IAEA
International Atomic Energy Agency

The IAEA's International Nuclear Management Academy and Support for University Education Programmes

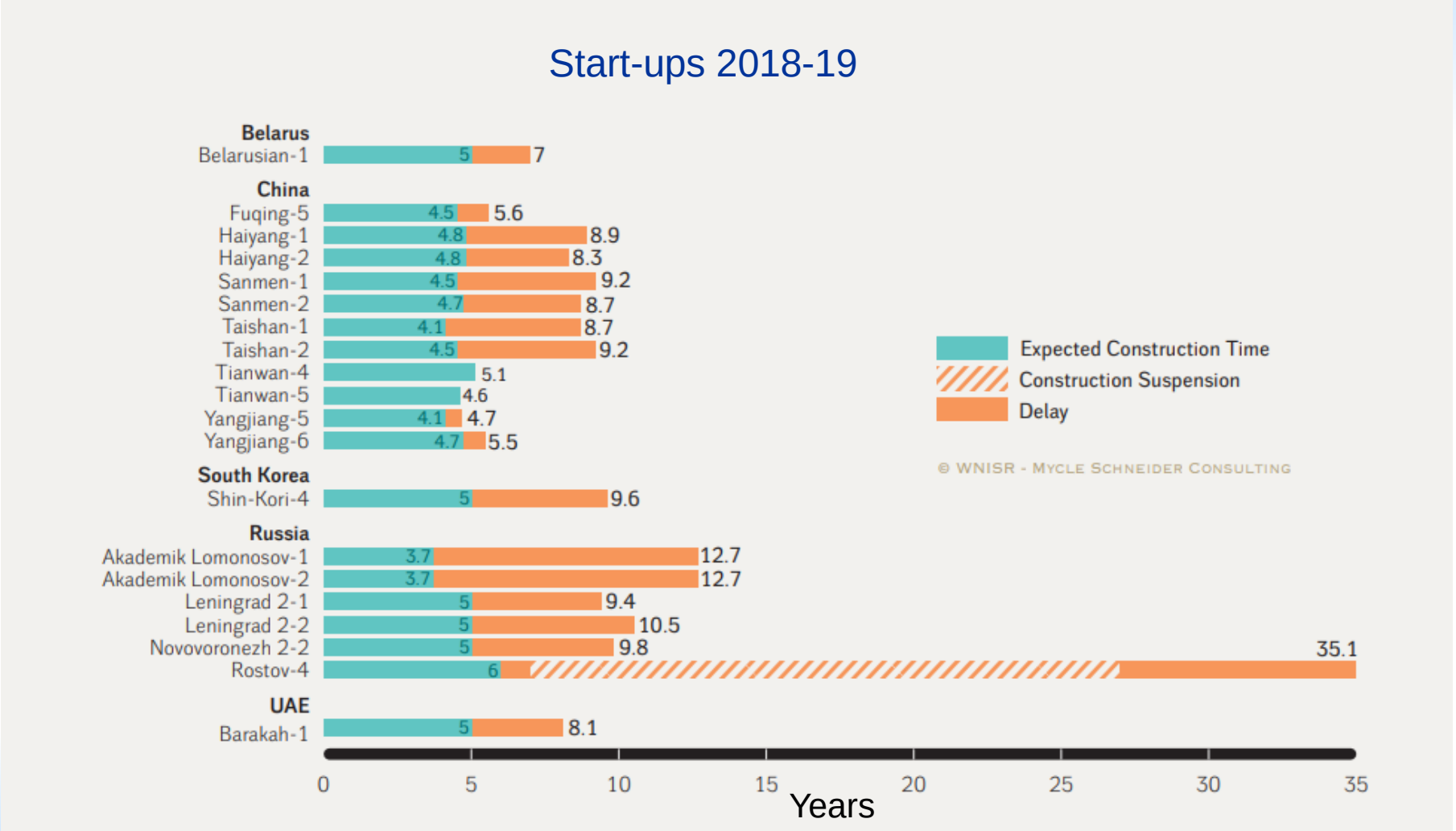
John Roberts

14th September 2022

Nuclear Days

University of West Bohemia, Czech Republic

NPP Expected vs Real Construction Time



Sources: WNISR, with IAEA-PRIS, 2021

Country	Units	Capacity (MWnet)	Construction Start	Grid Connection	Units Behind Schedule
China	18	17062	2012-2021	2021-2027	4
India	7	5194	2004-2021	2022-2026	6
South Korea	4	5360	2012-2018	2022-2025	4
Russia	3	2650	2018-2021	2022-2026	0
Turkey	3	3342	2018-2021	2024-2026	1
UAE	3	4035	2013-2015	2021-2023	3
Bangladesh	2	2160	2017-2018	2023-2024	0
Slovakia	2	880	1985-1985	2021-2023	2
UK	2	3260	2018-2019	2026-2027	2
USA	2	2234	2013	2022-2023	2
Argentina	1	25	2014	2024	1
Belarus	1	1110	2014	2022	1
Finland	1	1600	2005	2022	1
France	1	1600	2007	2023	1
Iran	1	1196	1976	2024	1
Japan	1	1325	2007	2025	1
Pakistan	1	1014	2016	2022	1
Total	**53**	**54047**	**1976-2021**	**2021-2027**	**31**

Olkiluoto 3, Finland

Construction Started 12th August 2005, **Grid Connection Dec 22 ??**

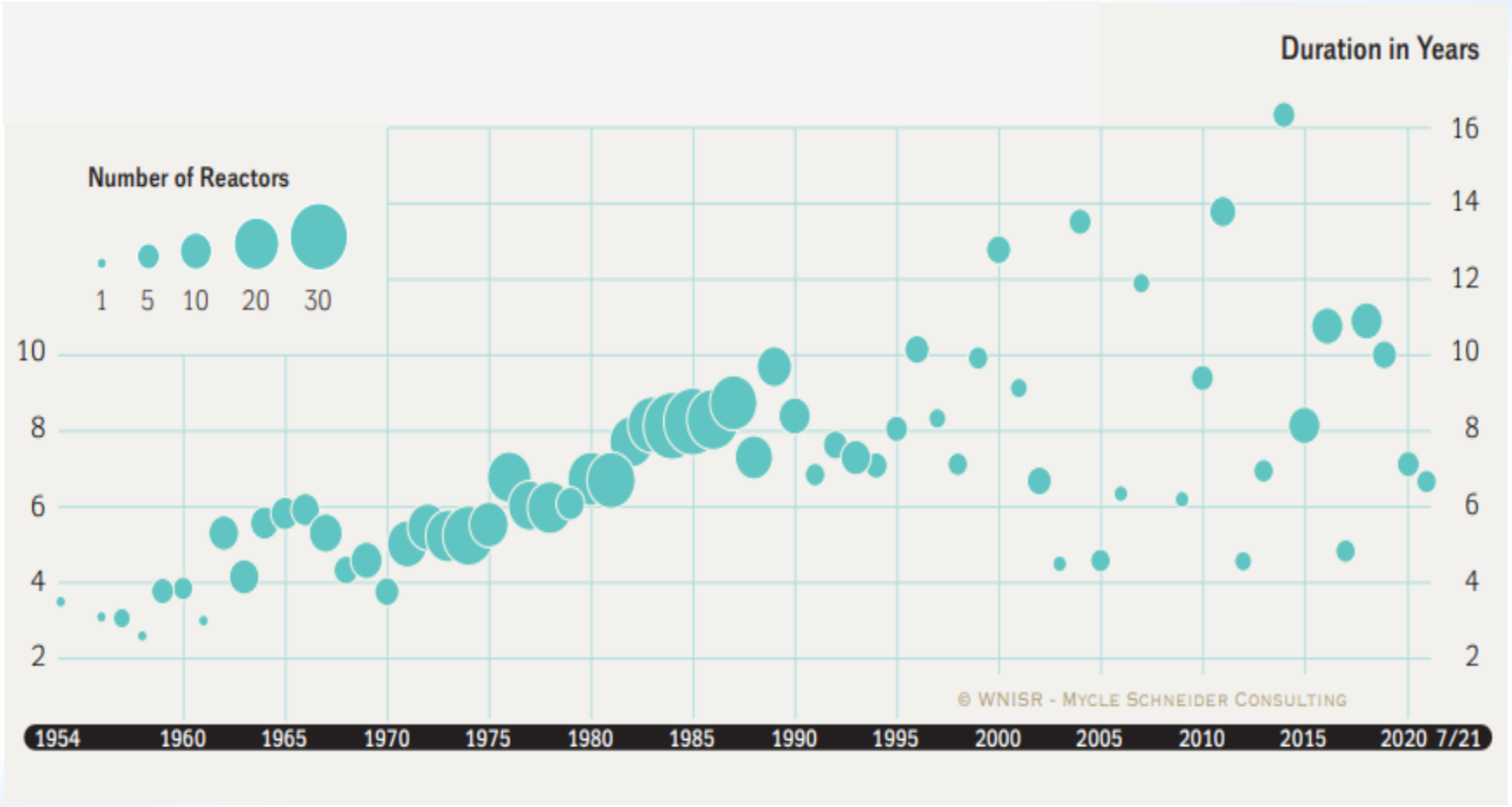
Flamanville 3, France

Construction Started 3rd December 2007, Grid Connection 2023?

Challenges of an NPP Project

- Long term commitment for a NPP > 100 years
- Many stakeholders with various views toward nuclear
- Many governmental authorities involved
- Nuclear infrastructure will need to be developed or upgraded
- Must comply with many different (inter)national treaties
- Long design, manufacturing and construction time
- Roles and core tasks of the leadership & management organisations involved will change over the different project phases
- A large number of contractors from multiple nationalities
- Technically complex and difficult plants to construct

Average Annual Construction Times



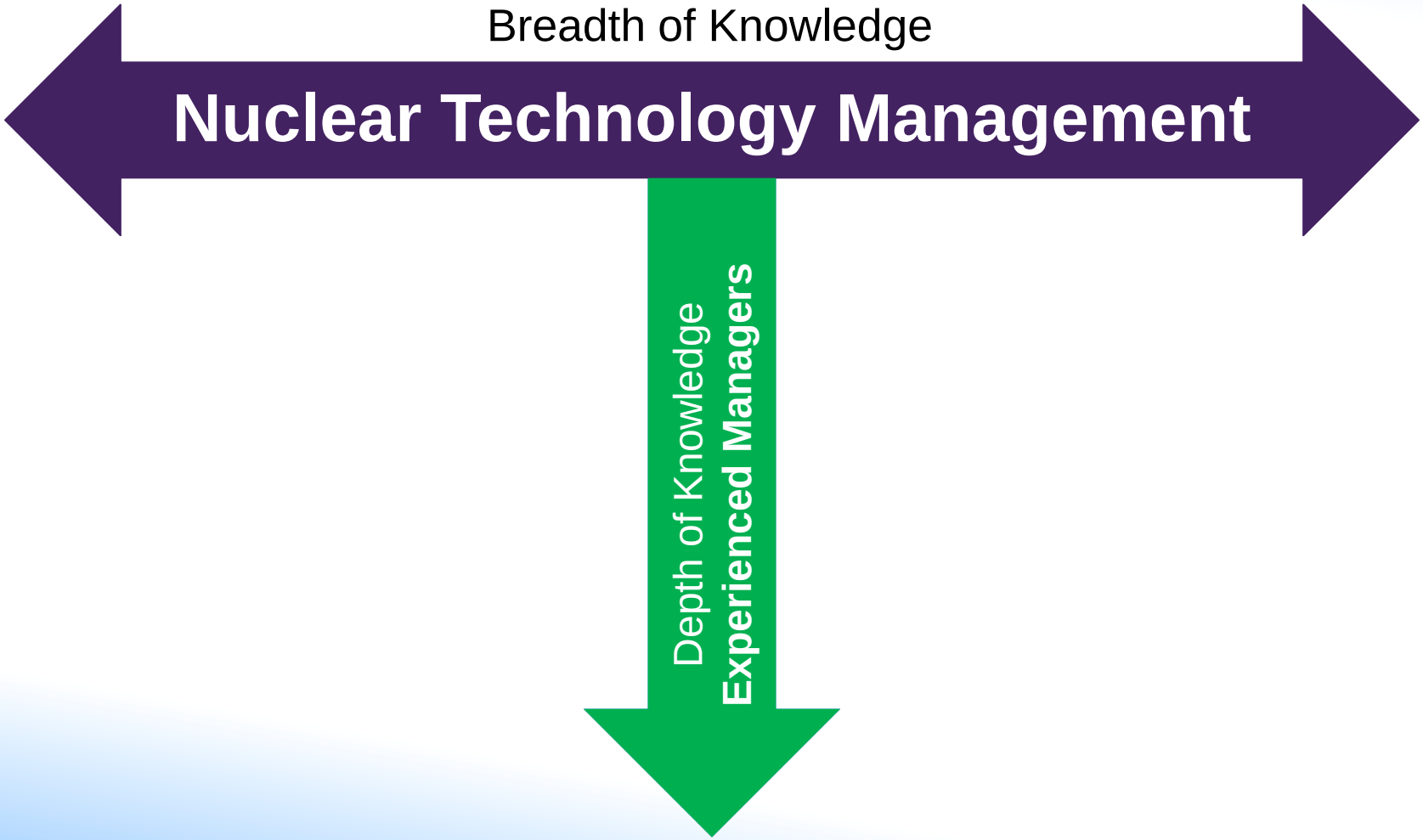
Sources: WNISR, with IAEA-PRIS, 2021

How can this be rectified?

1. Recruit experienced high-quality managers
   - No knowledge of the unique aspects of nuclear facilities
   - Can managers learn nuclear technology?

2. Give nuclear technology experts managerial responsibilities
   - Their education and career has been 100% technology focused
   - Can technologists learn management?

Aim: ‘T Shaped’ Leaders



International Nuclear Management Academy (INMA)

- A collaboration between the IAEA and leading universities to develop and deliver master's programmes in **nuclear technology management**
  - **Nuclear and radiological technology**
    - Facility design and operation, nuclear fuel cycle, radiological protection
  - **Management**
    - Finance, project management, human performance, safety management
  - **Leadership**
    - Communication, ethics, change management, safety culture

- INMA supports the establishment of master's level **nuclear technology management** programmes based on defined Curriculum Topics and cooperation with local stakeholders

- There are **50 Curriculum Topics** defined for INMA-NTM Programmes

- Endorsed programmes include at least **40 of the 50 Curriculum Topics**

INMA Deliverables

- Strengthen depth and breadth of managerial competencies
- Avoid serious gaps in nuclear managerial competencies
- Reduced time-lines to managerial competency
- Ensure high quality management education for nuclear managers available & accessible – full-time or part-time

Better educated and informed managers = better decision-making

Current Status - INMA Universities

Members

- The University of Manchester, United Kingdom
- National Research Nuclear University MEPhI, Moscow, Russia
- The University of Tokyo, Japan
- Texas A&M University, United States of America
- North-West University, South Africa
- University of the Witwatersrand, South Africa
- Budapest University of Technology and Economics, Hungary

Candidates in the endorsement process

- National Polytechnic University, Armenia
- Harbin Engineering University, China
- Tsinghua University, China
- University of Ontario Institute of Technology, Canada
- University of Idaho, United States of America
- University of West Bohemia, Czech Republic
- University of Sharjah, United Arab Emirates
- Sofia University St. Kliment Ohridski

Current Status - INMA Universities

Members

- The University of Manchester, United Kingdom
- National Research Nuclear University MEPhI, Moscow, Russia
- The University of Tokyo, Japan
- Texas A&M University, United States of America
- North-West University, South Africa
- University of the Witwatersrand, South Africa
- Budapest University of Technology and Economics, Hungary
- **National Polytechnic University, Armenia**
- **University of West Bohemia, Czech Republic**

Candidates in the endorsement process

- Harbin Engineering University, China
- Tsinghua University, China
- University of Ontario Institute of Technology, Canad
- University of Idaho, United States of America
- University of Sharjah, United Arab Emirates
- Sofia University St. Kliment Ohridski

Current Status - INMA Universities

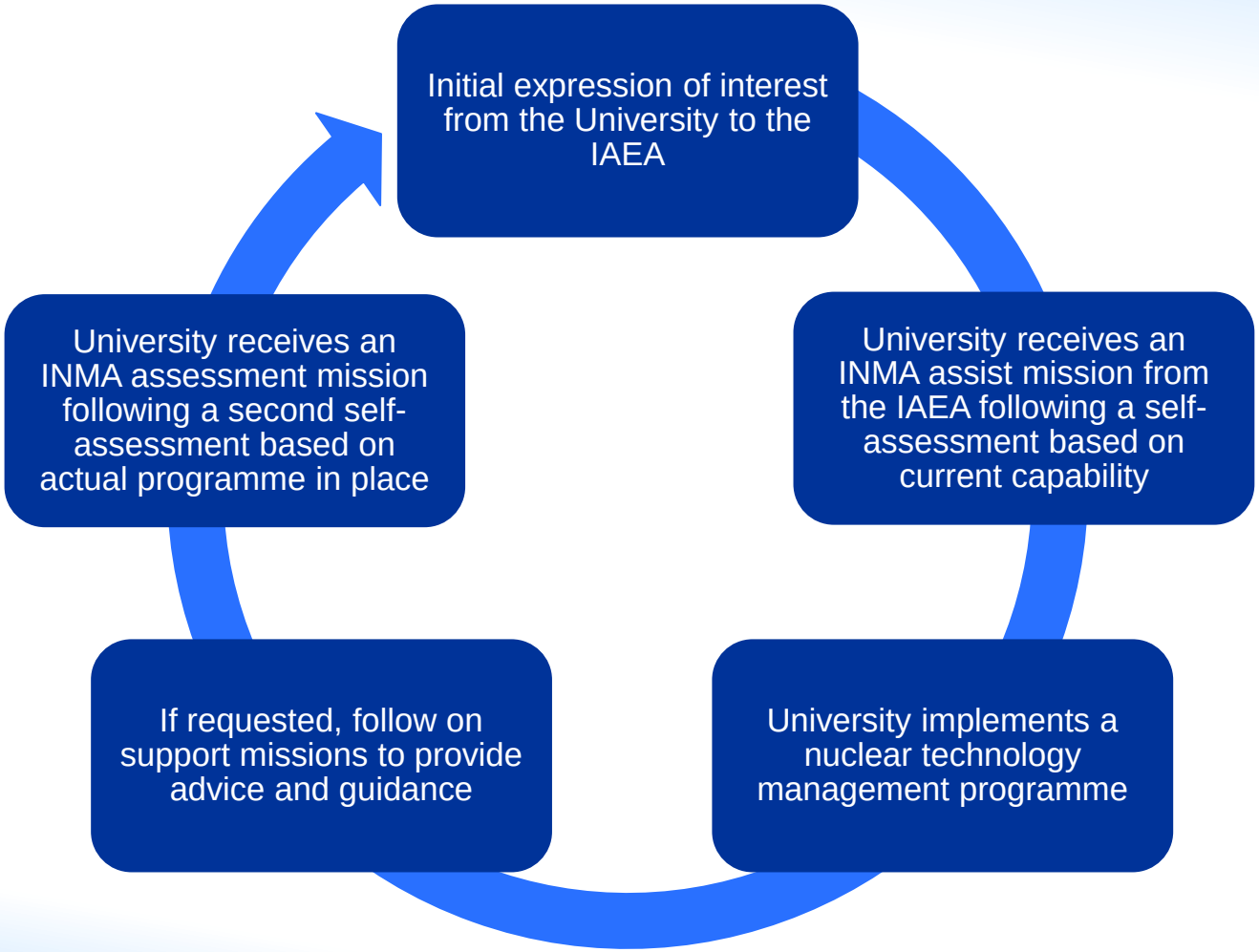
Members

- The University of Manchester, United Kingdom
- National Research Nuclear University MEPhI, Moscow, Russia
- The University of Tokyo, Japan
- Texas A&M University, United States of America
- North-West University, South Africa
- University of the Witwatersrand, South Africa
- Budapest University of Technology and Economics, Hungary

Candidates in the endorsement process

- National Polytechnic University, Armenia
- Harbin Engineering University, China
- Tsinghua University, China
- University of Ontario Institute of Technology, Canada
- University of Idaho, United States of America
- University of West Bohemia, Czech Republic
- University of Sharjah, United Arab Emirates
- Sofia University St. Kliment Ohridski

Initial INMA Cycle



Review after 4 years, full assessment after 8 years

What are the benefits?

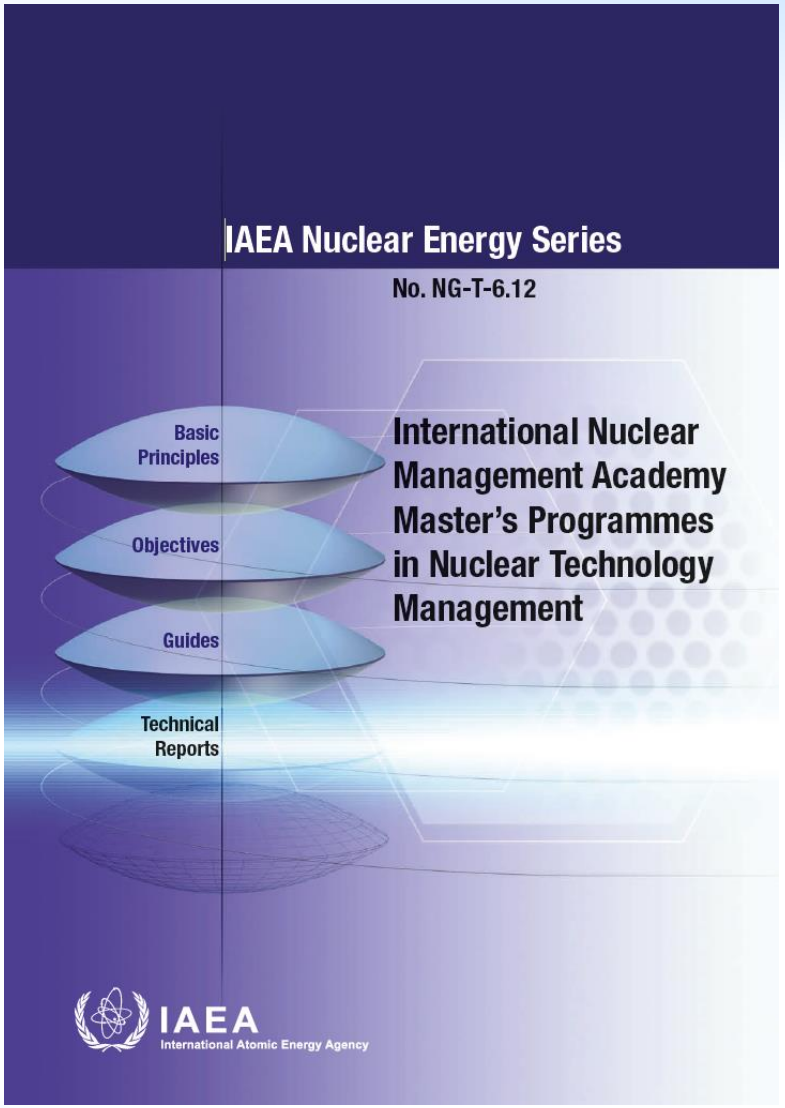
- For the student
  - Opens up career opportunities across the nuclear sector
  - Transferable skills help the student become job-ready faster

- For the University
  - Options for attracting broader range of vocational focused students, early career (full-time) and mid-career (part time)
  - Enhanced international recognition via links to the International IAEA educational programmes
  - Potential to attract a broader range of international students

- For the Industry
  - Improved safety and economic performance
  - Better return on investment

INMA Publication

- International Nuclear Management Academy Master's Programmes in Nuclear Technology Management
- Available from IAEA website



Further Support for Nuclear Education

Level 1 Programme Establishment: Nuclear or radiological education and training programmes are relatively few or evolving and an introduction to their implementation is required

Level 2 Programme Support: Active nuclear or radiological education and/or training programmes that need assistance in their general implementation and optimisation

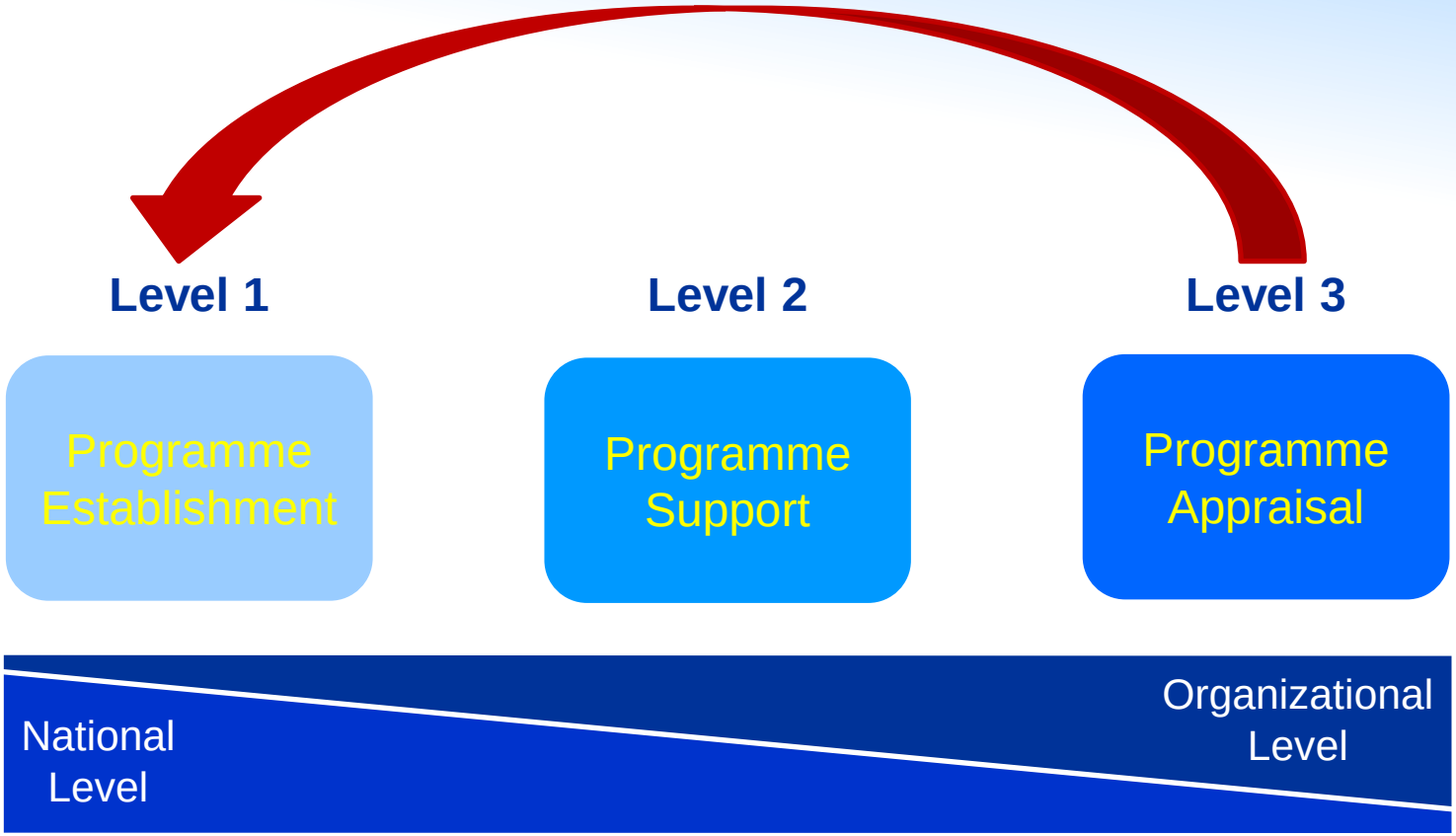
Level 3 Programme Appraisal: Specific high-level assistance to optimise and enhance nuclear or radiological education and training programmes to ensure their sustainability.
They are also used to collect best practices.

Level 3 – Programme Appraisal

- A two-way knowledge sharing process
  - Capture and share good practices and lessons learned from which other providers can benefit
  - Provide an opportunity for suggestions to enhance educational and training programmes

- Some providers with well-established programmes may be primarily visited to capture and disseminate their successful and innovative programme approaches
  - **create a catalogue of best practices to support the level 1 KMAVs**

Universities Supporting Universities



Level 3 – Programme Appraisal

- Possible Issues
  - Student recruitment
  - Staff retention
  - Implementation of distance learning
  - Access to facilities
  - International opportunities
  - Access to outreach materials

- Learn from good practices from around the world that give opportunities for continuous improvement

- **First level 3 mission at the Budapest University of Technology and Economics – December 2021**

Knowledge Management Assist Visits

Can help countries to develop education and training programmes for nuclear and radiological programmes

A strategic stakeholder engagement that brings together education and training providers, government and industry to enhance the sustainability of nuclear and radiological education and training

Can assist education and training providers and support the improvement of existing programmes through the sharing of good practices

Ensure that nuclear and radiological education and training programmes are designed to prepare the necessary workforce required for the safe, reliable and sustainable utilization of nuclear and radiological technologies

IAEA
International Atomic Energy Agency

Thank you!

External Environment

1.1	Energy production, distribution and markets
1.2	International nuclear and radiological organizations
1.3	National nuclear technology policy, planning and politics
1.4	Nuclear standards
1.5	Nuclear and radiological law
1.6	Business law and contract management
1.7	Intellectual property management
1.8	Nuclear and radiological licensing, licensing basis and regulatory processes
1.9	Nuclear security
1.10	Nuclear safeguards
1.11	Transport of nuclear goods and materials

Nuclear Technology

2.1	Nuclear or radiological facility design principles
2.2	Nuclear or radiological facility operational systems
2.3	Nuclear or radiological facility life management
2.4	Nuclear or radiological facility maintenance processes and programmes
2.5	Systems engineering for nuclear or radiological facilities
2.6	Nuclear safety principles and analysis
2.7	Radiological safety and protection
2.8	Nuclear reactor physics and reactivity management
2.9	Nuclear fuel cycle technologies
2.10.	Radioactive waste management and disposal
2.11	Nuclear or radiological facility decommissioning
2.12	Environmental protection, monitoring and remediation
2.13	Nuclear research and development and innovation management
2.14	Applications of nuclear science
2.15	Thermohydraulics

Management

3.1	Nuclear engineering project management
3.2	Management systems in nuclear or radiological organizations
3.3	Management of employee relations in nuclear or radiological organizations
3.4	Organizational human resource management and development
3.5	Organizational behaviour
3.6	Financial management and cost control in nuclear or radiological organizations
3.7	Information and records management in nuclear or radiological organizations
3.8	Training and human performance management in nuclear or radiological organizations
3.9	Performance monitoring and organization improvement
3.10	Nuclear quality assurance programmes
3.11	Procurement and supplier management in nuclear or radiological organizations
3.12	Nuclear safety management, and risk informed decision making
3.13	Nuclear incident management, emergency planning and response
3.14	Operating experience feedback and corrective action processes
3.15	Nuclear security programme management
3.16	Nuclear safety culture
3.17	Nuclear events and lessons learned
3.18	Nuclear knowledge management

Leadership

4.1	Strategic leadership
4.2	Ethics and values of a high standard
4.3	Internal Communication strategies for leaders in nuclear or radiological organizations
4.4	External Communication strategies for leaders in nuclear or radiological organizations
4.5	Leading change in nuclear or radiological organizations
4.6	Leadership to support the safety culture