Integrated Nuclear Infrastructure Review

An IAEA peer review service to assist Member States in the introduction or expansion of nuclear power programmes

IAEA
International Atomic Energy Agency

Integrated Nuclear Infrastructure Review (INIR) in numbers: ***August 2009–March 2020***

21 Member States hosted INIR missions

68 IAEA experts participated in INIR missions, supported by

22 external experts from **13** Member States

30 **INIR missions**

25 Main INIR missions

5 Follow-up missions

	Phase 1	Phase 2	Phase 3
MISSIONS	16	12	2

IAEA Milestones Approach

3 **Phases:** consider, prepare, construct

3 **Milestones:** decide, contract, commission and operate

19 **Nuclear infrastructure issues**

Integrated Nuclear Infrastructure Review (INIR)

Introduction

Today, nuclear power produces about 10% of the world's electricity, accounting for around one third of all low carbon electricity. Thirty countries operate nuclear power plants, including several that are planning to expand their nuclear fleet. Another 30 or so countries are considering or embarking on new nuclear power programmes as they regard nuclear power as a clean and reliable source of electricity generation, which can make a significant contribution to their economic development and to mitigating climate change.

Launching a new nuclear power programme is a major undertaking. It should be based upon a commitment to use nuclear power for peaceful purposes in a safe, secure and sustainable manner. It requires a sustainable national infrastructure that provides governmental and institutional, legal, regulatory, managerial, technological, human resource, industrial and stakeholder support throughout the life cycle of the nuclear power programme. The adherence to international legal instruments, adoption of internationally accepted standards to ensure high levels of nuclear safety, security and safeguards is also essential in establishing a responsible programme. Experience suggests that a nuclear power programme involves 10–15 years of preparatory work and a commitment of at least 100 years.

It is the sovereign decision of each country whether to include nuclear power in a national energy mix. However, when countries proceed with this option, the IAEA supports them through a variety of activities and services to do so safely, securely and sustainably.

In response to growing demand by embarking countries for advice and assistance, the IAEA developed the **Milestones Approach** (see p. 7) to assist countries that are considering or planning their first nuclear power plant to understand the commitments and obligations associated with developing a nuclear power programme. This approach is set out in the IAEA publication *Milestones in the Development of a National Nuclear Infrastructure for Nuclear Power.*

IAEA's INIR Service

The INIR service, established in 2009, provides Member States with an opportunity to evaluate the status of their national nuclear infrastructure on the basis of the Milestones Approach and the associated 19 infrastructure issues (see p. 8). The evaluation methodology used is documented in the IAEA publication *Evaluation of the Status of National Nuclear Infrastructure Development*. Upon invitation of a Member State, an INIR mission is conducted by a team of IAEA and international experts who have experience in nuclear power programmes and infrastructure development.

An INIR mission enables a Member State to have in-depth discussions with international experts about experiences and best practices in nuclear power infrastructure development. Recommendations and suggestions are provided to the Member State to support the development of a national action plan to address the gaps identified.

By providing a comprehensive assessment of all facets of a nuclear power programme, INIR is a valuable tool to ensure that the infrastructure required for the safe, secure and sustainable use of nuclear power is developed and implemented in a responsible and orderly manner.

Benefits of INIR

The key benefits of the INIR service are:

- Providing Member States with an opportunity to evaluate their nuclear power programme on the basis of the Milestones Approach;
- Drawing attention to areas requiring additional work;
- Providing a forum for peer discussion and exchange of experiences on infrastructure development;
- Helping Member States to increase the understanding of the required infrastructure among all national stakeholders;
- Making available an independent peer review report on the status of the national infrastructure to senior officials of the host country.

It should be noted that the INIR service is not an audit or inspection against established requirements; or a detailed assessment or verification of specific activities.

"The UAE is rapidly moving forward with the development of its peaceful nuclear energy sector. The successful conclusion of the Phase 3 INIR mission is a testament to the UAE's commitment to upholding the highest international standards of safety, security, and transparency as we approach the commissioning of the nation's first nuclear energy plant."

Ambassador Hamad Alkaabi, Permanent Representative of the United Arab Emirates to the IAEA, Abu Dhabi, United Arab Emirates; IAEA press release, 1 July 2018

INIR Team

Upon official request by a Member State the IAEA appoints an INIR team leader and a mission coordinator. The host country identifies counterparts for the preparatory work and for conducting the INIR mission.

Typically, eight to twelve experts are selected for the INIR team in consultation with the host country. The team includes professional staff from across the IAEA, namely, the Department of Nuclear Energy, Department of Nuclear Safety and Security, Department of Safeguards and the Office of Legal Affairs, as well as experienced external experts.

Funding

INIR missions are funded through the IAEA Technical Cooperation Programme, extrabudgetary contributions from the Peaceful Uses Initiative (PUI) and cost sharing by the host Government.

IAEA and external experts in discussion with officials from Bangladesh during an INIR follow-up mission, May 2016. (Photo: IAEA)

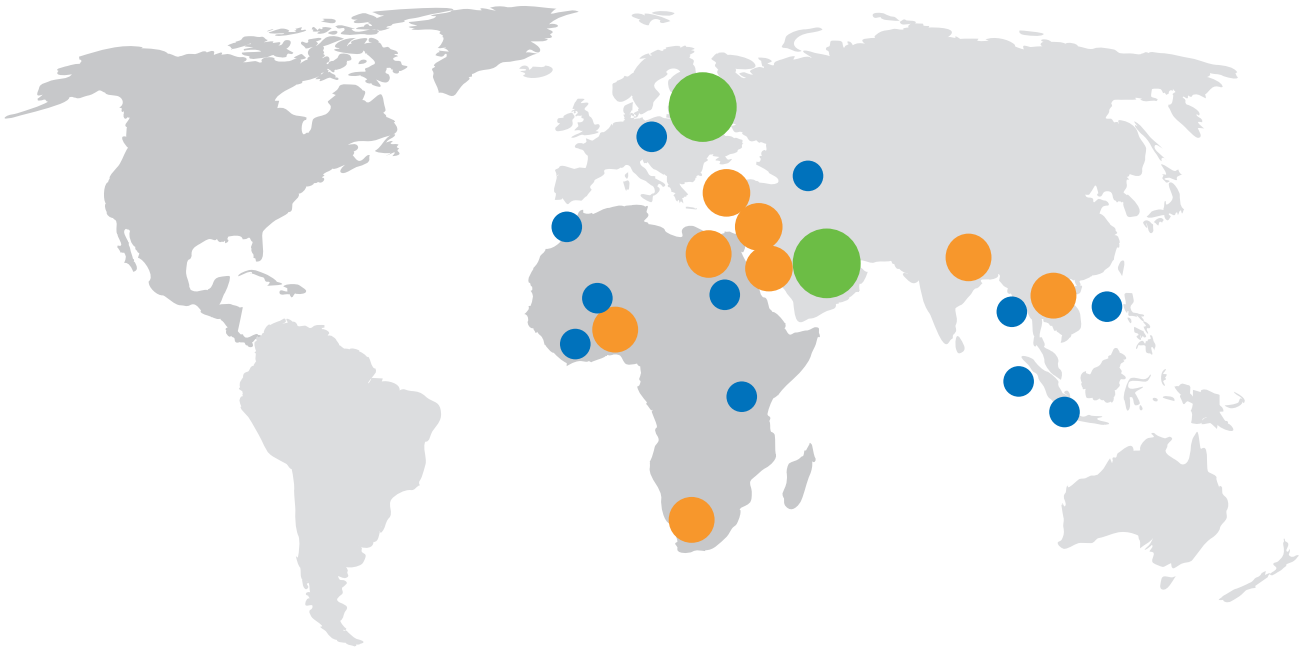
INIR missions in Member States

Between 2009 and March 2020, the IAEA conducted 30 INIR missions for the different phases of developing a nuclear power programme upon the invitation of 21 Member States:

Bangladesh, Belarus, Egypt, Ghana, Indonesia, Jordan, Kazakhstan, Kenya, Malaysia, Morocco, Niger, Nigeria, the Philippines, Poland, Saudi Arabia, Sudan, Thailand, Turkey, the United Arab Emirates, Viet Nam and South Africa, an operating country.

Twenty-five INIR missions and five follow-up missions were conducted so far, including 13 INIR missions in countries preparing for a final decision to proceed with the programme (Phase 1 of the Milestones Approach) and ten missions to countries preparing the infrastructure to start construction (Phase 2 of the Milestones Approach). The United Arab Emirates and Belarus hosted Phase 3 INIR missions to assess their readiness for commissioning and operating their first nuclear power plants.

Integrated Nuclear Infrastructure Review Missions 2009–2020



INIR - 1

Ghana (2017, 2019*); Indonesia (2009); Jordan (2009, 2012*); Kazakhstan (2016); Kenya (2015); Malaysia (2016); Morocco (2015); Niger (2018); Philippines (2018); Poland (2013, 2016*); Sudan (2018); Thailand (2010); Viet Nam (2009)

INIR - 2

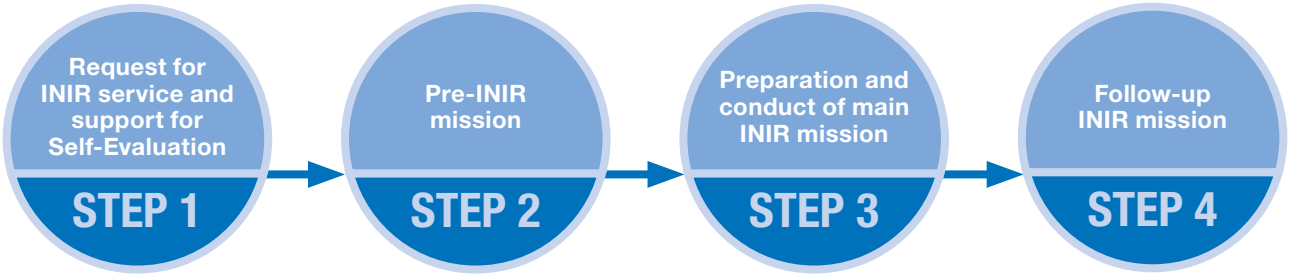
Bangladesh (2011, 2016*); Belarus (2012); Egypt (2019); Jordan (2014); Nigeria (2015); Saudi Arabia (2018); *South Africa (2013);* Turkey (2013); United Arab Emirates (2011); Viet Nam (2012, 2014*)

INIR - 3

Belarus (2020)
United Arab Emirates (2018)

* INIR follow-up missions

Structure of the INIR Service



The INIR service includes four steps, which are described in detail in the IAEA Services Series 34, *Guidelines for Preparing and Conducting an Integrated Nuclear Infrastructure Review (INIR).*

Step 1: Support for Self-Evaluation

The process starts with the country's self-evaluation of the status of its national nuclear infrastructure. This self-evaluation is based on the IAEA publication *Evaluation of the Status of National Infrastructure Development.* The IAEA then reviews the country's self-evaluation report (SER) in terms of being sufficient, complete and supported by relevant documents. If required, the IAEA may organize a mission to discuss with the Member State the sections of the SER requiring improvement.

"Ghana is committed to the careful step-by-step development of its nuclear power programme. The gaps identified by the mission will be tackled in earnest to enable the country to make a knowledgeable decision, as per its roadmap for nuclear power development."

Benjamin Nyarko, Director General, Ghana Atomic Energy Commission and Acting Chairman, Ghana Nuclear Power Programme Organisation, Accra, Ghana; IAEA press release, 23 January 2017

"The results from the INIR mission will help us focus our efforts on the identified gaps, accelerate the legislative process and prepare the national decision."

Alfonso Cusi, Secretary of Energy, Manila, the Philippines; IAEA press release, 17 December 2018

Step 2: Pre-INIR mission

Five to eight months before the INIR mission, the IAEA conducts a pre-INIR mission to the host country, where the review process is discussed. The terms of reference, the review team and logistical arrangements for the INIR mission are also agreed upon.

Step 3: Main INIR mission

The INIR mission is held over a period of seven to eleven working days, depending on the respective Milestones Phase. The review process is performed through interviews, held in plenary sessions. These interviews are based on the country's self-evaluation and their supporting documents. Representatives of all stakeholders involved in developing the national nuclear power programme take part in the discussions.

At the end of the mission, the findings are presented in a preliminary draft report, which includes recommendations and suggestions in areas requiring additional work to reach the corresponding milestone. Good practices, from which other embarking countries may benefit, are also identified.

Communication with the Media

The host country may decide to hold a press conference or invite the media to attend the entrance and exit meetings. In cooperation with the host country, the IAEA issues a press release at the end of the mission, summarizing the main findings.

INIR Mission Report

The IAEA Deputy Director General, Head of the Department of Nuclear Energy, or his/her representative, will deliver the final INIR report to designated officials of the host country about three to four months after the mission.

The IAEA publishes the INIR mission report on its website 90 days after delivery to the Member State, unless the country requests otherwise. A number of countries have agreed to have their INIR reports published, available at https://www.iaea.org/services/review-missions/integrated-nuclear-infrastructure-review-inir.

Hosting the INIR mission, Belarus demonstrated its transparency and genuine interest to receive an objective professional assessment of the readiness of its nuclear power infrastructure for the commissioning of the country's first nuclear power plant. The recommendations and suggestions will be an important guidance for our continuous efforts aimed at ensuring the highest level of safety and reliability of the Belarusian nuclear power plant."

Mikhail Mikhadyuk, Deputy Minister of Energy of the Republic of Belarus, Minsk, Belarus; IAEA press release, 3 March 2020

Step 4: Follow-up INIR mission

A Member State may wish to invite the IAEA to conduct a follow-up mission to assess the implementation of the recommendations and suggestions provided during the main mission. The timing, to be agreed with the Member State, is recommended to be 18–30 months after the main mission.

First INIR Mission in 2009: Khaled Toukan, Chairman of the Jordan Atomic Energy Commission (right) and Akira Omoto, former Director of the IAEA Division of Nuclear Power, Amman, Jordan, August 2009 (Photo: JAEC)

Nigerian Vice President Yemi Osinbajo and IAEA Deputy Director General Mikhail Chudakov in Abuja, with Nigeria Atomic Energy Commission and IAEA officials, at an INIR Mission to Nigeria, June 2015. (Photo: The State House)

Other IAEA Peer Review and Advisory Services

The IAEA offers several other services that support Member States in the introduction or expansion of nuclear power. While the INIR service covers the nuclear infrastructure development in a comprehensive way, addressing all 19 issues, other IAEA missions are usually related to individual issues, such as site and supporting facilities, regulatory framework or emergency planning. They include:

- Site and External Events Design Review Service (SEED)
- Integrated Regulatory Review Service (IRRS)
- Physical Protection Advisory Service (IPPAS)
- International State Systems of Accounting for and Control of Nuclear Material Advisory Service (ISSAS)
- Emergency Preparedness Review (EPREV) Service
- Pre-Operational Safety Review Team (Pre-OSART) Mission.

Continuing the IAEA's Support: Integrated Work Plans

The results of an INIR mission (or other review missions, when applicable) are expected to help Member States to develop or update its National Action Plan that details the necessary activities to move the nuclear power programme forward.

In 2011, the IAEA developed and adopted the concept of Integrated Work Plans (IWPs) which have proved to be a useful tool for planning, prioritizing, integrating and coordinating IAEA assistance for embarking countries.

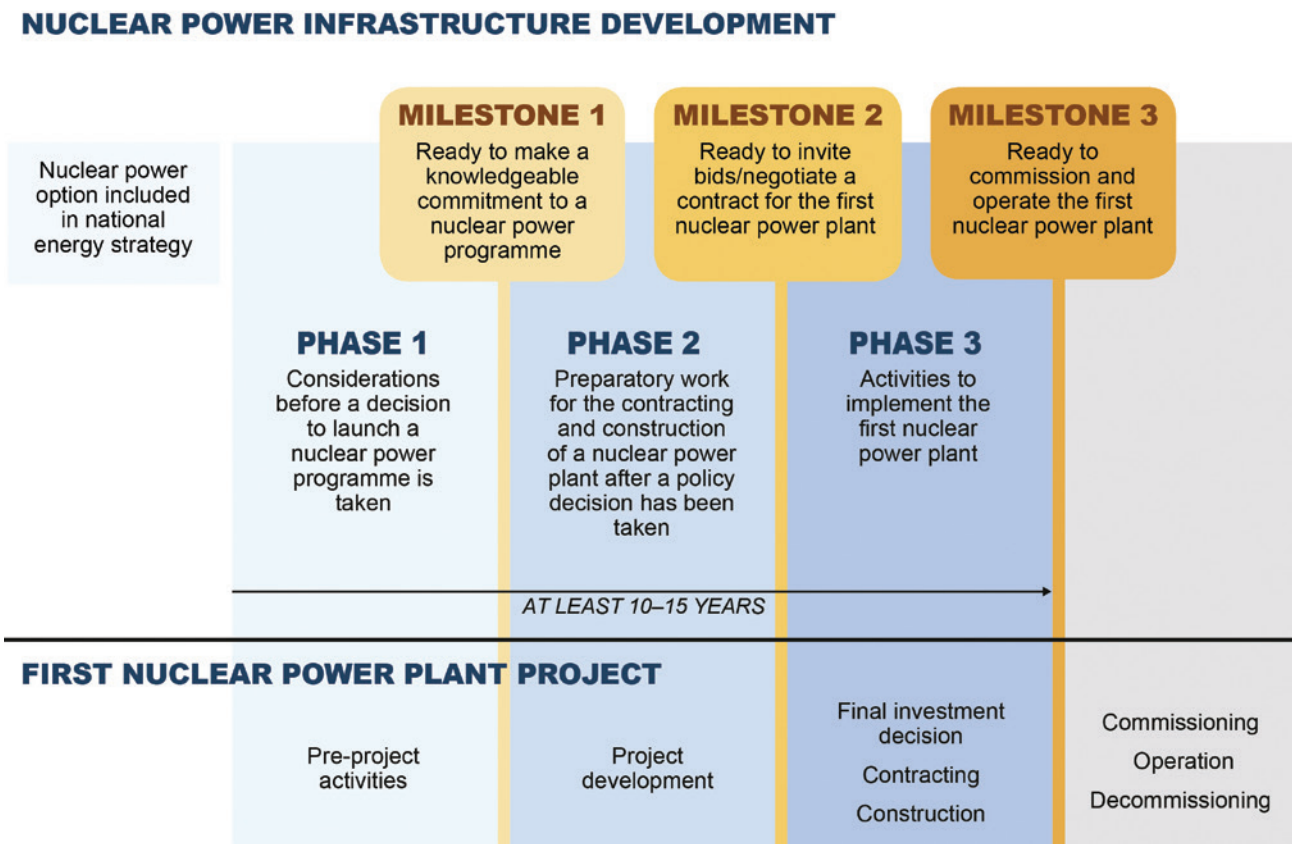
An IWP, jointly developed by the IAEA and the Member State, provides the framework for defining all IAEA assistance to support national activities for developing the nuclear power infrastructure. In meetings of IAEA staff and Member State representatives, the IWP is regularly updated and revised to reflect any changes, challenges and the evolving priorities. Integrated nuclear infrastructure training activities are defined that will benefit the country's programme developments, such as training courses, workshops, scientific visits and seminars, covering one or several of the 19 nuclear infrastructure issues of the Milestones Approach.

Belarus and the United Arab Emirates hosted the first Phase 3 INIR Missions. Both countries are close to commissioning and operating their first nuclear power plants. (Left: Ostrovets NPP, Belarus (Photo: Ministry of Energy); right: Barakah NPP, United Arab Emirates (Photo: ENEC)

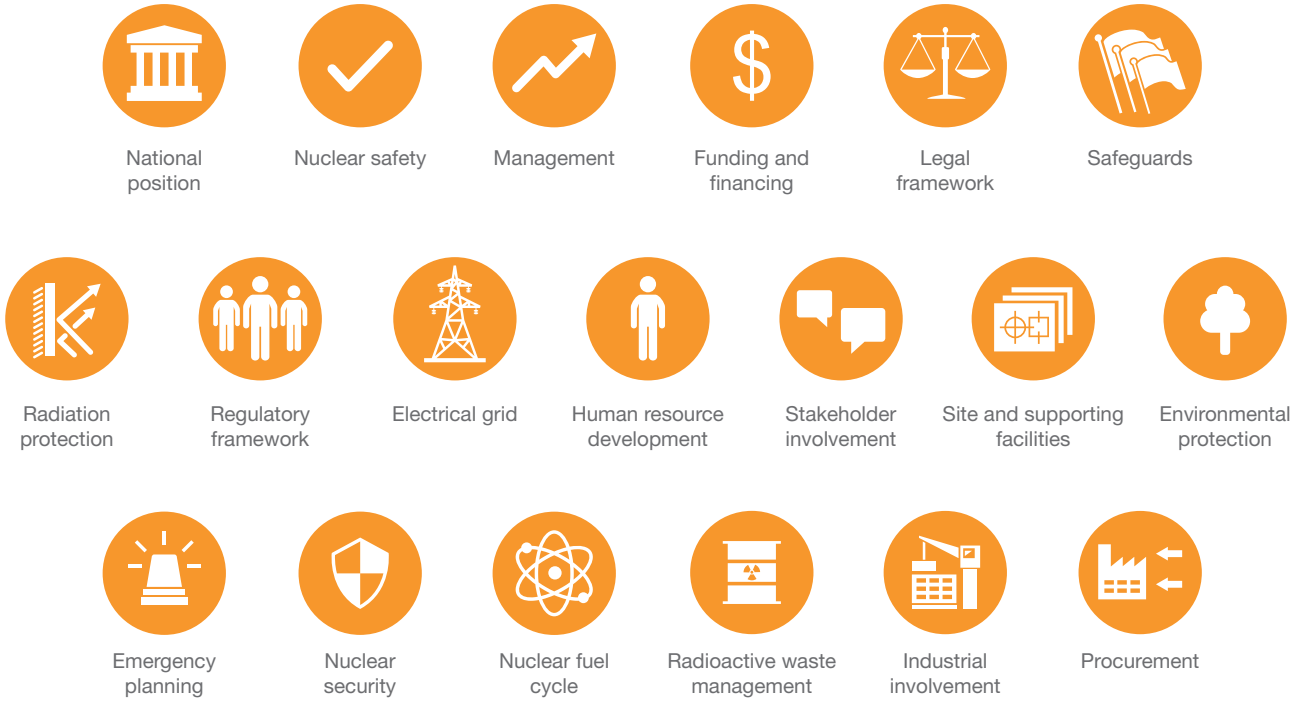
IAEA Milestones Approach

First published in 2007 and revised in 2015, the IAEA Milestones Approach supports countries in creating an enabling environment for a successful nuclear power programme and helps them to understand, and prepare for, the associated commitments and obligations. Documented in *Milestones in the Development of a National Infrastructure for Nuclear Power,* this result-oriented approach comprises three phases (consider, prepare, construct), three milestones (decide, contract, commission) and 19 infrastructure issues (see p. 8) to be addressed in each phase.

These nuclear infrastructure issues require specific actions during each of the three phases. Completion of the actions for a phase represents the achievement of the associated milestone. The order in which the 19 infrastructure issues are presented does not imply relative importance. All issues require appropriate attention.



The 19 Nuclear Infrastructure Issues of the IAEA Milestones Approach



Publications

- *Guidelines for Preparing and Conducting and Integrated Nuclear Infrastructure Review (INIR),* IAEA Services Series No. 34 (2017)
- *Evaluation of the Status of National Nuclear Infrastructure Development,* IAEA Nuclear Energy Series No. NG-T-3.2 (Rev. 1) (2016)
- *Milestones in the Development of a National Infrastructure for Nuclear Power,* IAEA Nuclear Energy Series No. NG-G-3.1 (Rev. 1) (2015)
- *Establishing the Safety Infrastructure for a Nuclear Power Programme,* IAEA Safety Standards Series No. SSG-16 (2012)
- *Establishing the Nuclear Security Infrastructure for a Nuclear Power Programme,* IAEA Nuclear Security Series No. 19 (2013)
- *Guidance for States Implementing Comprehensive Safeguards Agreements and Additional Protocols,* IAEA Services Series No. 21 (2012/updated 2016)
- *Safeguards Implementation Practices Guide on Establishing and Maintaining State Safeguards Infrastructure,* IAEA Services Series No. 31 (2018)

A comprehensive listing of all relevant IAEA publications and other material is available in the Nuclear Infrastructure Bibliography:

https://www.iaea.org/topics/infrastructure-development/bibliography

INIR Missions in Pictures

The INIR Mission to South Africa, February 2013, was the first one to an operating country and the first to Africa. (Photo: IAEA)

Turkey hosted an INIR mission in November 2013. (Photo: MENR)

IAEA and external experts at the INIR Mission to Niger, April 2018. (Photo: IAEA)

Interview session during the INIR follow-up mission to Ghana, October 2019. (Photo: GNPPO)

M. Shaker El-Markabi, Egypt's Minister of Electricity and Renewable Energy (centre) and D. Hahn, Director, IAEA Division of Nuclear Power, with national nuclear authorities officials at an INIR mission to Egypt, October 2019. (Photo: NPPA)

Exit meeting at the INIR Mission to Belarus, March 2020. (Photo: IAEA)

For More Information

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