

NUCLEAR KNOWLEDGE MANAGEMENT

IAEA assistance in implementing knowledge management
in nuclear organizations and facilitating sustainable
education in nuclear science and technology



Nuclear
Energy



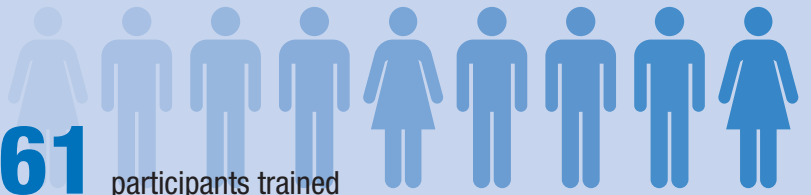
200+ **MEETINGS**
held with Member States



SCHOOLS

1861

participants trained



32

Nuclear Energy
Management Schools



23

Nuclear Knowledge
Management Schools



73  Member States
represented

48  Member States
represented



59
MISSIONS

43 Knowledge Management
Assist Visits

16 International Nuclear Management
Academy Peer Reviews

36  Member States
benefiting



TOP DONORS

Japan
2012-ongoing

Russian Federation
2016-ongoing

USA
2018-ongoing



Nuclear Knowledge Management (NKM)

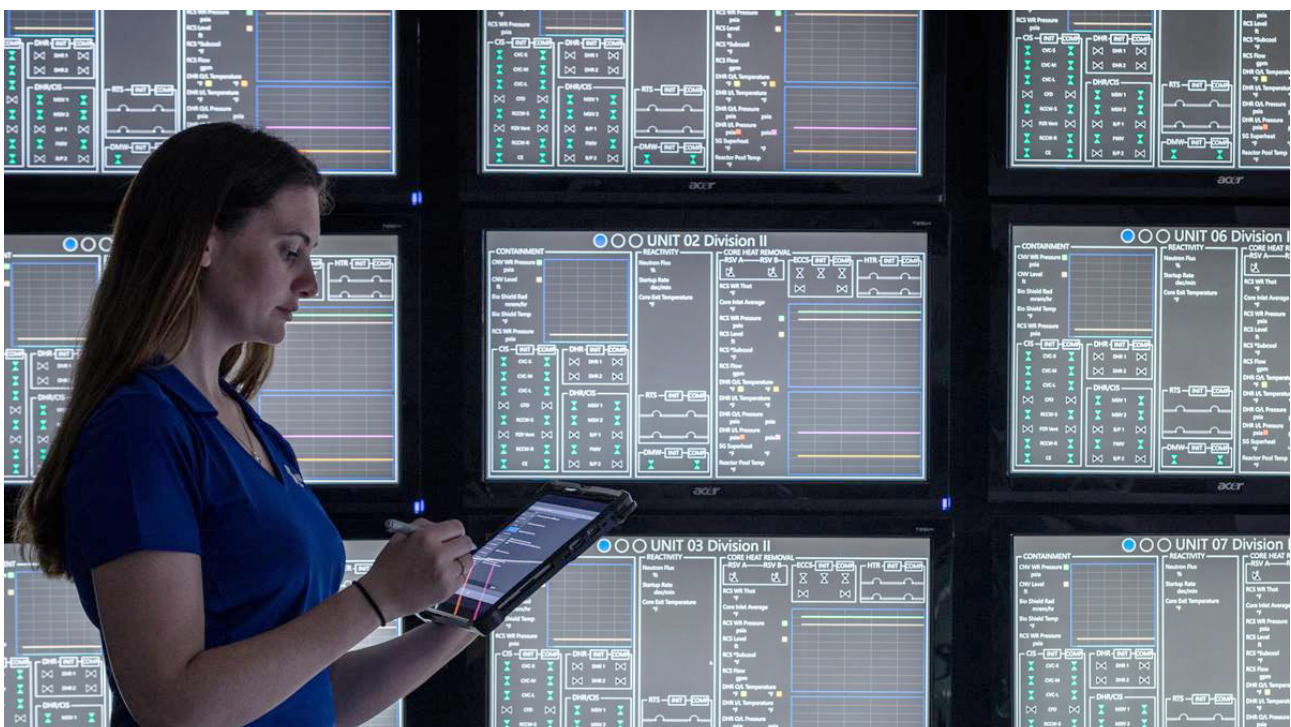
Building, collecting, transferring, sharing, preserving, maintaining and utilizing knowledge is essential to developing and keeping the necessary technical expertise and competences required for nuclear power programmes and other nuclear technologies. The IAEA helps Member States maintain and preserve nuclear knowledge.

Appropriate expertise must be developed and kept available throughout the nuclear technology life cycle. Effective knowledge management helps achieve this objective. Advanced and specialized knowledge in nuclear engineering and science is required for the safe and effective design, construction, licensing, commissioning, operation, maintenance and decommissioning of nuclear technology-based systems, which may have long life cycles in changing contexts.

The safe use of licensed nuclear facilities and technologies is reliant on the ongoing availability and maintenance of suitable knowledge and expertise, including an adequate understanding of related safety issues. The ability of organizations that operate or utilize nuclear technology to take safe decisions and actions can be affected

by knowledge gaps or knowledge loss. Appropriate knowledge management methods and supporting technology are needed to establish and manage nuclear knowledge, competencies, information and records, work processes, data interpretation, and analysis and verification techniques.

The IAEA continues its NKM activities focused on formulating and providing guidance and services on NKM methods, facilitating knowledge sharing networks, developing knowledge organizational systems and solutions, and fostering and supporting nuclear education and training for capacity building. An increased number of Member States have included knowledge management components in national and regional technical cooperation projects and others are providing extra budgetary funds to the IAEA for this.



Objectives of the NKM programme

- Support Member States in their application of NKM strategies and approaches through the development and dissemination of IAEA methodology, guidance and tools, implementation in national programmes and by providing KM services and assistance.
- Provide support and guidance to Member States in applying advanced technologies for sustainable nuclear information management over the life cycle to strengthen safety and economics of peaceful uses of nuclear technology.
- Strengthen and enhance university education in Member States in the areas of nuclear technology management, nuclear engineering, nuclear science and applications.

Services

- **Knowledge Management Assist Visits**
- **Schools**
 - Nuclear Knowledge Management School
 - Nuclear Energy Management School
- **International Nuclear Management Academy**
- **Nuclear Education Networks**



Knowledge Management Assist Visits (KMAV)

Knowledge Management Assist Visits (KMAVs) are designed to assist Member State nuclear organizations to effectively utilize pragmatic knowledge management methodologies that can contribute to both safety and business objectives. KMAV reviews the existing knowledge management practices of a nuclear organization using an IAEA developed review process that assesses eight different areas related to knowledge management and provides recommendations based on gaps identified through a self-assessment process.

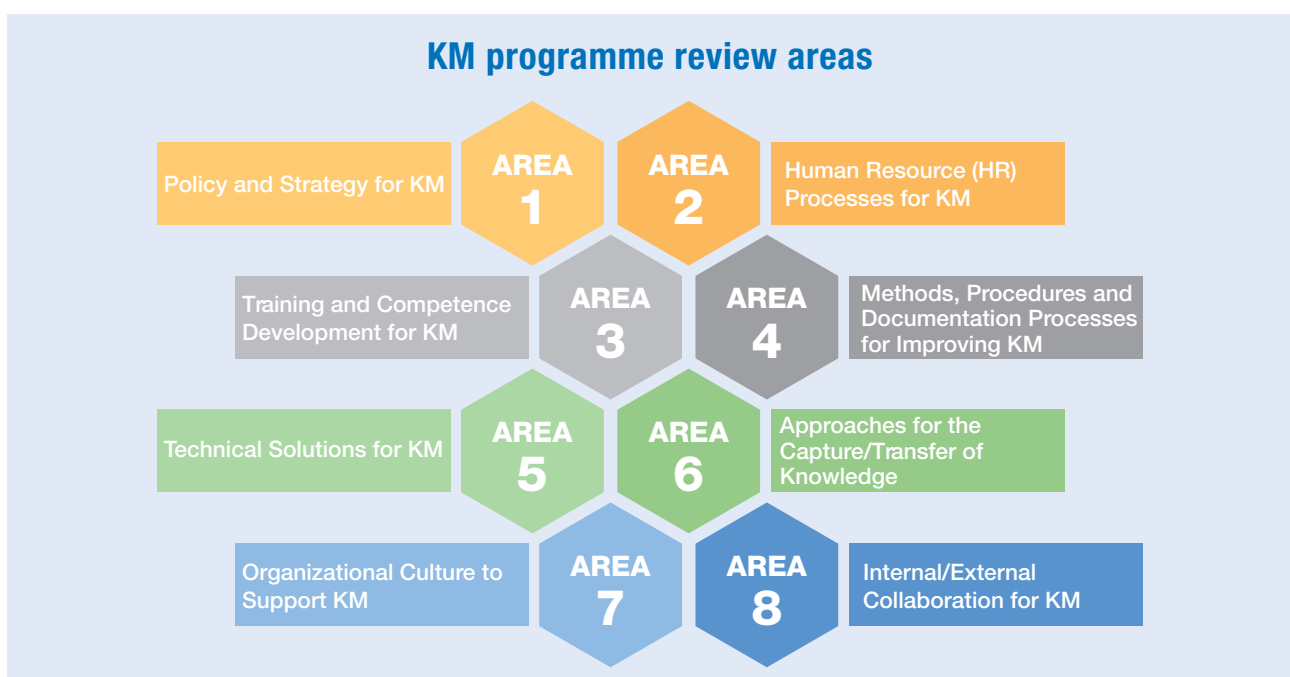
The goal is to help the organization improve its knowledge management practices. All information received and retained by KMAV team members will be subject to strict control by the IAEA and will not be released to others without the written consent of the counterpart.

KMAV missions are intended for almost all types of nuclear organizations including nuclear power plants, research and development facilities, technical support organizations, regulatory organizations, and academic institutions.

The service can be provided at three levels, depending on an organization's needs in the area of knowledge management:

- KM Awareness and Orientation
- KM Implementation
- KM Expert Assistance

The KMAV missions are essentially designed to facilitate Member State nuclear organizations to move through the seven steps of the roadmap for implementing a strategic KM programme, as shown in the figure below.



Schools

The Nuclear Knowledge Management School and the Nuclear Energy Management School represent one of the IAEA's important mechanisms to support capacity building in the Member States.

Nuclear Knowledge Management (NKM) School

The purpose of the NKM School is to provide specialized education and training on the development and implementation of nuclear knowledge management programmes in nuclear energy, science and technology.

The school's programme follows a blended learning approach and are comprised of online pre-training, classroom lectures, panel discussions, group projects and other interactive activities.

Objectives

- Raise participants' awareness of knowledge as a key safety, performance, and economic asset in the nuclear sector; including the importance of implementing an integrated approach to nuclear knowledge management in their organizations.
- Review various dimensions of nuclear knowledge management as a key business management tool, including human resources, talent and information management.
- Train participants on different knowledge management methodology tools and practices.
- Provide participants with international educational experience and an opportunity for worldwide networking with current and future managers of nuclear knowledge management programmes.

Format

- International Centre for Theoretical Physics (ICTP): open to all Member States. One-week preliminary online training course followed by a one-week residential school.
- Regional or National: open to participants from invited Member States (in agreement with the host organization). Typically, a one-week preliminary online training course followed by a one-week residential school.



Target Audience

The NKM School programme is designed for professionals managing nuclear knowledge and human resource capability in the nuclear sector.

Curriculum

The school's curriculum is designed for a one-week course and covers a range of topics focusing on methodologies and practices and explores various dimensions of NKM. These include processes and tools, challenges and benefits, culture influence, relationship with human resource development, IT for knowledge preservation and sharing.

The curriculum consists of four modules that are delivered in multiple sessions supported by case-studies and group projects. The

group projects cover different aspects of knowledge management and are mentored by the lecturers.

The four modules are:

- An Integrated Approach to Nuclear Knowledge Management
- Nuclear Knowledge Management Tools and Techniques
- Nuclear Knowledge Management as a Business Tool
- Nuclear Information Management

Learning is supplemented with real-life examples, best practices and lessons learned from different types of nuclear organizations. The aim is to encourage forward thinking and to enable participants to apply the learned theory and gained insights directly in their workplace.



Nuclear Energy Management (NEM) School

The purpose of the NEM School is to provide participants with a foundation of nuclear knowledge to help them successfully manage and lead a nuclear energy programme.

The school's programme follows a blended learning approach and are comprised of a preliminary online training course, classroom lectures, panel discussions, technical visits, group projects and other interactive activities.

Objectives

- Introduce participants to leadership and managerial competencies needed to successfully run nuclear energy and technology programmes.
- Raise participants' awareness about recent developments in nuclear energy and technology.
- Broaden participants' understanding of key issues and challenges associated with nuclear energy and technology.
- Provide an international educational experience and an opportunity for worldwide networking with future leaders and managers of nuclear energy and technology programmes.

Format

- ICTP-International: open to all Member States. One-week preliminary online training course followed by a two-week residential school.
- Regional or National: open to participants from invited Member States (in agreement with the host organization). Typically, one-week pre-training e-learning course followed by a two-week residential school.
- Advanced NEM School: open to participants from invited Member States (in agreement with the host organization). Typically, one-week course designed in a workshop type format.



Target Audience

The one-week advanced NEM school is designed for managers/decision makers in nuclear organizations.

The two-week foundation NEM School is designed for new or young professionals entering the field of nuclear energy and nuclear technology.

Curriculum

The school curriculum is designed to cover a range of topics that are relevant to Member States, especially countries that are considering

starting, re-launching or expanding a nuclear power programme. The standard curriculum consists of the following key modules:

- IAEA and Nuclear Technology
- Key Issues and Challenges
- IAEA's Safety, Security and Safeguards Requirements
- Nuclear Technology Life Cycles
- Group projects on different aspects of the challenges associated with managing nuclear energy programmes, mentored by the lecturers.



International Nuclear Management Academy (INMA)

The International Nuclear Management Academy (INMA) supports the establishment and delivery of university master's programmes in nuclear technology management (NTM) to improve the safety, project management and operational performance of nuclear and radiological facilities in Member States.

Nuclear technology management professionals are able to manage teams across a broad range of nuclear and radiological disciplines, as well as individuals and organisations, as they have the required breadth of knowledge in both technology and management.

INMA enables collaboration between the IAEA and leading universities to provide NTM master's programmes that are designed to develop NTM professionals that have both the technology and management competencies required for the nuclear workforce. The INMA-NTM programmes have defined curriculum topics focusing on leadership, management and nuclear technology to provide consistency of content across all programmes.

INMA supports collaboration between the universities and local industries to provide sustainable NTM programmes that reflect the

industry's best practices and accumulated knowledge. The programmes can be tailored to provide a spectrum of nuclear/radiological technology education for experienced managers and management education for nuclear or radiological subject matter experts.

The IAEA supports the universities with INMA peer review missions to benchmark their NTM programmes against the INMA nuclear technology management curriculum topics. This ensures the quality of the NTM programmes is maintained as well as the consistency between all the programmes being delivered by the universities. The result of a successful peer review mission is INMA endorsement of the NTM master's programme and INMA membership for the university. Improving the standard of management within the nuclear industry will enhance safety as well as other benefits, such as greater efficiency, the recruitment and retention of higher quality staff and wider acceptance of nuclear energy for the safe, secure and economic production of electricity, as well as other nuclear and radiological applications. INMA supports all these objectives.



INMA Curriculum Topics

The International Nuclear Management Academy has identified fifty nuclear technology management Curriculum Topics in four Categories. It is expected that at least 80% of these Curriculum Topics are covered by an INMA endorsed NTM programme.

1. External Environment

This category has 11 curriculum topics related to understanding or managing aspects of a nuclear organization's external environment such as the political, legal, regulatory, business and societal environments in which nuclear managers operate. Directly or indirectly, the external environment constrains, orients, influences or governs many decisions and actions of a nuclear manager.

1. Energy production, distribution and markets;
2. International nuclear and radiological organizations;
3. National nuclear technology policy, planning and politics;
4. Nuclear standards;
5. Nuclear and radiological law;
6. Business law and contract management;
7. Intellectual property management;
8. Nuclear and radiological licensing, licensing basis and regulatory processes;
9. Nuclear security;
10. Nuclear safeguards;
11. Transport of nuclear goods and materials.

2. Technology

This category has 15 curriculum topics related to the basics of nuclear technology, engineering, and their applications that are involved directly or indirectly in the management of nuclear facilities for power and non-power applications.

1. Nuclear or radiological facility design principles;
2. Nuclear or radiological facility operational systems;
3. Nuclear or radiological facility life management;
4. Nuclear or radiological facility maintenance processes and programmes;
5. Systems engineering for nuclear or radiological facilities;
6. Nuclear safety principles and analysis;
7. Radiological safety and protection;
8. Nuclear reactor physics and reactivity management;
9. Nuclear fuel cycle technologies;
10. Nuclear waste management and disposal;
11. Nuclear or radiological facility decommissioning;
12. Environmental protection, monitoring and remediation;
13. Nuclear R&D and innovation management;
14. Applications of nuclear science;
15. Thermal hydraulics.

3. Management

This category has 18 curriculum topics related to the challenges and practices of management in the nuclear sector with due consideration of safety, security and economics.

1. Nuclear engineering project management;
2. Management systems in nuclear or radiological organizations;
3. Management of employee relations in nuclear or radiological organizations;
4. Organizational human resource management and development;
5. Organizational behaviour;
6. Financial management and cost control in nuclear or radiological organizations;
7. Information and records management in nuclear or radiological organizations;
8. Training and human performance management in nuclear or radiological organizations;
9. Performance monitoring and organization improvement;
10. Nuclear quality assurance programmes;
11. Procurement and supplier management in nuclear or radiological organizations;
12. Nuclear safety management, and risk-informed decision making;
13. Nuclear incident management, emergency planning and response;

14. Operating experience feedback and corrective action processes;
15. Nuclear security programme management;
16. Nuclear safety culture;
17. Nuclear events and lessons learned;
18. Nuclear knowledge management.

4. Leadership

This category has six curriculum topics demonstrating that leadership requires vision, strong ethical behaviours, clear foresight and goal setting, commitment to safety and security, good communication skills with all stakeholders, and a professional disposition in all situations. Leaders in nuclear organizations are more effective when they have an understanding of high-level technological competencies, coupled with strong managerial skills.

1. Strategic leadership;
2. Ethics and values of a high standard;
3. Internal communication strategies for leaders in nuclear or radiological organizations;
4. External communication strategies for leaders in nuclear or radiological organizations;
5. Leading change in nuclear or radiological organizations;
6. Leadership to support the safety culture.

Nuclear Education Networks

Networking in nuclear education allows for the effective use of educational resources. Valuable experiences and best practices, as well as educational materials and tools, can be shared through meaningful regional and interregional cooperation. The IAEA promotes partnerships among nuclear education and training institutions across the globe. It has directly fostered regional education networks in Asia, Africa, Latin America and the Caribbean, and in Eastern Europe and Central Asia. To further support exchange and discussion among education networks, the IAEA has also established dedicated forums.

The collaboration within and among education networks contributes to the promotion, management and preservation of nuclear knowledge, and helps to ensure that talented and qualified human resources are available for the safe and sustainable use of nuclear technology.

The networks also promote cooperation between academia, government and industry, and foster quality assurance, benchmarking and accreditation, as well as resource sustainability.

Through meetings and technical cooperation projects, the IAEA offers support to the following education networks:

- Asian Network for Education in Nuclear Technology (ANENT)
- African Network for Education in Nuclear Science and Technology (AFRA-NEST)
- Latin American Network for Education in Nuclear Technology (LANENT)
- Regional Network for Education and Training in Nuclear Technology (STAR-NET)



Nuclear Energy Management School,
Oak Ridge National Laboratory, Oak Ridge, USA, 2019

“Bringing together IAEA experts and individuals from different member states all in one room created an excellent forum to discuss challenges in the nuclear industry.”

Scherbakova Dasha,
Ontario Power Generation, Canada

Nuclear Energy Management School, ICTP, Trieste, Italy, 2019

“As part of the regulatory body we need to have a holistic view of the activities, and this course gave me a general overview that is always welcome, including some ideas for improving my specific activities.”

Lucas Martiri, **Nuclear Regulatory Authority of Argentina, Argentina**

Nuclear Knowledge Management School, ICTP, Trieste, Italy, 2019

“I really appreciate that the speakers always tell real life stories to relate theoretical concepts. In that way, I was able to understand the theories and their application in various institutions.”

Rissa Amper, **Philippine Nuclear Research Institute, Philippines**

“The presenters are experts with 30+ years of experience in NKM! It is a privilege to attend lectures from professionals who have worked and shaped world leaders in this field.”

Nadir Hashim, **Kenyatta University, Kenya**

KMAV Level 1 Mission, Brazil, 2019

“Having gone through a Knowledge Management Workshop as part of a KMAV Mission, it became very important for us to integrate employees from different departments of Eletronuclear to establish partnerships for an efficient and natural knowledge management process in our organisation.”

Daniele Cordeiro Ferreira,
Department Head, Career, Remuneration and Personal Development, Eletronuclear, Brazil



Department of Nuclear Energy
International Atomic Energy Agency

Vienna International Centre
PO Box 100, 1400 Vienna, Austria
Tel.: +43 1 2600-0
www.iaea.org/NE
@IAEANE

visit us online:

www.iaea.org/NKMsection
NKM.Contact-Point@iaea.org



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