Webinar **#1**

The **IAEA Milestones Approach** and **Key Organizations** involved in the development of a **nuclear power programme**

IAEA Nuclear Infrastructure Development

IAEA Milestones Approach and Key Organizations involved in the development of a nuclear power programme

Marta Kaczmarek

Nuclear Infrastructure Development Section
IAEA Department of Nuclear Energy

Learning Objectives

- Increase your awareness of the IAEA Milestones Approach and its three phases, three milestones, and 19 related nuclear infrastructure issues;
- Strengthen your knowledge about international obligations and commitments associated with introducing nuclear power, and the need for a well-coordinated national effort to establish a successful nuclear power programme, and
- Gain a general understanding of the roles and responsibilities of the key organizations involved in establishing a nuclear power programme in each phase of the Milestones Approach: Nuclear Energy Programme Implementing Organization (NEPIO), Regulatory Body, and Owner-Operator.

IAEA Milestones Approach and Key Organizations involved in the development of a nuclear power programme

Milko Kovachev
NIDS, IAEA

Sharaf Al-Sharif
KA CARE, Saudi Arabia

Pal Kovacs
Prime Minister's Office, Hungary

Poll Time

Where do you work?

- Government
- Nuclear Regulatory Body
- Owner/Operator
- NEPIO: Nuclear Energy Programme Implementing Organization
- NGO
- Academia
- Research Institution
- International Organisation
- Media
- Private Sector-non-nuclear
- Other

Milko Kovachev

- Section Head, Nuclear Infrastructure Development Section, IAEA
- Over 35 years of experience in the nuclear energy management
  - Government decision-making role
  - Vendor experience
  - International financial institutes and consultancies
- Master's degree in Mechanical (Nuclear) Engineering from the Technical University of Sofia, Senior Reactor Operator license at Kozloduy NPP

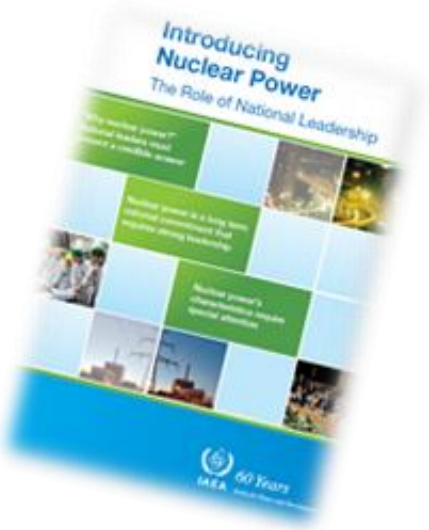
IAEA
International Atomic Energy Agency

The IAEA Milestones Approach and an overview of the Key Organizations involved in a new nuclear power programme

Milko Kovachev
Head: Nuclear Infrastructure Development Section
Division of Nuclear Power - Department of Nuclear Energy

Considerations for Nuclear Power

- Adherence to international legal instruments on nuclear safety, security, safeguards, liability
- Ensure internationally-accepted standards of safety, security



- ~100 year commitment
- Strong national leadership, coordination and broad political and popular support

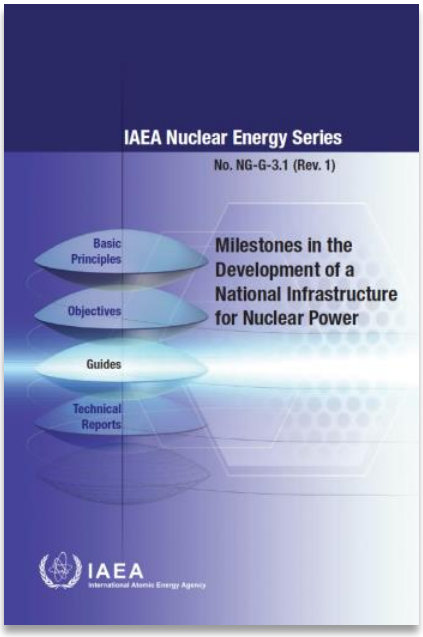
IAEA Milestones Approach

The IAEA has developed the Milestones Approach to assist Member States introducing a nuclear power programme or expanding an existing one

The national nuclear infrastructure required to support the programme ranges from

'**softer**' areas, such as laws, institutions, regulations, international legal instruments, human resources, and stakeholder involvement

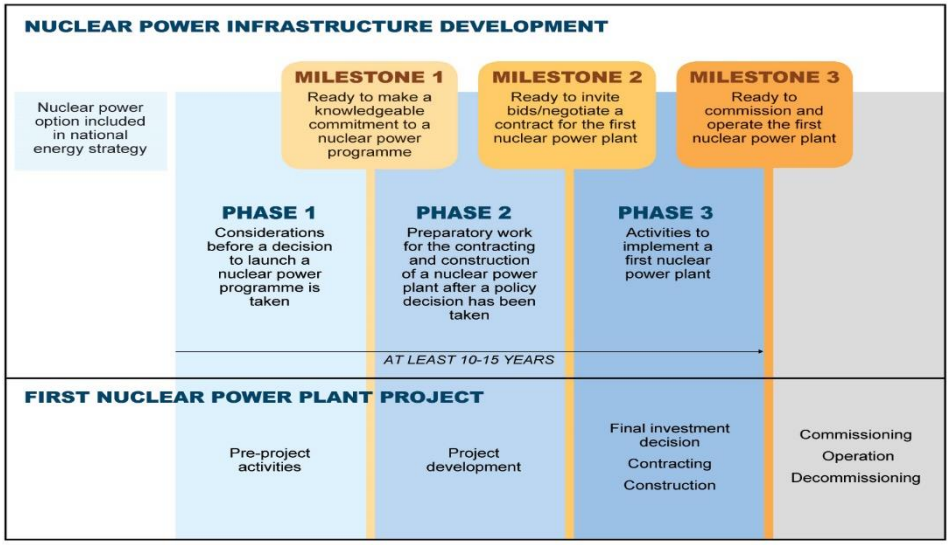
to the '**hard**' (or physical) aspects of infrastructure, such as the capacity and quality of the electricity grid, available sites, transport system and the local industrial base



NG-G-3.1 issued in 2007
Updated in 2015

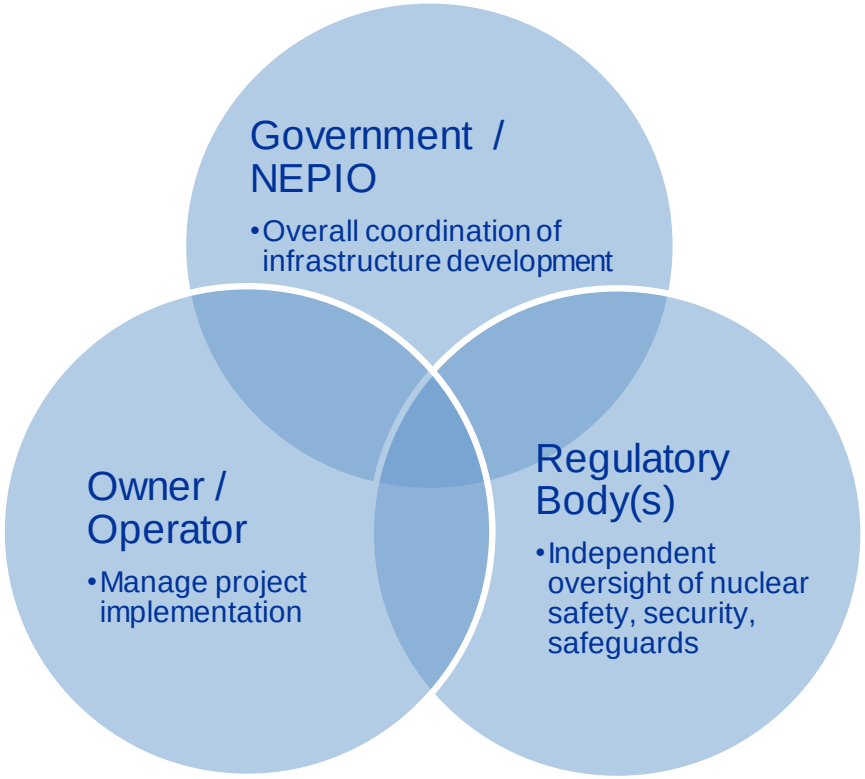
IAEA Milestones Approach

- 3 Phases (Consider – Prepare – Construct)
- 3 Milestones (Decide – Contract – Commission)



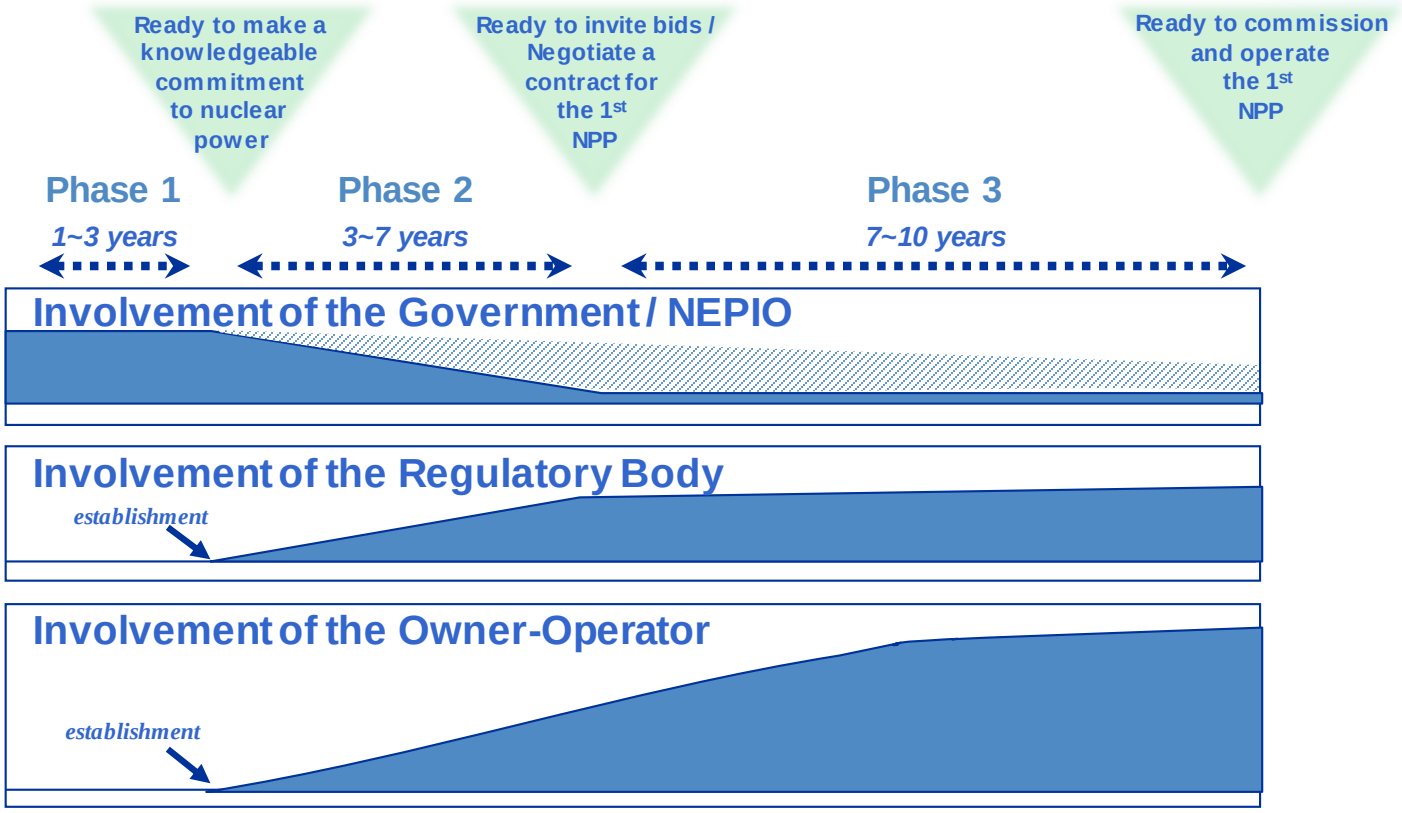
- 19 Infrastructure Issues

Three key organizations



NEPIO: Nuclear Energy Programme Implementation Organization

Building institutions



Indicative timing – actual experience could be different

Summary

- The phased IAEA Milestones Approach helps Member States streamline their efforts in developing nuclear power programmes in a safe, secure and sustainable manner
- 3 key organizations are involved:
  - Government / NEPIO
  - Regulatory Body
  - Owner-Operator of the NPP
- The roles and responsibilities of the three key organizations change as the programme progresses through the three phases of the Milestones Approach
- All three organizations are needed for a safe, secure and sustainable nuclear power programme


IAEA
International Atomic Energy Agency
Atoms for Peace and Development

Thank you!

Sharaf Al-Sharif

- Head of the Atomic Energy Sector at K.A.CARE
- Oversees the development of K.A.CARE's National Nuclear Infrastructure Development program
- Lead or contributed to several techno-economic feasibility studies related to nuclear energy technologies carried out by K.A.CARE
- PhD in Mechanical Engineering from the University of Manchester, UK, 2010. MSc in Fluid Dynamics, University of Manchester, 2005.

The Experience of Saudi Arabia in Developing a National Nuclear Infrastructure

Sharaf F. Al-Sharif

Head of the Atomic Energy Sector

King Abdullah City for Atomic and Renewable Energy

Kingdom of Saudi Arabia

Content:

1. Introduction and Background
2. Program Overview and Structure
3. Program Monitoring and Control
4. IAEA support
5. Takeaways

1. INTRODUCTION AND BACKGROUND

Introduction

- **Why does Saudi Arabia want to introduce nuclear energy into its national energy mix?**

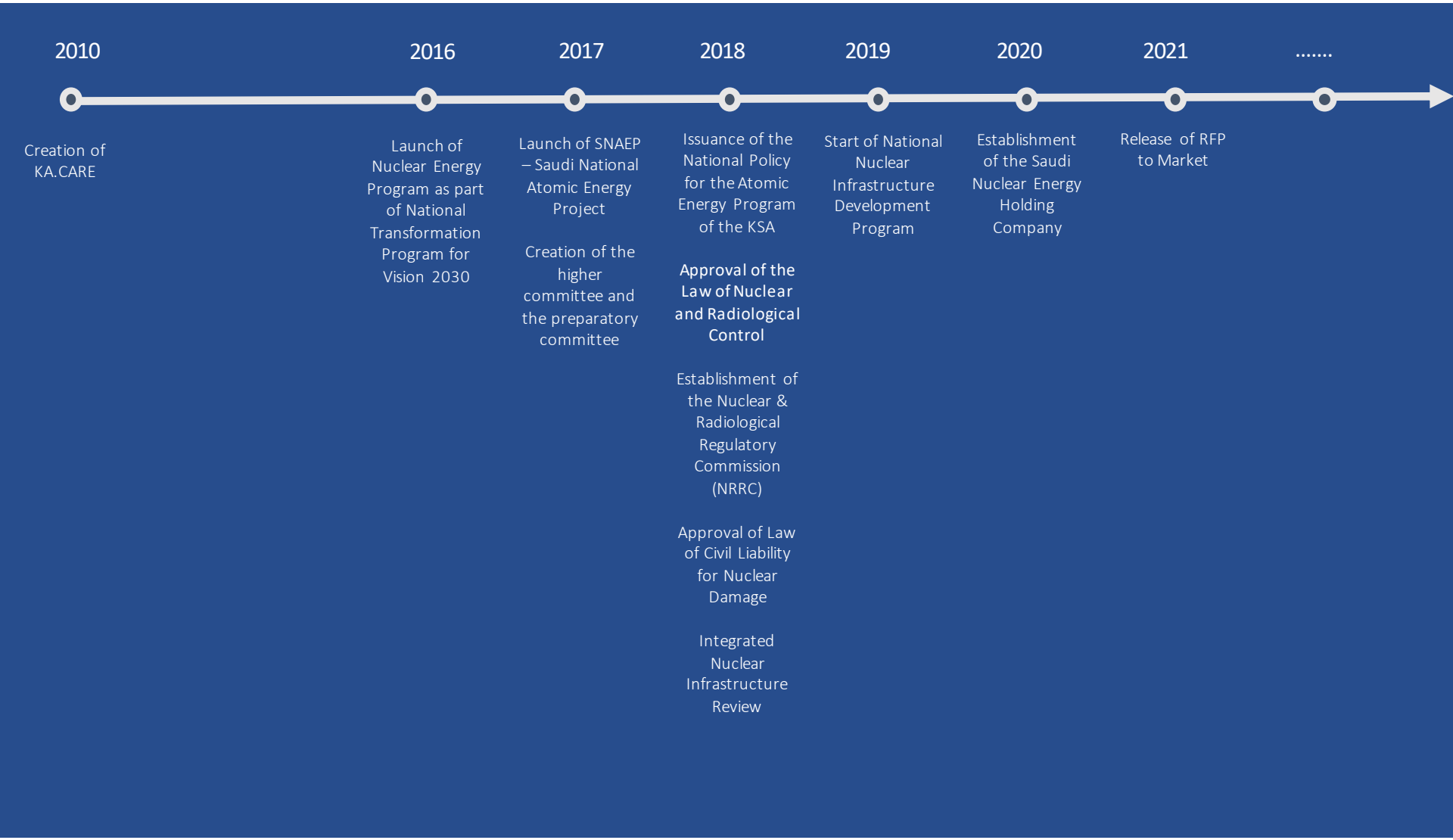
  Diversification of energy sources

  Decrease reliance on Oil & Gas for domestic consumption

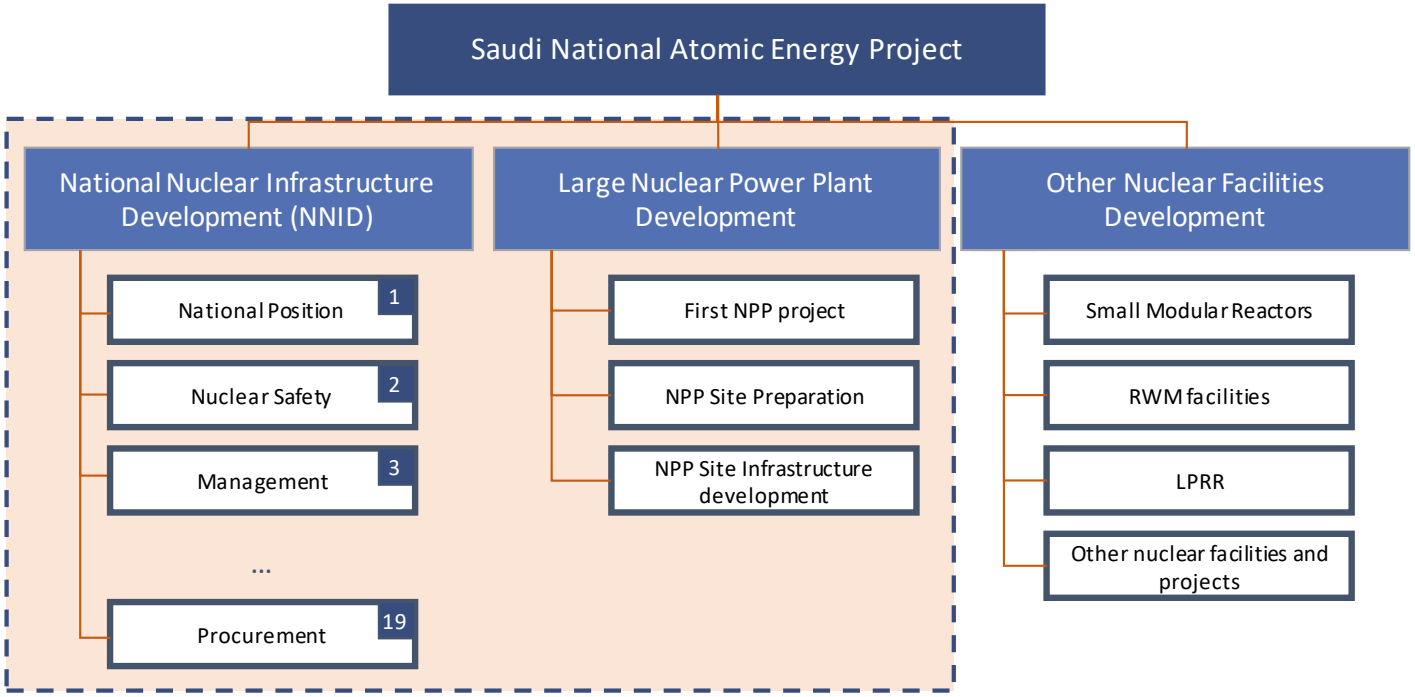
- **Creation of K.A.CARE in 2010 and its Mandate**

  "sources for sustainable and reliable electricity generation and desalinated water production that reduces the reliance on hydrocarbon resources and thus provides an additional guarantee for the production of water and electricity in the future and prolongs at the same time hydrocarbon resources to keep them a source of income for a longer period"

Nuclear Energy Program Timeline

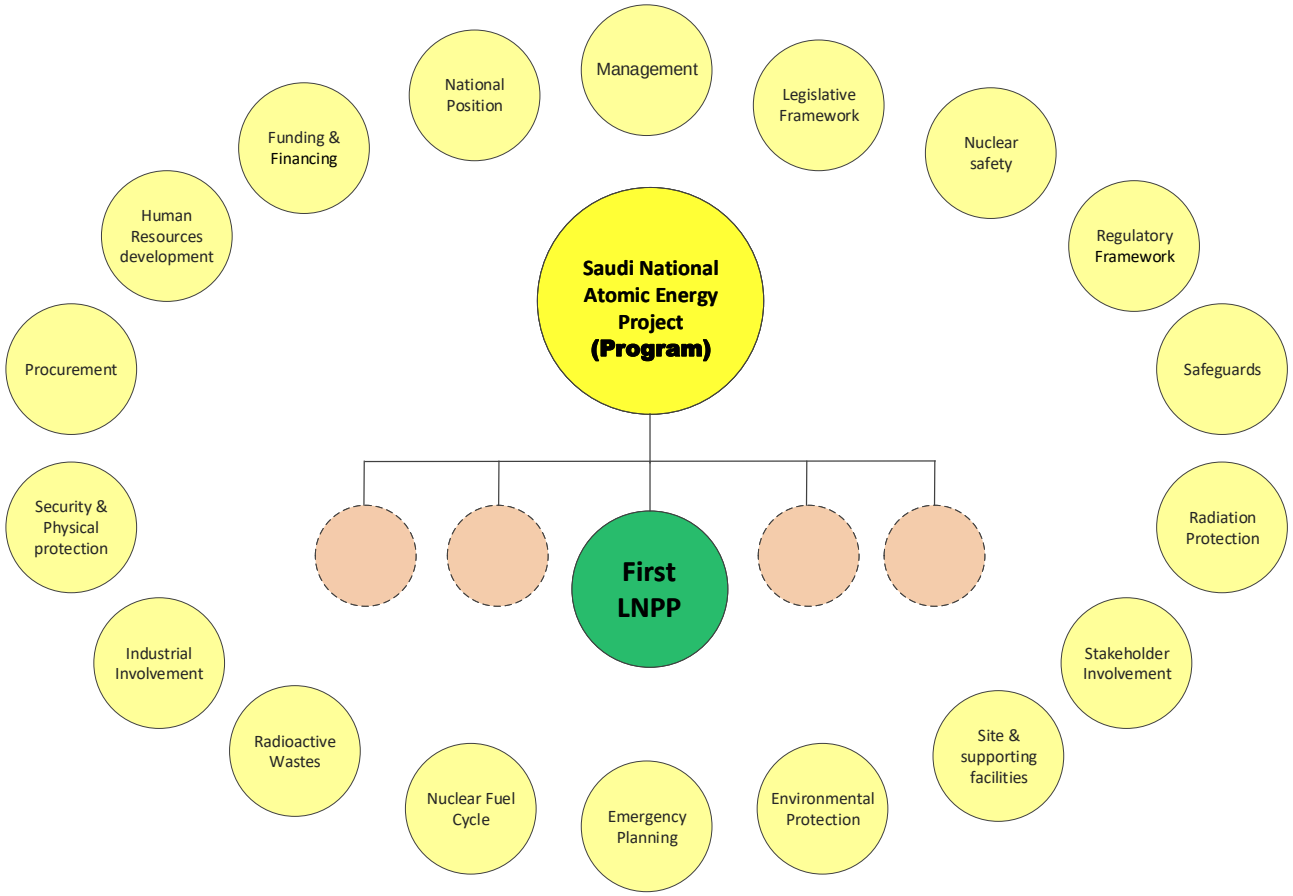


SNAEP Structure

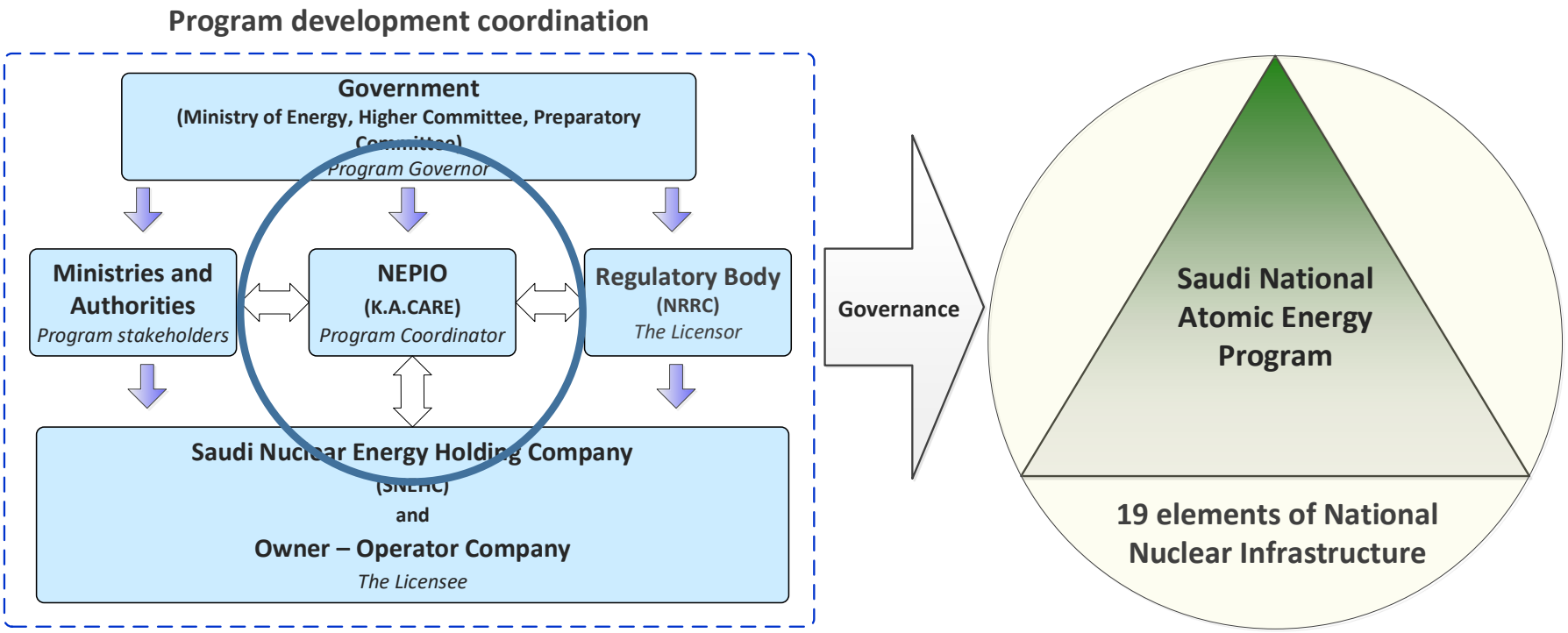


2. NNID PROGRAM OVERVIEW AND STRUCTURE

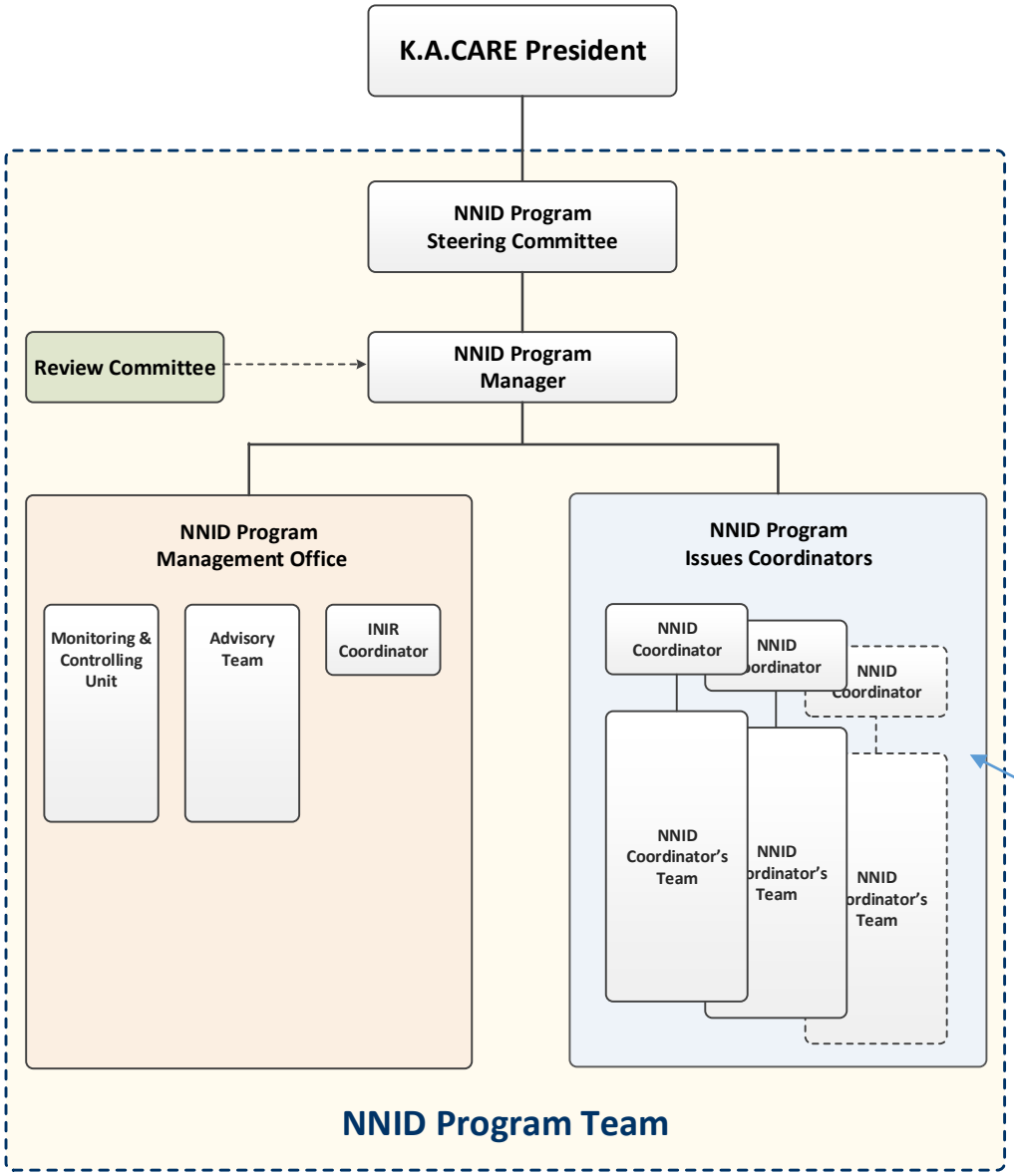
SNAEP Overview



SNAEP development coordination – Main Stakeholders

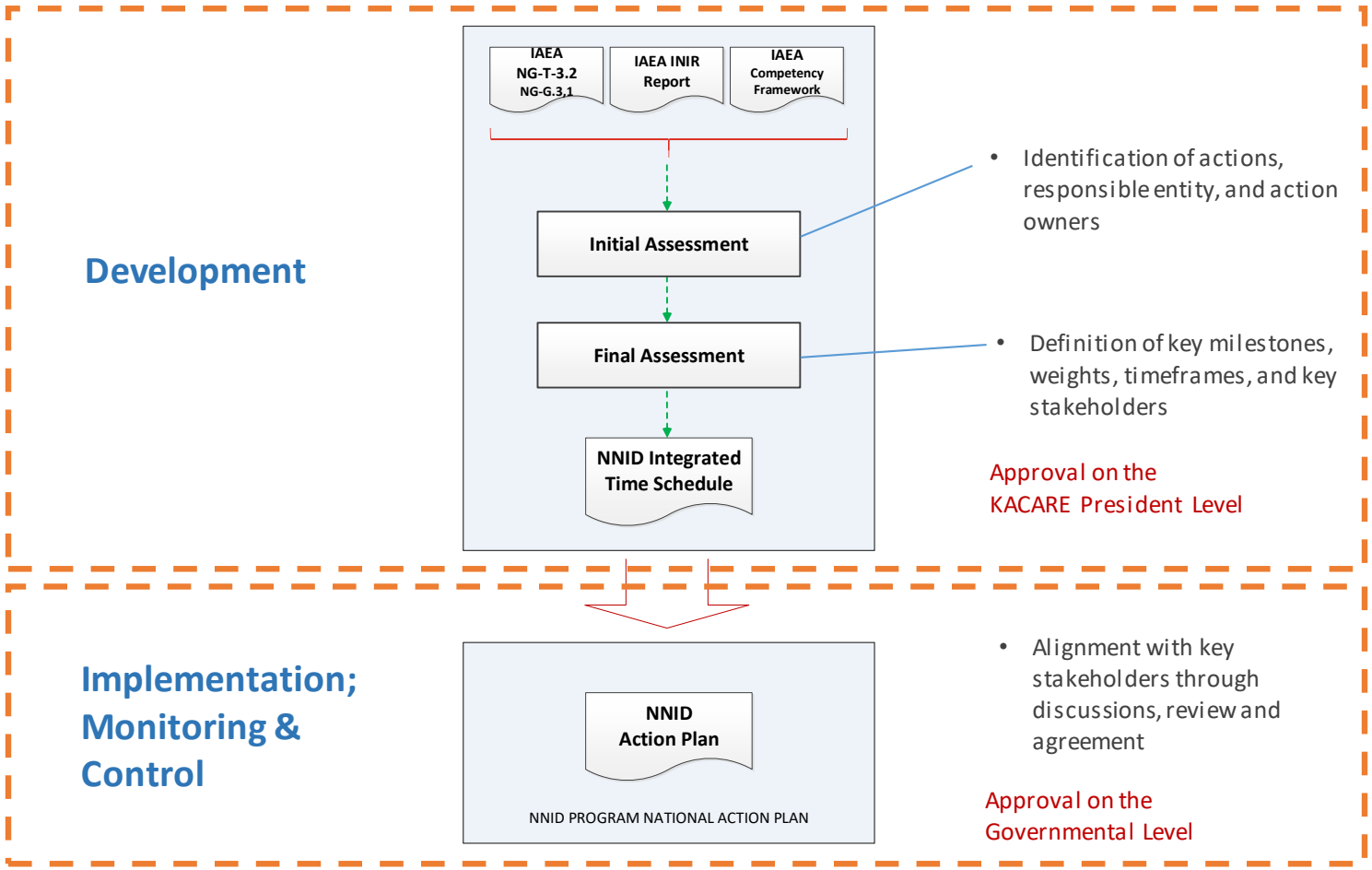


NNID Structure



	NNID Issue	K-A-CARE Coordinator	K-A-CARE Deputy Coordinator	NRRC Representative
1	National position	Saleh AlHarbi	Abdulrahman AlAti	Fahad AlZakari
2	Nuclear safety	David Watson	Fares AlBlouwy	Fahad AlZakari
3	Management	Ali Albassami	Rubaian AlShahrani	Yousef AlZeyadi
4	Funding and financing	Abdulmalik AlSabery	Mishari AlDosari	Abdullah Althomali
5	Legal framework	Abdullah AlSaif	Abdulkarem Fall	Muqrin Alshaykh
6	Safeguards	Ali AlDhahri	Fares AlTuwaijri	Abdulaziz Zubaqni
7	Regulatory framework	David Watson	Talal AlHarbi	Muqrin Alshaykh
8	Radiation protection	Abdulmohsen AlSufyani	Luai Badghaish	Abdulaziz Bin Shaman
9	Electrical grid	Abdulwahab AlShehri	Ahmad AlRizq	TBD
10	Human resource development	Kim Pringle	Fahad AlYabel	Abdullah Althomali
11	Stakeholder involvement	Mishari AlDosari	Ali Albassami	Abdullah Althomali
12	Site and supporting facilities	Naif AlRomaih	Thamer AlSulaiman	Omar Khamis
13	Environmental protection	Ashraf Mohammed	Faris AlHawsawi	Bassam Alqahtani
14	Emergency planning	David Watson	Fares AlBlouwy	Abdulrahman Alarfaj
15	Nuclear security	Abdullah AlBugami	Ali AlDhahri	Ghannam Alanazi
16	Nuclear fuel cycle	Ahmed AlSufyan	Saud AlShikh	TBD
17	Radioactive waste management	Mohammad AlQahtani	Rubaian AlShahrani	TBD
18	Industrial involvement	Mohammad Zakri	Abdulelah Abobakr	TBD
19	Procurement	Abdulaziz AlSheddi	Abdulmajeed AlAbdulJabbar	No representative

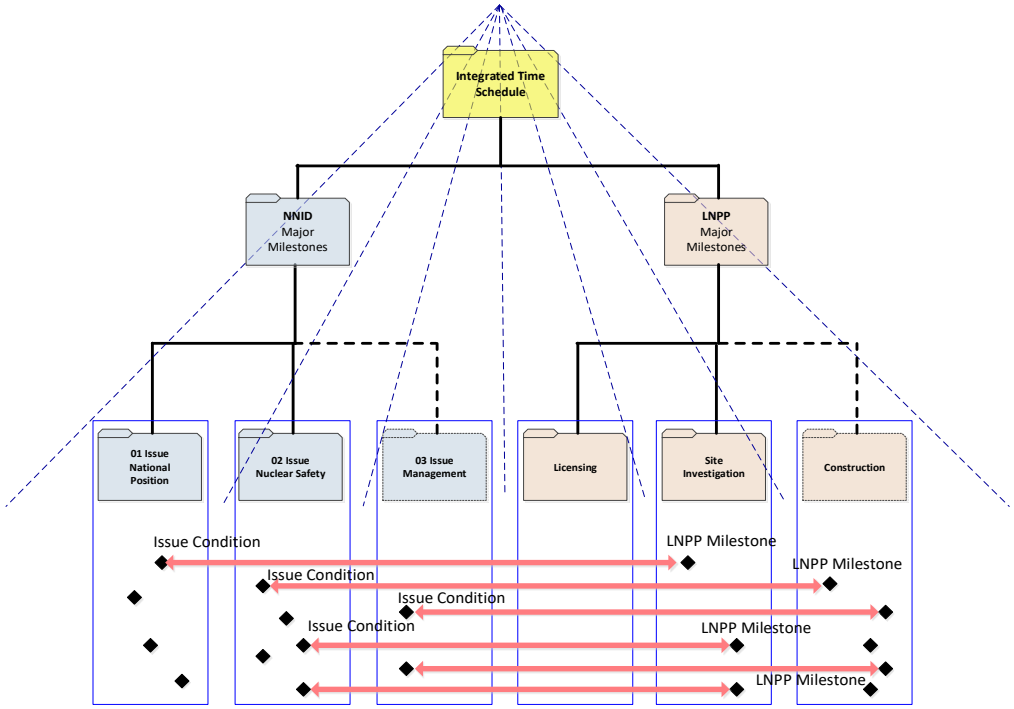
Action Plan development



3. PROGRAM MONITORING AND CONTROL

Management Aspects of NNID Program

- Integration with LNPP schedule
- Clear roles and responsibilities for coordinators and related committees
- Defined mechanism for planning, monitoring, and control
- Governance & Escalation process to ensure timely implementation of actions and resolving any issues
- Engagement of key stakeholders through high-level committees as well as Joint Working Groups



Page 1 of 1
Data Date : 24-Jul-18
Print Date: 25-Feb-20

National Nuclear Infrastructure Development (NNID) Final
National Nuclear Infrastructure

Approved : .....
Date: .....

Activity ID	Activity Name	Duration (Months)	Start	Finish
	National Nuclear Infrastructure Development (NNID)	241	19-Apr-18 A	30-Dec-36
	Major Milestones	241	19-Apr-18 A	30-Dec-36
	Issue 01: National Position	80	24-Jul-18	31-Mar-25
	Issue 02: Nuclear safety	38	24-Jul-18	30-Sep-21
	Issue 03: Management	68	26-Sep-18	11-Dec-23
	Issue 04: Funding and Financing	29	24-Jul-18	31-Dec-20
	Issue 05: Legal Framework	24	24-Jul-18	22-Jul-20
	Issue 06: Safeguards	78	16-Oct-18	30-Apr-25
	Issue 07: Regulatory Framework	48	24-Jul-18	31-Jul-22
	Issue 08: Radiation protection	84	01-Jan-19	31-Dec-25
	Issue 09: Electrical Grid	71	02-Jun-19	14-May-25
	Issue 10: Human Capacity Building	41	19-Feb-19	14-Apr-22
	Issue 11: Stakeholder Involvement	24	01-Jan-19	31-Dec-20
	Issue 12: Site and Supporting Facilities	33	01-Jan-19	28-Jun-21
	Issue 13: Environmental protection	35	24-Jul-18	04-Apr-21
	Issue 14: Emergency planning	35	24-Jul-18	30-Jun-21
	Issue 15: Nuclear Security	48	01-Jan-19	29-Dec-22
	Issue 16: Nuclear Fuel Cycle	51	24-Jul-18	24-Oct-22
	Issue 17: Radioactive waste management	27	01-Jan-19	31-Mar-21
	Issue 18: Industrial Involvement	59	24-Jul-18	29-Jun-23
	Issue 19: Procurement	27	01-Oct-19	20-Dec-21

SNAEP Dashboard development – Main preconditions

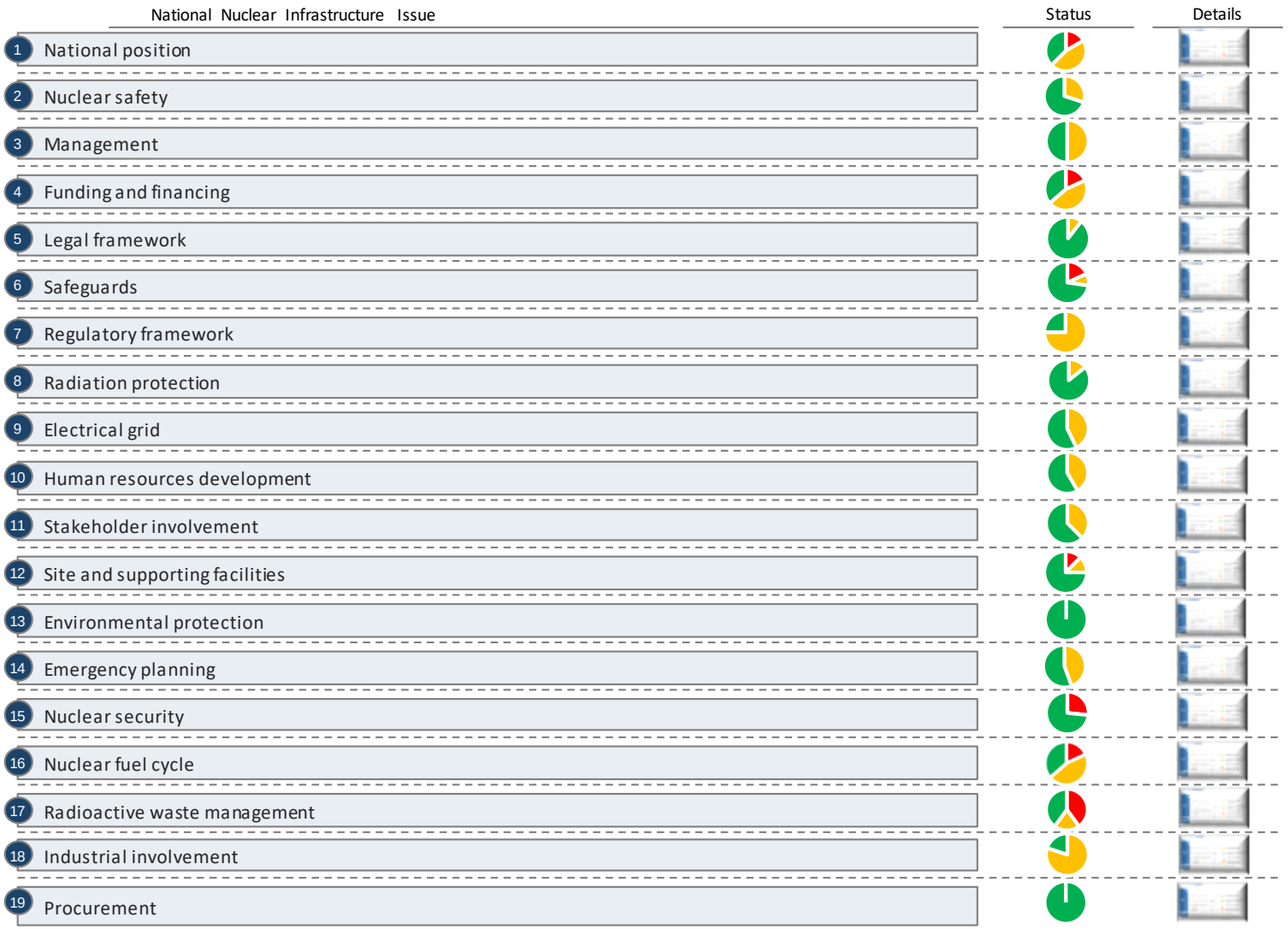
- Dashboards
- Monthly Progress Reports
- Quarterly Progress Reports

- Integrated Time Schedule
- Planning and Controlling as part of the Program Management Office
- Planning, controlling and reporting processes established

- SNAEP Structure: NNID and LNPP
- KACARE Organizational Structure – Program Management Office
- KACARE Process Model and Management processes
- KACARE Responsibility Assignment Matrix

NNID Status Level 1

(Example for illustration only)



4. IAEA SUPPORT

IAEA Support

- **Implementation of INIR**

Emphasized understanding of Nuclear Infrastructure vs. NPP project development

- **Implementation of the Integrated Work Plan**

Structured way of cooperation focusing on areas that need improvement

- **References** (Quick access to information on NID and relevant areas)
  - the IAEA Nuclear Infrastructure Competency Framework
  - Nuclear Infrastructure Bibliography

5. KEY TAKEAWAYS

Key Takeaways

- The **Milestones Approach** along with the **issues** and **conditions** can be used as the basis for an effective **program management tool**
- Developing nuclear infrastructure is the **enabler** for the NNP project, and therefore work must begin **well in advance** of it.
- The NEPIO needs to be empowered to enlist and **coordinate** the work of other government entities.
- Good **project** and **program management** practices are essential in planning, implementing, and monitoring progress of Nuclear Infrastructure development.
- It is essential to develop a **management system for the NEPIO** in order to execute its function during different phases, specially during Phase 2, where close and timely coordination is necessary.

Poll Time

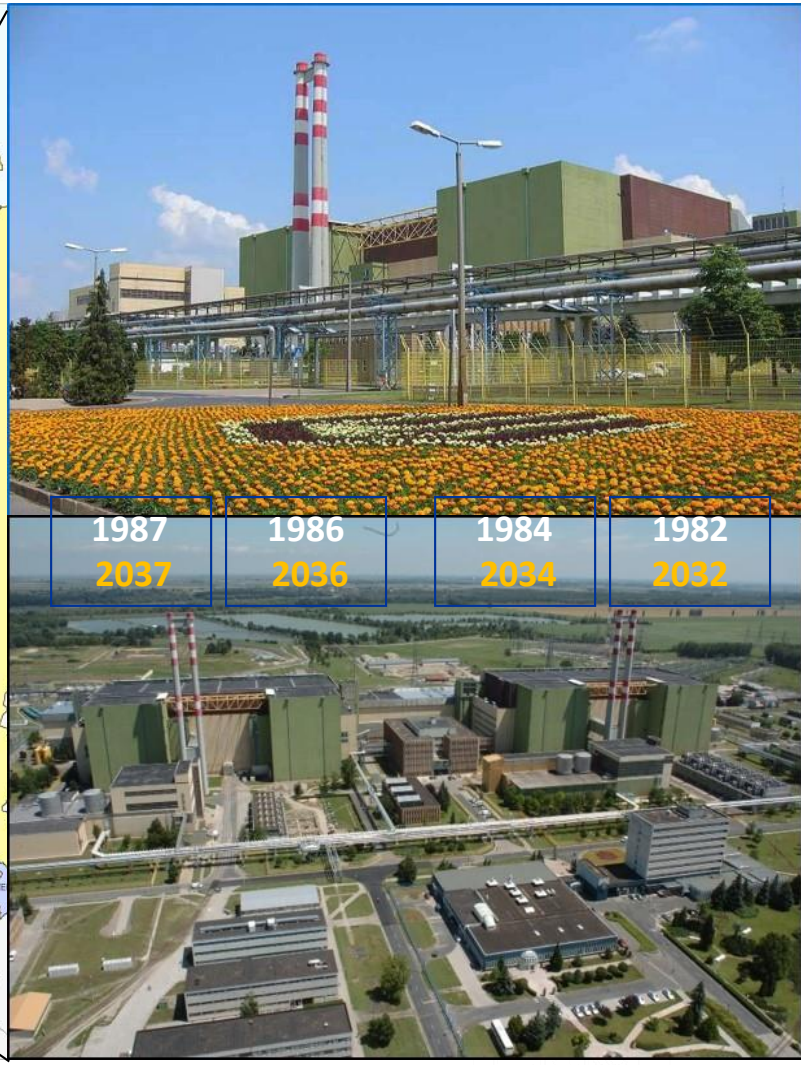
Which of the following is the leading organization in the development of a national nuclear power programme?

- Owner-Operator of the Nuclear Power Plant
- Nuclear Regulatory Body
- Government / NEPIO
- Each of those
- International Atomic Energy Agency (IAEA)
- Don't know

Pal Kovacs

- State Secretary responsible for maintaining the capacity of the Paks Nuclear Power Plant (“Paks-2 Project”)
- Over 30 years of experience in the nuclear energy management
  - Government decision-making role
  - Owner / Operator experience
  - International organisations service
- Degree in Engineering (Thermal Physics) from the Moscow University of Energy, Degree in Economy from Foreign Trade College

Hungary



- Nuclear share in electricity production: 49%
- Nuclear share in electricity consumption: 36%

- No.1 Infrastructure element: Paks I. (4 units in operation)

Extensive nuclear industry and an advanced regulatory environment in Hungary

Infrastructure Issues
No. 1 – National position
No. 5 – Legal framework
No. 7 – Regulatory framework
No. 16 – Nuclear fuel cycle
No. 17 – Radioactive waste management

5 additional nuclear facilities:

- Budapest Research Reactor
- BME – Training Reactor
- Spent fuel interim storage facility
- Geological repository for LLW / ILW
  - Püspökszilágy
  - Bátaapáti

Regulation:

- Atomic Act of 1996, Nuclear Safety Code
- Decommissioning Fund since 1998
- National policy and program on radioactive waste management (EU-requirement)

R&D & Education:

- Energy Research Institute (EK) ≈ 200+ scientists
- Institute for Nuclear Research – ATOMKI in Debrecen
- Several universities with nuclear-related studies
- ELI-ALPS – laser research center in Szeged

Nuclear program supported in all aspects: regulation, authority, R&D, education, radioactive waste management, research into transmutation, gas cooled reactors, …

Paks II - A capacity replacement project

Location – Paks I. site

Infrastructure Issue
No. 1 – *National Position*

- Paks II. – Hungary's project of the century, also unique in Europe;
- Two new nuclear units, 2x VVER-1200;
- 12,5 bn EUR investment;
- Advanced safety systems;
- Load-following capability;
- High annual load factor;

- <u>Separate minister responsible for the project, he is a member of the government (NEPIO!)</u>

Main energy policy targets with nuclear: decarbonisation, security of supply, affordable electricity

Task allocation between NEPIO and Owner

Ministry for Paks II. (NEPIO)

- The coordination of the international and intergovernmental agreements (IGA, FIGA).

↓ ↓

- **Responsible for the political and public law areas of the investment**

↓

Ministry without Portfolio
responsible for the Paks II. project

János Süli, minister

Paks II. Ltd. (Owner/Operator)

- The execution of the tasks set out in the ***Implementation Agreements*** (EPC, O&M, NFS),
- Paks II. Ltd. is the owner of the project and the partner of the Russian contractor.

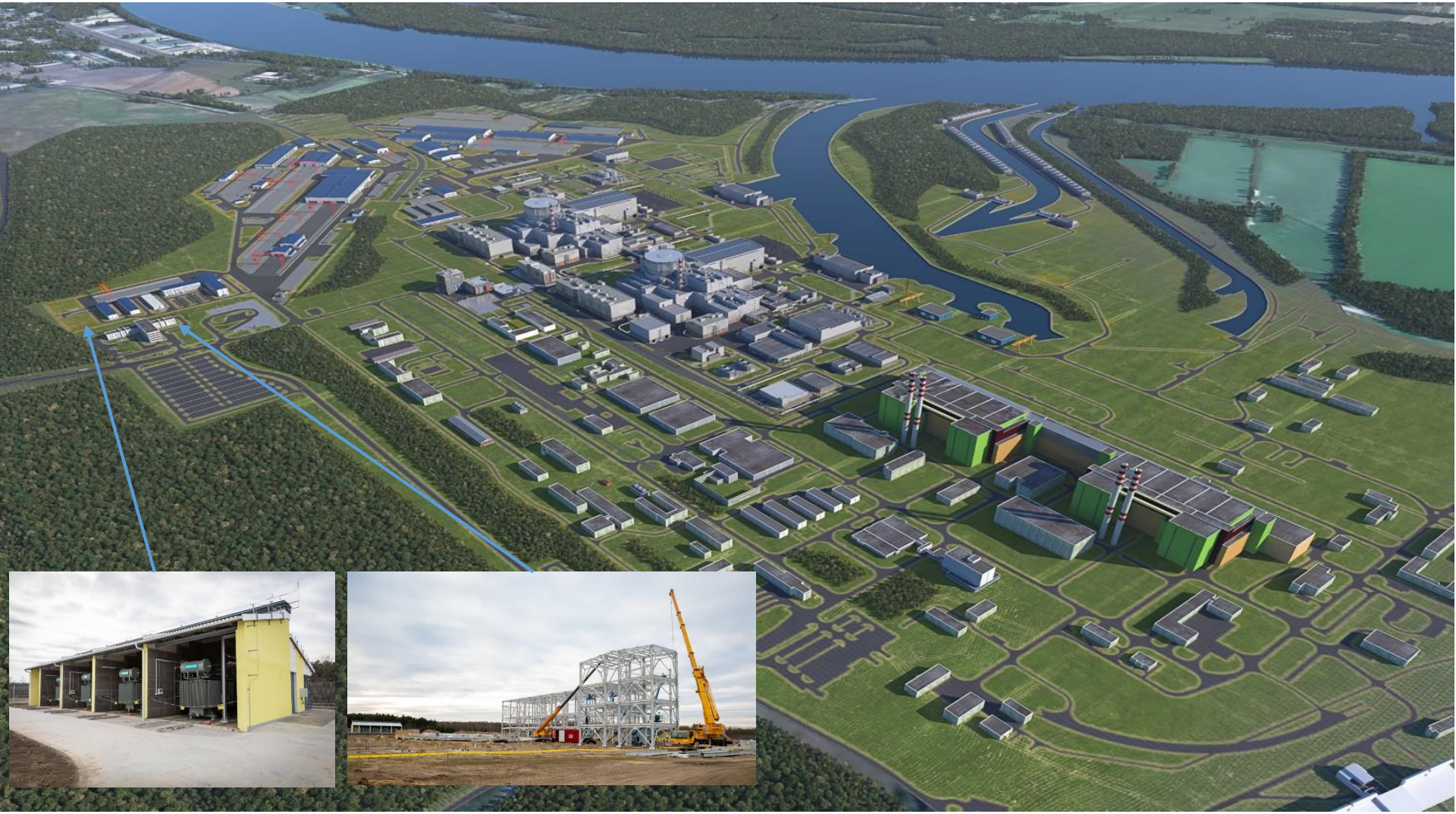
↓ ↓

- **Responsible for the technical, construction and private law areas of the investment**

↓

Paks II Ltd.

Site, CEB and visualization of the new and old units – Paks I. and Paks II.



Political and legal framework of the project

Infrastructure Issues
No. 1 – National position
No. 5 – Legal framework
No. 7 – Regulatory framework

2009:

- **Decision-in-principle** of the Hungarian Parliament about new units (95,4% support)

2011:

- **National Energy Strategy 2030**

2012:

- **Establishment of MVM Paks II. Nuclear Power Plant Development Ltd**. (since 2017: Paks II. NPP Ltd.)

2014:

- **Intergovernmental agreement (IGA)** on the peaceful use of nuclear energy by Russia and Hungary
- **Financial Intergovernmental Agreement (FIGA)** on financing the NPP construction: Credit facility: up to EUR 10bn, for financing 80% of the project costs
- **Implementation agreements**: (1) EPC, (2) fuel supply contract, (3) O&M support contract

Since 2014

- **The Paks II. NPP Ltd. has obtained more than 400 licences**
- Among them the environmental licence and the site licence (both effective)
- **Implementation licence application (ILA) just submitted** (30th June 2020)

Main upcoming tasks

- Construction and erection base (**CEB**)

Electricity grid – only minor development necessary

Infrastructure Issue No. 9 - *Electrical grid*

The only new network item to be built:

Albertirsa – Paks 400 kV dual system power line (~115 km)

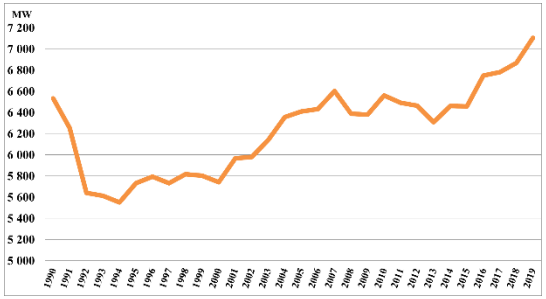
Electricity consumption growth 2013-2019:

- **1,3% / year**

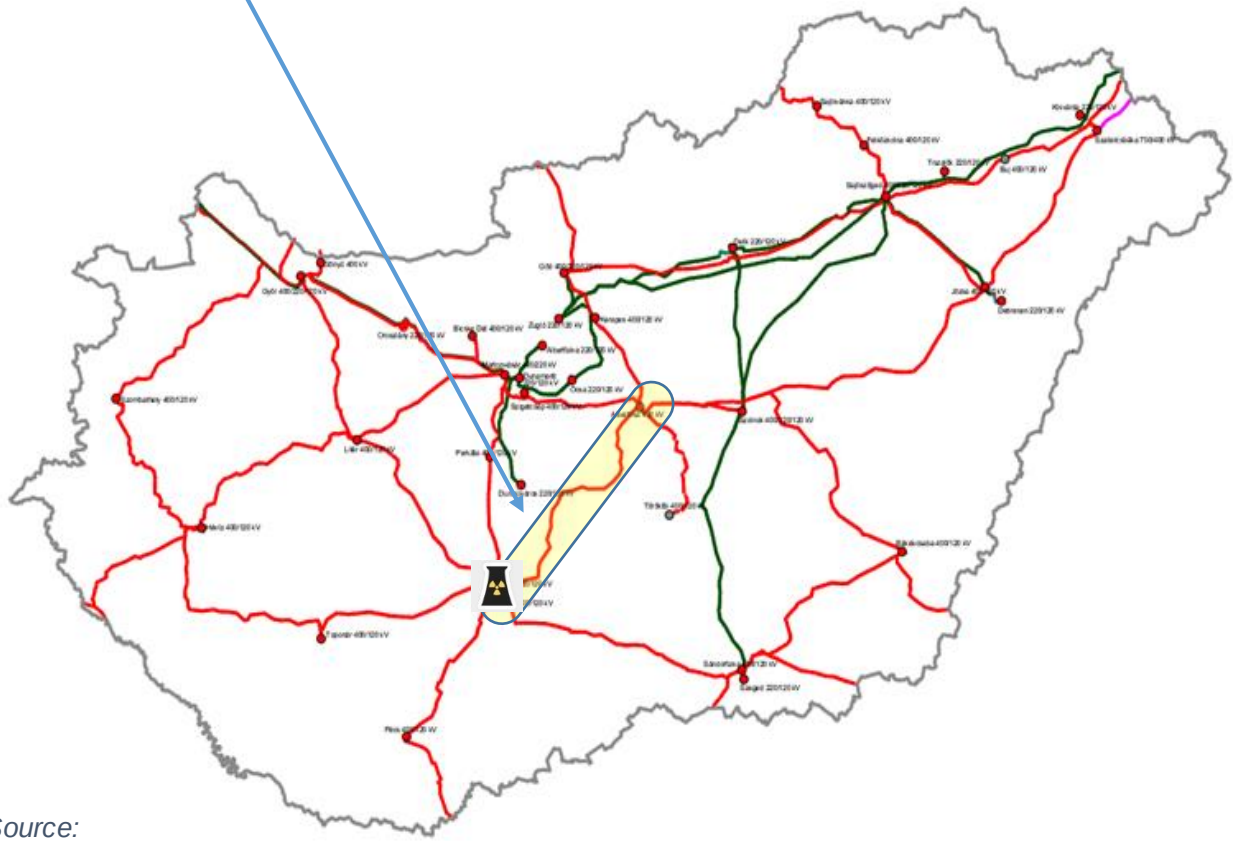
Steady increase of peak load:

- 2019.12.05. – 7105 MW
- 2019.12.04. – 7099 MW
- 2019.01.23. – 6926 MW
- 2019.01.08. – 6884 MW
- 2018.12.19. – 6869 MW

Development of gross peak load



Source: MAVIR, Hungarian TSO



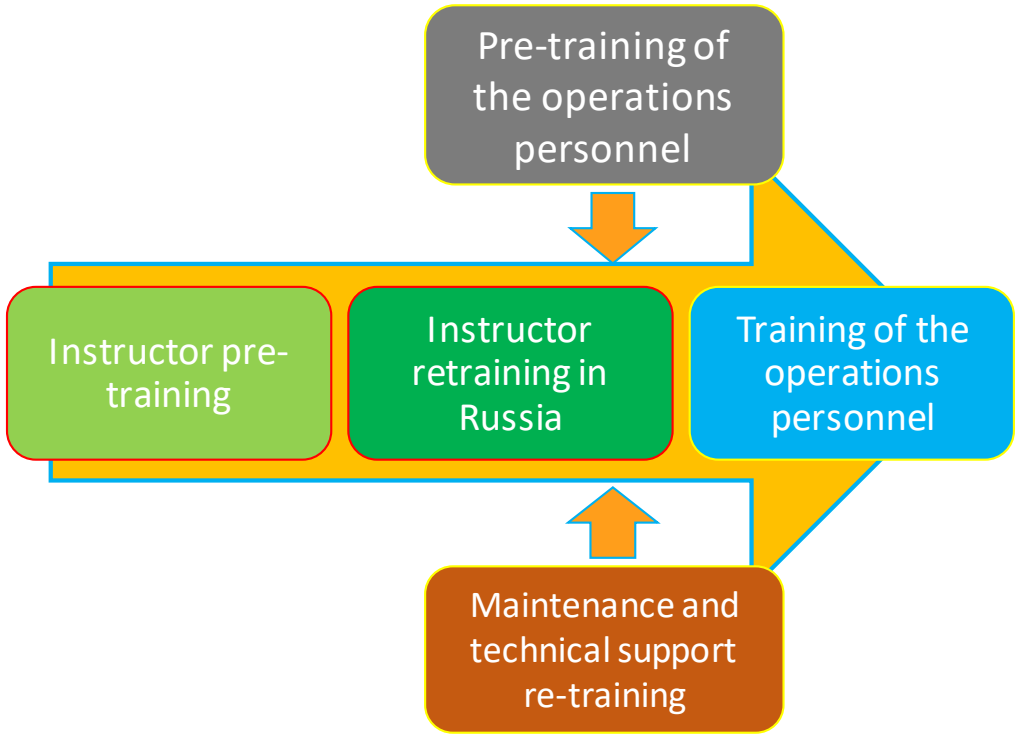
COVID-19: provisional impact only

Human Resource Development

Infrastructure Issue No. 10 –
Human resource development

Training of operations personnel in five steps to ensure safe operation:

1. Recruitment of 40 instructors + 10 in reserve
2. Theoretical pre-training for the instructors in Hungary. Pre-training at Paks Nuclear Power Plant for 7 would-be simulator instructors already started
3. The Contractor retrains the instructors in Russia (in English language)
4. Recruitment of first maintenance staff and its pre-training
5. Instructors provide theoretical training for the operations personnel



Stakeholder Involvement

- The environmental impact assessment was submitted on the 19th of December 2014.
- The procedure was carried out according to the Aarhus and Espoo Convention.

- The whole documentation was available in English, but the **transboundary effects chapter and the non-technical summary were translated to all stakeholder's national language.**

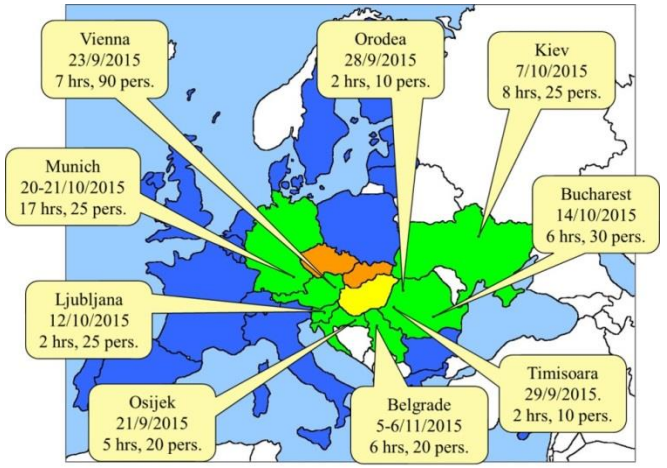
- **Public hearings: in 7 countries (9 locations).**

- The UN Economic and Social Council in 2017 classified the EIA procedure of the Paks II project a good practice, an example to follow

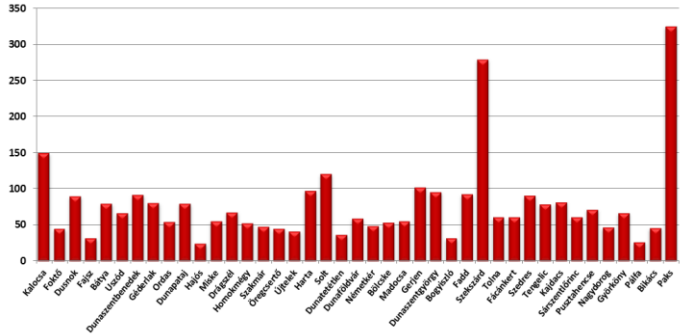
- **Effective environmental licence since August 2017.**

- Despite of the above, referring to the Aarhus Convention, an international group of NGOs (Austrian, German, Czech, Romanian) filed a complaint against the EIA procedure at the UN in 2019 – **case dropped on 8th November 2019**

Infrastructure Issue No. 11
- *Stakeholder involvement*



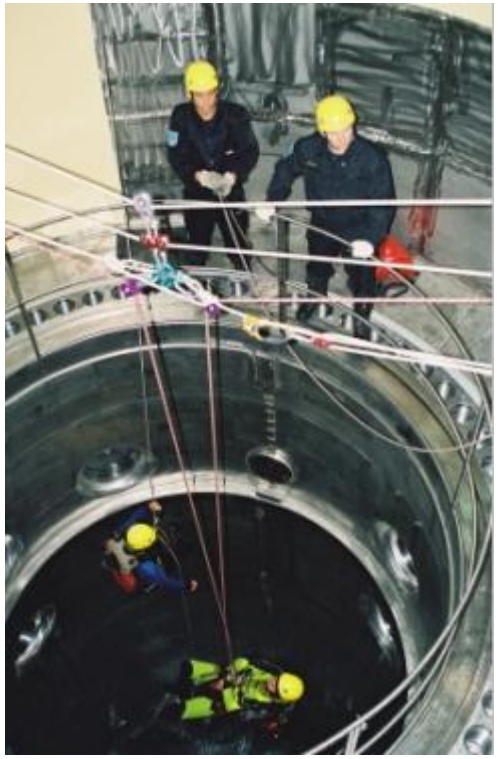
Paks II. public hearings during the international environmental licensing procedure



Number of participants at the public fora by municipalities in Hungary

Conclusions

- Placement of NEPIO extremely important – should be very high-level
- Complex, broad-minded development of the nuclear infrastructure necessary:
  - R&D, regulation, independent authority, education (!!!)
- Learn from experienced countries
  - Hungary: education of Vietnamese workforce (200+ people)
  - Maintenance and Training Center in Paks – real (unused) steam generator, reactor pressure vessel for training



Q & A Time

Milko Kovachev
NIDS, IAEA

Sharaf Al-Sharif
KA CARE, Saudi Arabia

Pal Kovacs
Prime Minister's Office, Hungary

Webinar Series on
Role of Government and Key Organizations involved in the development of a nuclear power programme

Upcoming Webinars

Responsibilities and Functions of a Nuclear Energy Programme Implementing Organization (NEPIO)

Responsibilities and Capabilities of Owners and Operators of NPPs

Experience of Member States in Building a Regulatory Framework for the Oversight of NPPs

IAEA Nuclear Infrastructure Development