained in In-service Inspection (ISI) to assess the embrittlement of reactor pressure vessels which created understanding of Integrity and embrittlement management of reactor pressure vessels. Maintenance and outage management programmes were prepared, and IAEA helped to develop optimised outage management programmes for achieving maximum availability factor of BNPP-1. Staff were trained for normal and emergency conditions at the BNPP-1 and in the improvement of occupational safety and environmental procedures and plans.

Staff of maintenance department could address issues related to the maintenance and applying new techniques

**Output 05 - Human resources management system improved.**

EM on Review the progress of methods and Software for independent root-cause analyses of BNPP-1 carried out in 2019. Which helped in TapRoot analysis with the help of IAEA experts. IAEA experts enabled the team to introduce and prepared performance indicators for OPEX.

The Root Cause Analysis (RCA) process in the BNPP and several were reviewed, and recommendations were provided by IAEA expert.

**Output 06 - Programme on accident/severe accident management and nuclear emergency response reviewed and updated.**

BNPP-1 team acquired capabilities in sever accident management. The experts of IAEA helped BNPP-1 staff in revising on-site and off-site management documents and processes in the light of lesson learned from Fukushima accident.

**07 - Programme for occupational safety and environmental management improved.**

BNPP-1 developed understanding of ESTE software which was installed which helped in modernization and progress in field of Safety and Environmental issues. This tool helped in developing a new version of procedures and updating the system.

**Outcome Achievement**

***Outcome***: Owner's capabilities towards safe and reliable operation and maintenance of BNPP-1 enhanced.

***Indicator***: Performance and safety indicators are assessed by the end of 2018 in all areas and are implemented in 2019 for improvement in comparison with the baseline

**Achievements:**

The project strengthened the capabilities of NPPD in safe operation of NPP especially in the areas of technical support, maintenance, repair, and emergency planning. Staff has acquired knowledge and understanding of on OSART missions. Emergency preparedness and response plans are revised and improved. NPPD staff became aware of emergency zones and the requirements of each zone.

This project helped to achieve the outcomes as;

1. NPPD staff developed capabilities for independent safety analysis.
2. Staff member of maintenance and repair department acquired capability in using latest methods and implementation procedures are established.
3. NPPD staff acquired the knowledge of aging management and long-term operation, procedures and processes are revised in the light of action under Fukushima incidence.

**LESSONS AND RECOMMENDATIONS**

**Sustainability**: Nuclear power plants contributes sustainability of socio-economic development of country. The knowledge acquired during the implementation of activities under this project helped NPPD staff ensure safe and reliable operation of BNPP-1. The NPPD staff were also trained in emergency preparedness and response, aging management and long-term plant operations which will be accommodating for safe plant operation. The knowledge acquired will contribute to safe and sustainable operation of BNPP-1 in future.

**Lessons learned regarding project management:**

As the COVID-19 pandemic has affected the implementation of face-to-face events, planning meeting involving TOs, CPs and the PMO to carefully evaluate what can be done virtually (even partly) and what not is necessary for the effective implementation of activities.

**Which practice proved to be beneficial for the project**?

From start of the project, a quarterly review meeting was agreed which had contributed to a more well-organized review of planned activities, its ToR, pre-requisite information etc. towards an efficient implementation. This practice had improved the planning of the project activities with more engagements and ownership by the CPs.

**Which practices proved not to be beneficial?**

Implementation of some project activity virtually/online due to the restrictions of the COVID-19 pandemic was not perceived as effective and useful as physical ones by the CPs. Planning meetings to evaluate the feasibility of virtual delivery will help.

**What was learned about partnership(s) with other stakeholders, if any?**

Continuous and coherent engagement of all project stakeholders proved beneficial during implementation of project. Frequent communication between the project teams can assist in understanding the challenges to meet the project outcome.

**Recommendations**

1. As the COVID-19 pandemic has affected implementing face-to-face events, and several events are postponed. Therefore, it is proposed to hold project planning meetings with CPs to evaluate project activities on what can or cannot be implemented virtually. This will be helpful to recalibrate the delivery of activities for effective implementation.
2. An extended support from IAEA is required to continue in enhancing level of operational safety and reliably for NPPs.