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Joint ICTP-IAEA School of Nuclear Energy Management

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Nuclear Knowledge Management – Why and for what?

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MANAGING NUCLEAR KNOWLEDGE

THE IAEA PROGRAM AND ACTIVITIES

Yanko Yanev
Head IAEA NKM Program

Agenda for today

- Introduction to Knowledge management
- Nuclear knowledge
- Nuclear Knowledge Management and Human Resource Development
- IAEA perspective
- QUO VADIS?

Managing Nuclear Knowledge

- What does it mean?
  - Why we should do it?
    - How this is done?

I A E A Role and Activities

Knowledge?

- the acquiring, understanding and interpreting of information.
- Knowledge is often used to refer to a body of facts and principles accumulated over time.
- Knowledge gives information a purpose or a use. Data leads to information and information leads to knowledge.
- Knowledge confers a capacity for effective action

Knowledge

- The principal obstacle to knowledge management for many is the lack of a profound understanding of knowledge.
- When trying to define “knowledge”, people are making a really ugly mess of” managing information”.
- In practice, the terms information and knowledge are often used interchangeably.

Many have tried….

Raphael's *School of Athens* and the Wisdom of the Ancients

Knowledge is the mother of all virtue; all vice proceeds from ignorance

Knowledge is power

Learning is a treasure which accompanies its owner everywhere

Knowledge is experience everything else is information

Introduction to Knowledge Management

- **Business activity with two primary aspects:**
  - Treating the knowledge component of everyday work as an explicit concern of business, reflected in relevant strategy, policy, and practice at all levels of the organization.
  - Making a direct connection between an organization's intellectual assets (both explicit [recorded] and tacit [personal know-how]) and positive business results.

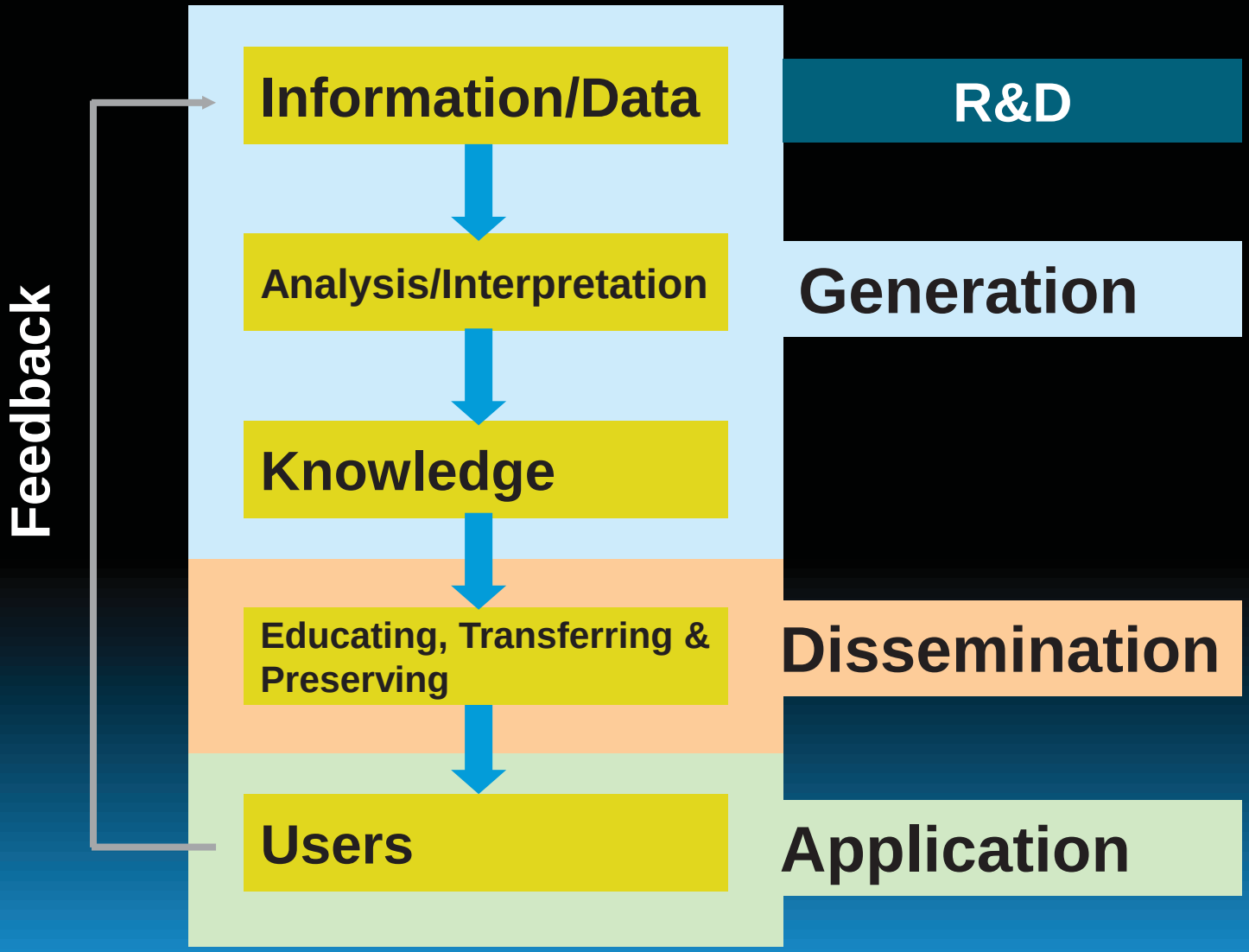
Definitions

- Knowledge management is hard to define because knowledge is hard to define.
- How would a nurse or a doctor define **'health care'** succinctly?
- How would a CEO describe **"management"?** How would a CFO describe **"compensation"?**
- How we at the IAEA define **"proliferation resistance"**

Knowledge management:

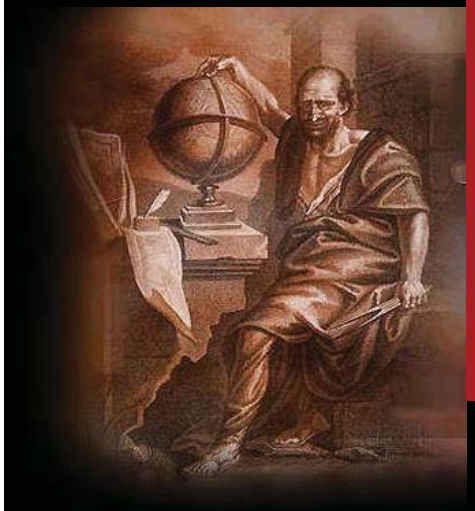
- Connected with several well-known management strategies, practices, and business issues, including
  - change management
  - best practices
  - risk management
  - benchmarking
  - may be others.
- Knowledge management is a natural extension of 'business process reengineering,'

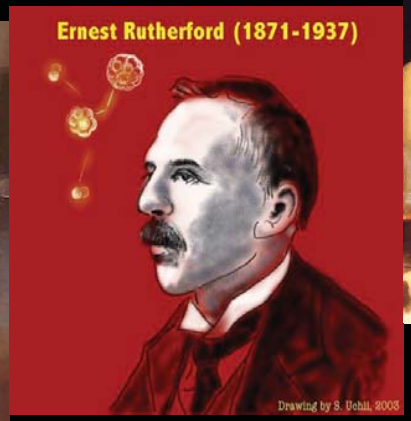
The Knowledge Processes

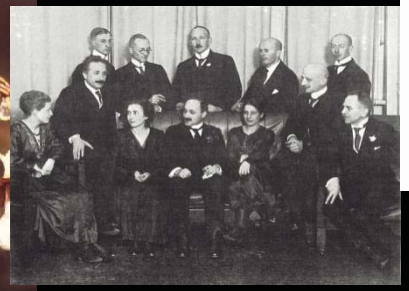


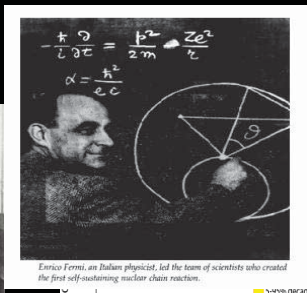
Nuclear Knowledge

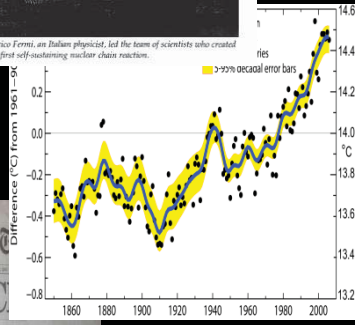
a remarkable achievement of human development

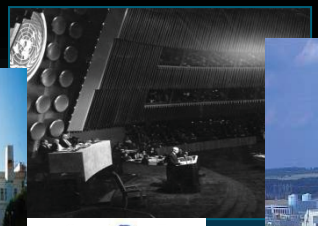


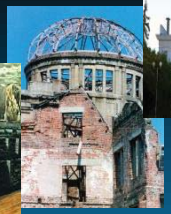


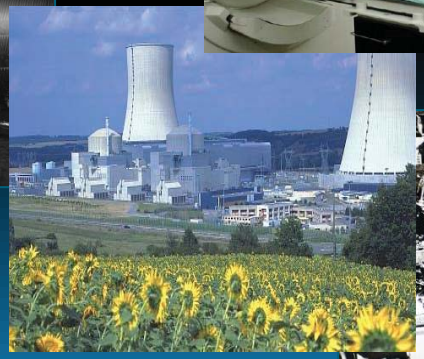












1945 1955 1965 1975 1985 1995 2005

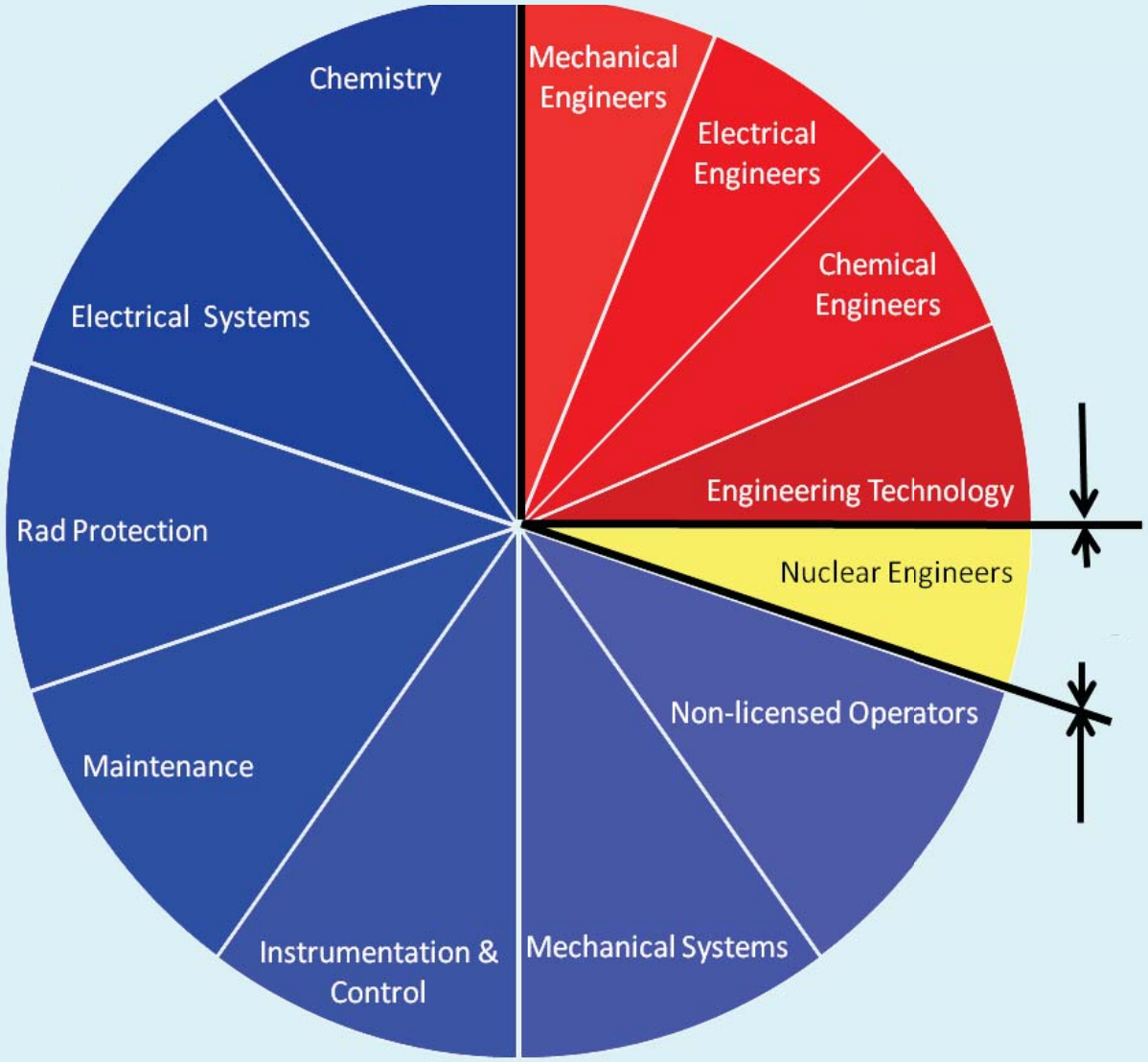
Nuclear Knowledge

- Nuclear knowledge is unique in many ways: it is complex, requires significant financial commitment and government support and must be developed, shared and transferred over many generations.
- The combination of personal skills and experience needed to turn this information into useable knowledge is particularly scarce.

Nuclear knowledge specials

- its **long-term accumulation** and the long life cycle of facility operation;
- **remarkable investment** from governments (public money);
- security, non-proliferation and safety concerns; **international obligations**
- needs **large critical mass of basic nuclear science** to support practical applications.

Knowledge needed for Nuclear power Development



Organizational Context

Asset Classes:

Physical Capital

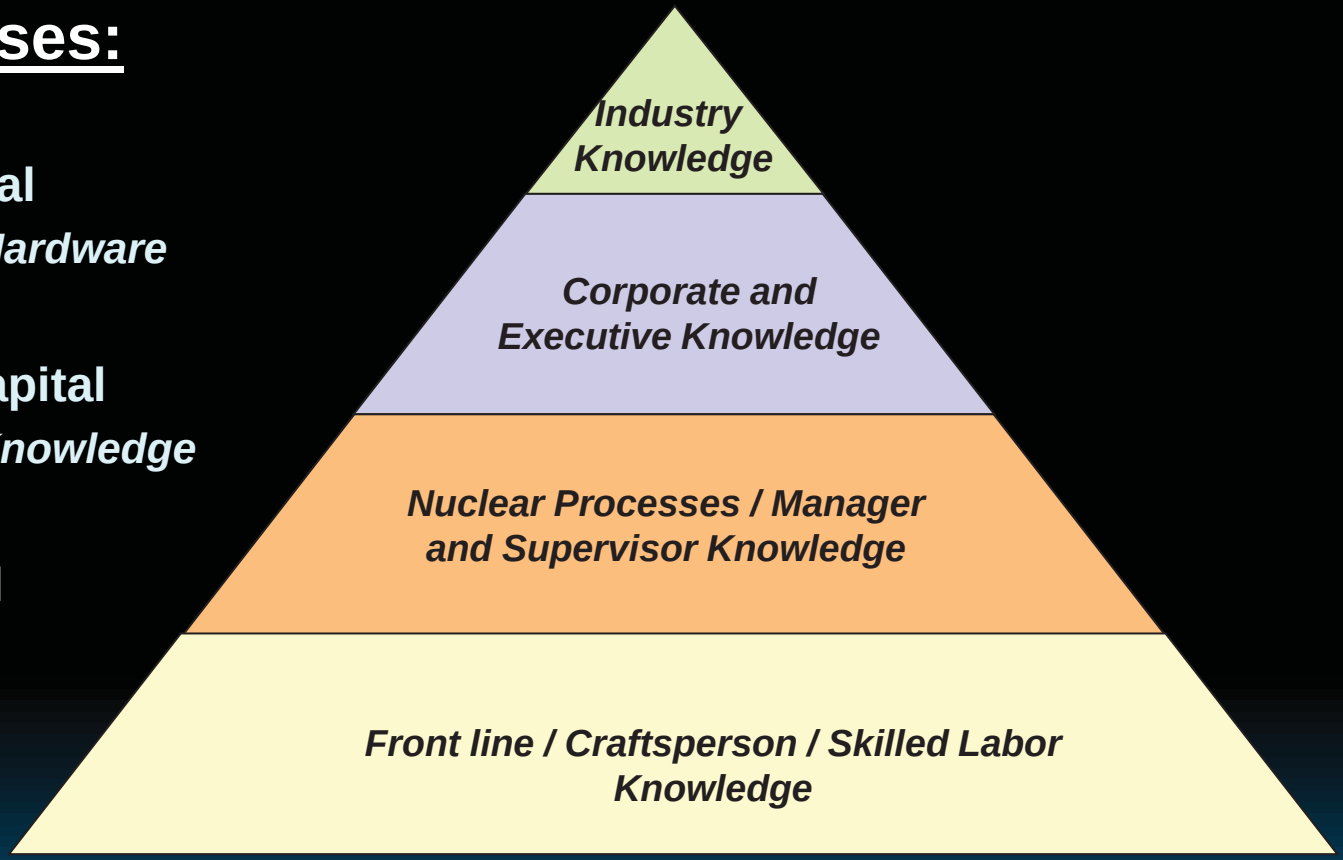
- ***Equipment/Hardware***

Technology Capital

- ***IT/Process Knowledge***

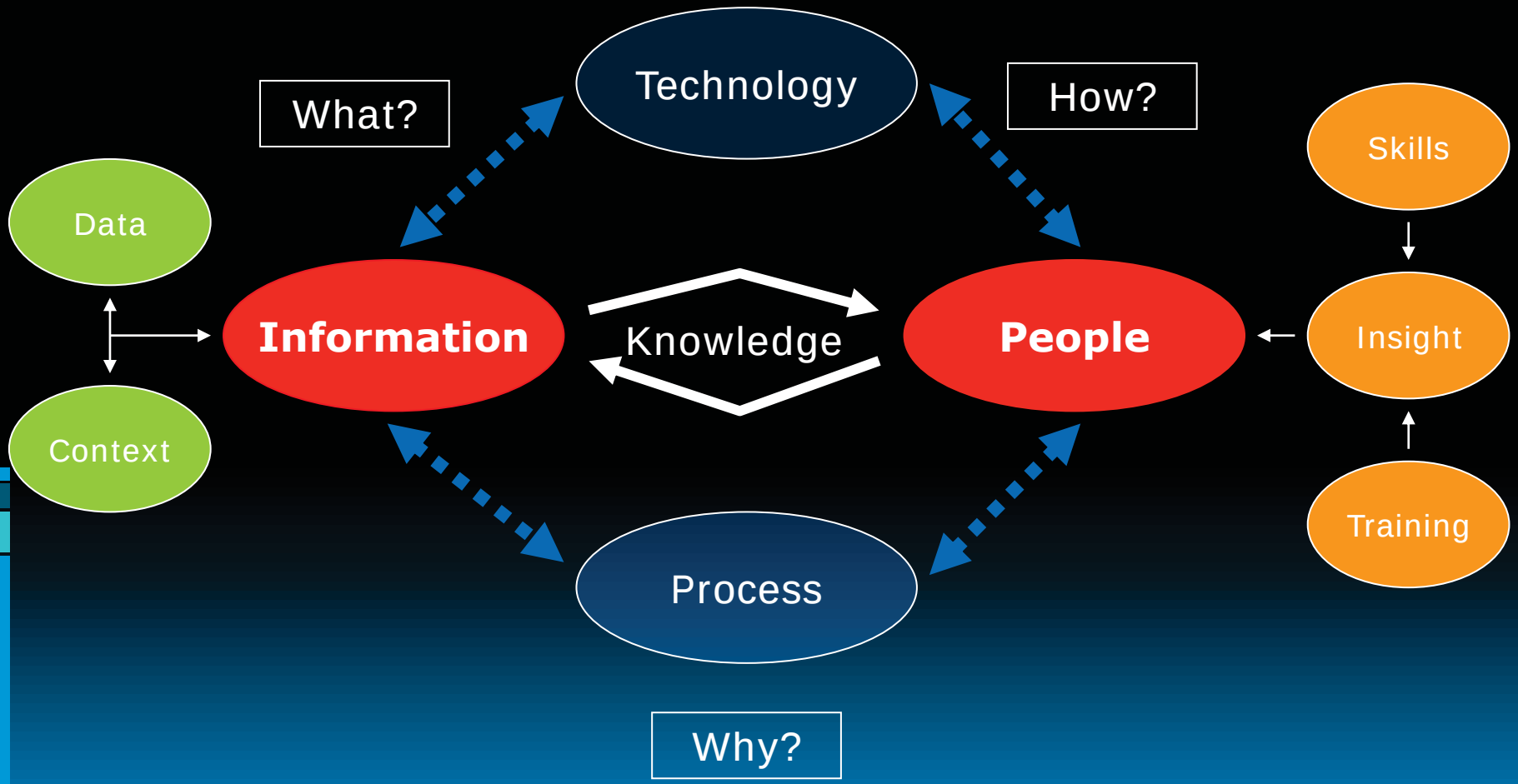
Human Capital

- ***People***



A resource which was created by absorbing other resources, Has its own *cost* . Needs to be managed in an efficient and effective manner to help to reach *organizational or national goals*.

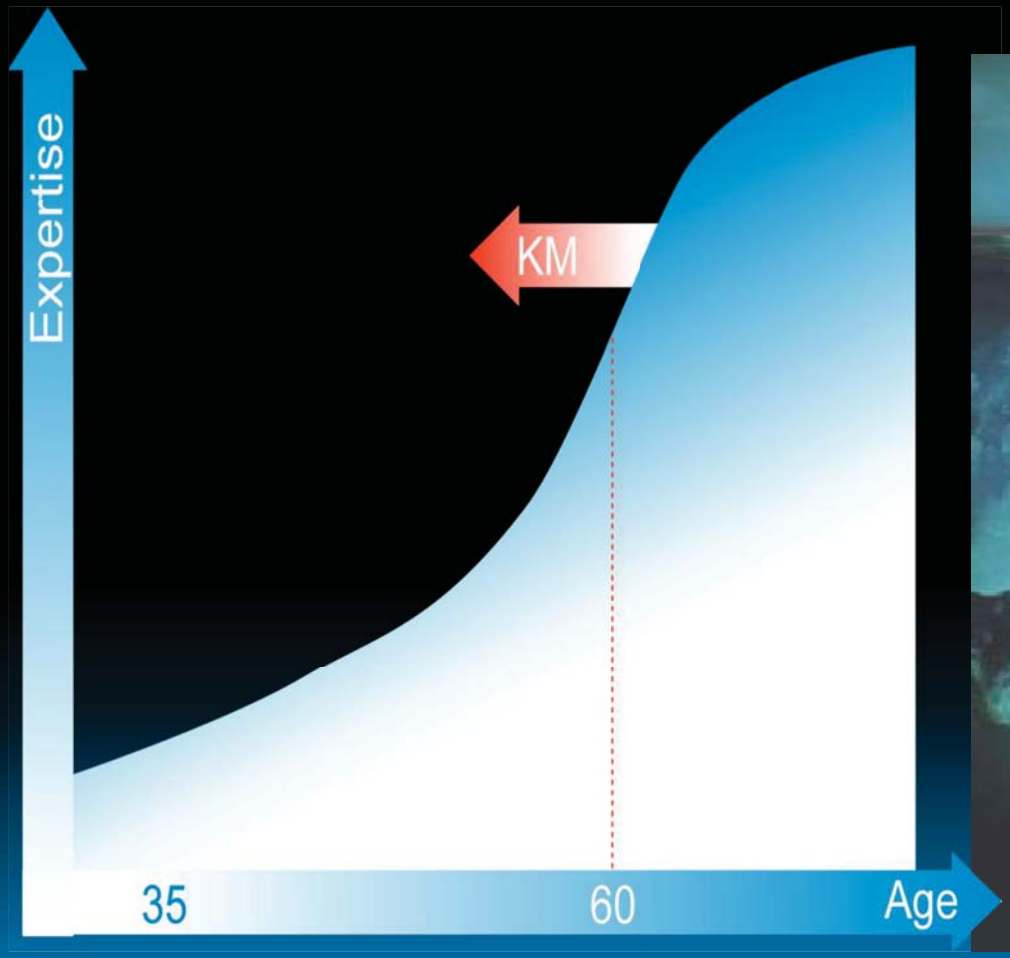
Knowledge management process cycle

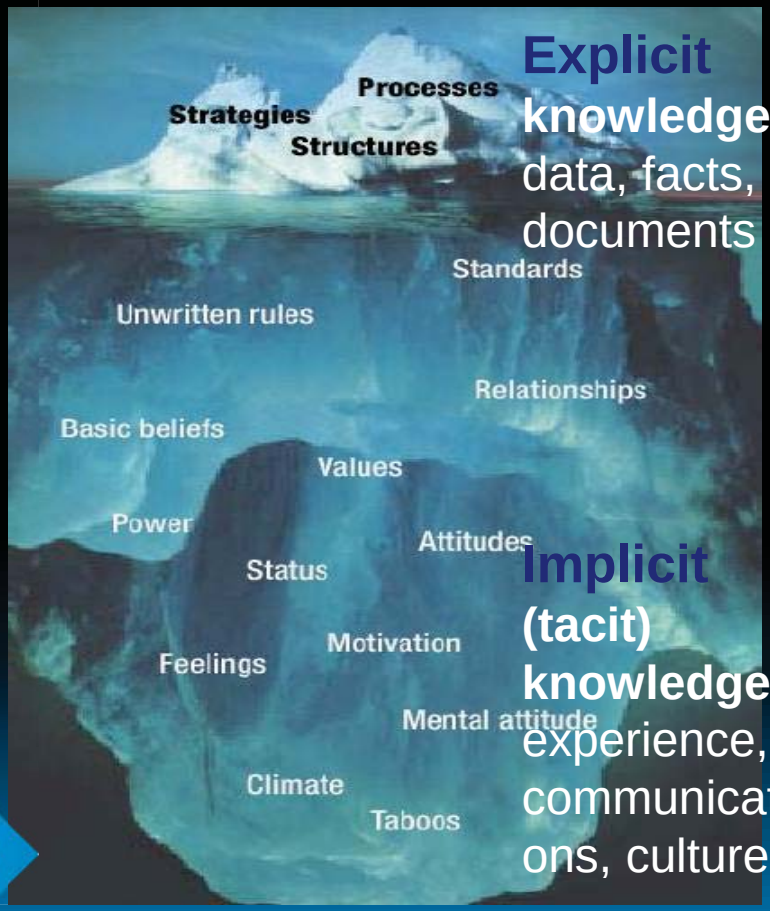


IAEA Definition of NKM

- **Nuclear Knowledge Management** at the project, organizational and national levels is an **integrated and systematic** approach applied to all stages of the knowledge cycle, including its identification, sharing, protection, dissemination, preservation and transfer.
- **NKM** affects and relates to human resource management, information and communication technology, process and management approaches, document management systems, and corporate and national strategies.

The Two Critical Issues





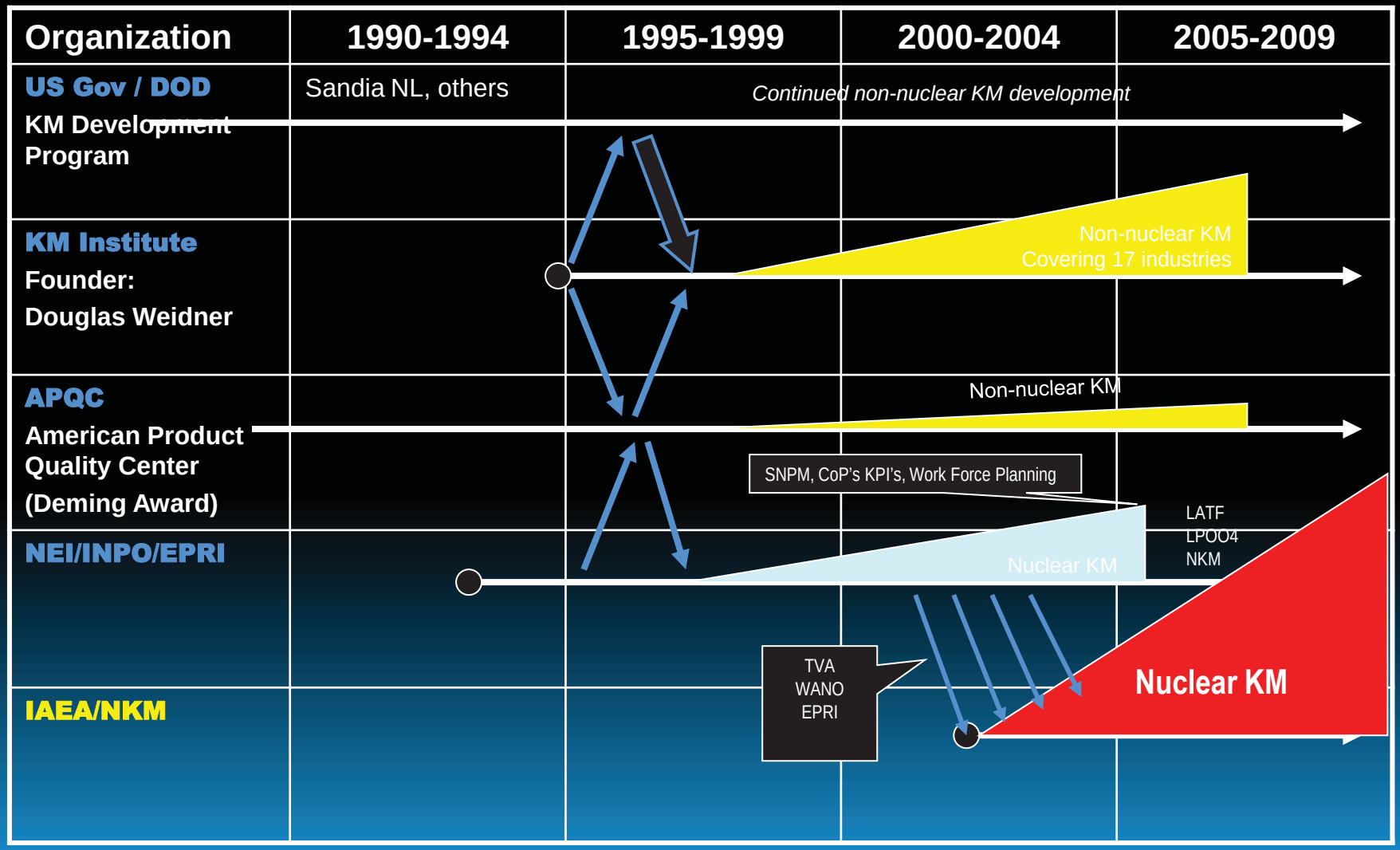
Explicit knowledge: data, facts, documents

Implicit (tacit) knowledge: experience, communications, culture

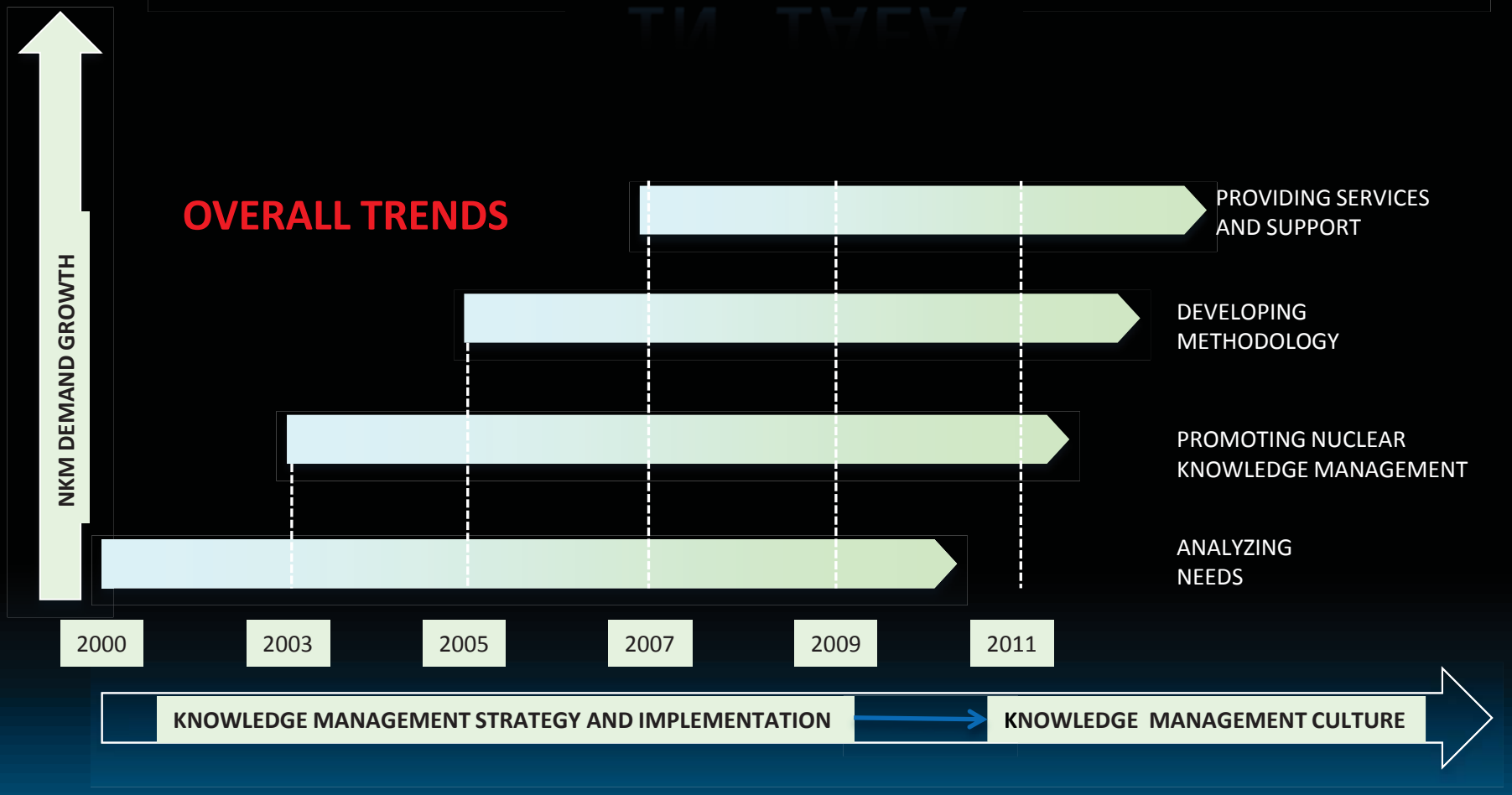
IAEA NUCLEAR KNOWLEDGE MANAGEMENT PROGRAM

NKM BIG PICTURE

(a view from the US)



EVOLUTION OF NKM PROGRAM IN IAEA



Program Strategy

DEMAND	ACTIONS	OBJECTIVES
1. Develop Methodology and Guidance 2. Facilitate educational networks. 3. Develop pilot projects	1. Transfer NKM to Member States through workshops, schools, assist visits and TC projects 2. Establish and facilitate nuclear E-Learning networks 3. Create advanced knowledge products	1. Integrate NKM in Management Systems 2. Promote Nuclear Knowledge Management Culture in Member states. 3. Enhance innovative nuclear education

NKM Methodology and Guidance

O
- NKM objectives

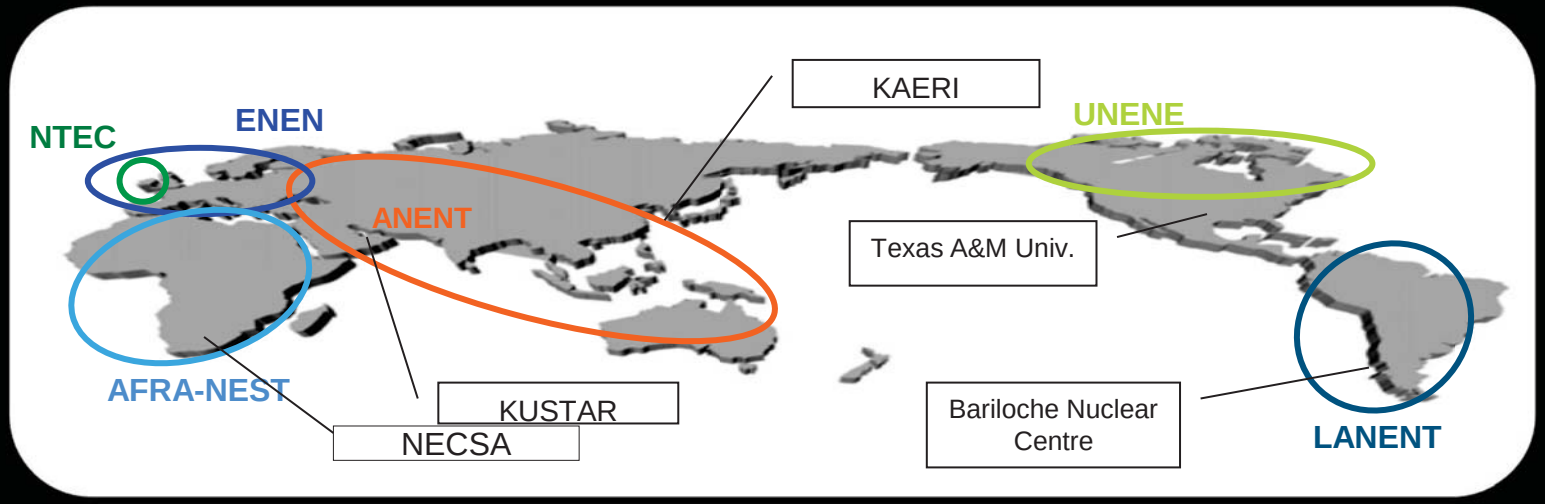
G
- NKM Guides
- NPP, RAWF,GO,RO, KLRA,

R
- Technical reports
- NKM Handbook, NKM Glossary, NKM Conference Proceedings

IAEA NKM Documents and Guides

Networking Nuclear Education

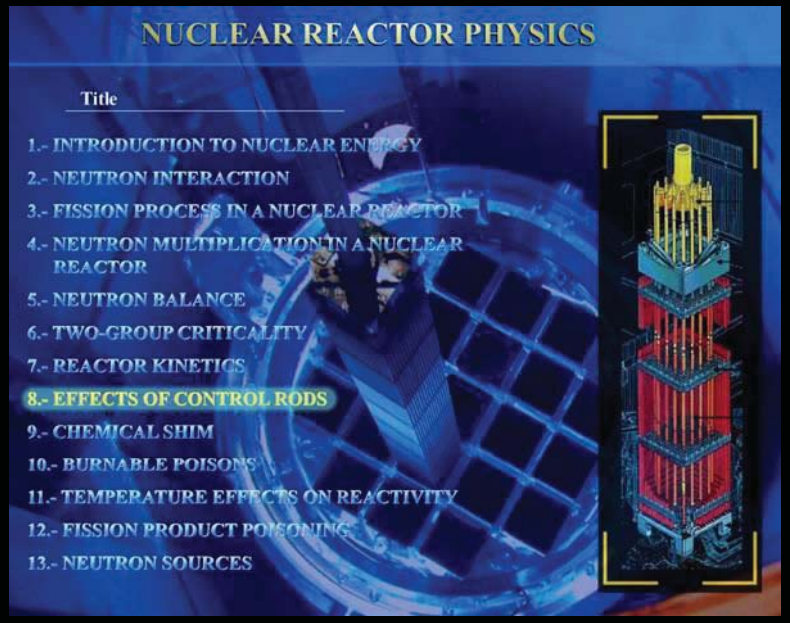
"...Networking education should be further made more efficient by interlinking networks and sharing best practices on a global scale..." *SAGNE, 2010*

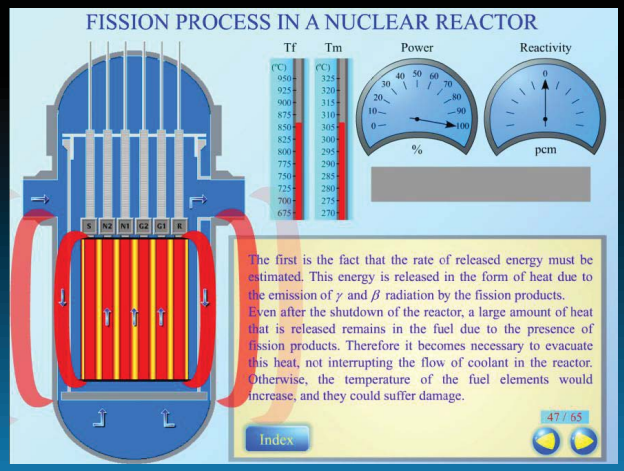


To provide a forum to exchange the policy and strategies for nuclear education and training and to facilitate the regional and interregional cooperation to share educational experiences and resources:

- **The Asian Network for Education in Nuclear Technology (ANENT)**
- **The European Nuclear Education Network Association (ENEN)**
- **The Nuclear Technology Education Consortium (NTEC)**
- **The University Network of Excellence in Nuclear Engineering (UNENE)**
- **African Regional Cooperative Agreement – Network for Education in Nuclear Science and Technology (AFRA-NEST)**
- **Regional Cooperative Agreement in Latin America and the Caribbean (ARCAL) – Bariloche Nuclear Centre in Argentine**

New Knowledge Products
Multimedia Textbook "Nuclear Reactor Physics"





Technical Univ. of Catalonia

1. Neutron interaction
2. Introduction to the Nuclear Energy
3. Fission process in a nuclear reactor
4. Neutron multiplication in a nuclear reactor
5. Neutron balance in an material medium
6. Criticality in multiplier medium
7. Reactor kinetics
8. Control rod effect
9. Soluble poisons
10. Burnable poisons
11. Reactivity temperature effects
12. Fission products poisoning
13. Neutron Sources

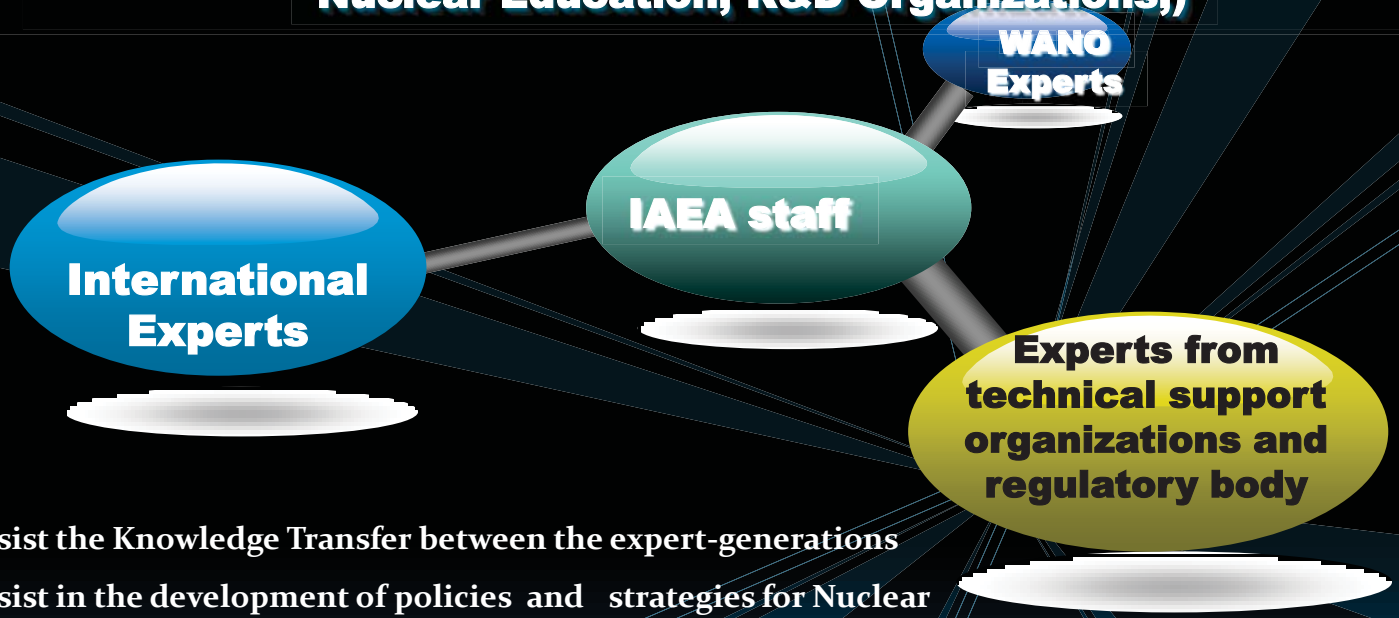
NKM SERVICES

KNOWLEDGE ASSIST VISITS

KNOWLEDGE AUDITS

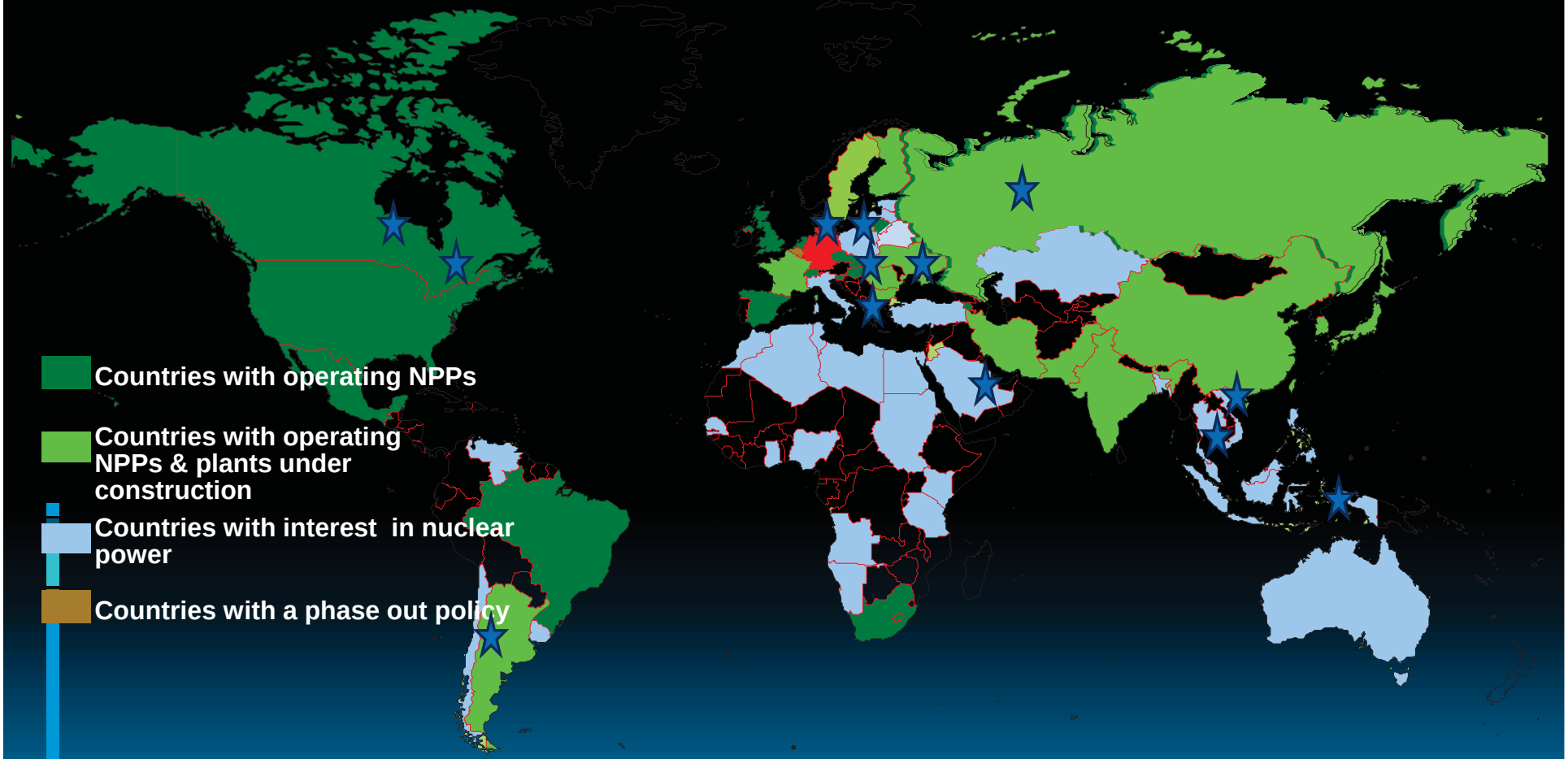
Assist Mission on Knowledge Management for Nuclear Industry

(Operating Organizations, Regulatory Bodies, Nuclear Education, R&D Organizations,)



- Assist the Knowledge Transfer between the expert-generations
- Assist in the development of policies and strategies for Nuclear Knowledge Management
- Review the nuclear education and training programs of Member States
- Facilitate the transfer of NKM methodologies and tools
- Help in NKM maturity assessment for NPP and R&D organizations

Knowledge Management Assist Visits



Managing the Future

Nuclear E-Learning Portal

Integrating nuclear resources for education and training in synergy with IAEA and other educational establishments

- facilitating access to educational materials and teaching experience
- enabling a convenient and flexible e-learning environment
- contributing towards developing nuclear skills and competencies needed in the 21st century


IAEA
IAEA Electronic Learning Portal
HOME
ABOUT
LEARNER
TEACHER
LIBRARY
COMMUNITY
search...
Communication. Collaboration. Knowledge.
DG STATEMENT
The generation of professionals who built and led the nuclear power industry for much of the past 50 years is approaching retirement and in some countries there are not enough students coming up through the educational system to take their place...
Read more
E-LEARNING
This E-Learning (ANENT) package will provide you with more opportunities, resources, and new strategies for nuclear education and training through the ANENT Cyber Learning Platform.
Read more
EVENTS
Training/Workshop on the School of Nuclear Energy Management (in cooperation with ICTP)
8-26 November, Trieste, Italy
E-Mail
KNOWLEDGE BASE
Energy Series
International Safety Standards
Site Map
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IAEA Electronic Learning Portal

IAEA

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- Univ. N. Programmes
- International Studies
- Monitoring and Control

Home \ Teacher

ANENT E-LEARNING

This E-Learning (ANENT) package will provide you with more opportunities, resources, and new strategies for nuclear education and training through the ANENT Cyber Learning Platform.

Read more

INTERNATIONAL STUDIES

Here you will also find international studies on nuclear subjects, as well as studies from North American and international bodies.

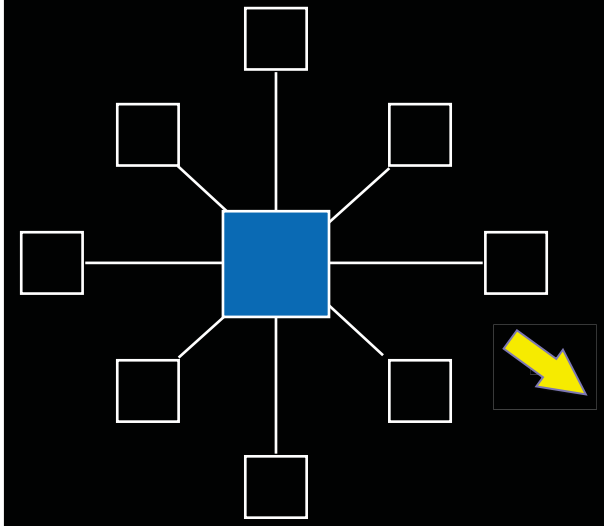
Read more

UNIV. N. PROGRAMMES

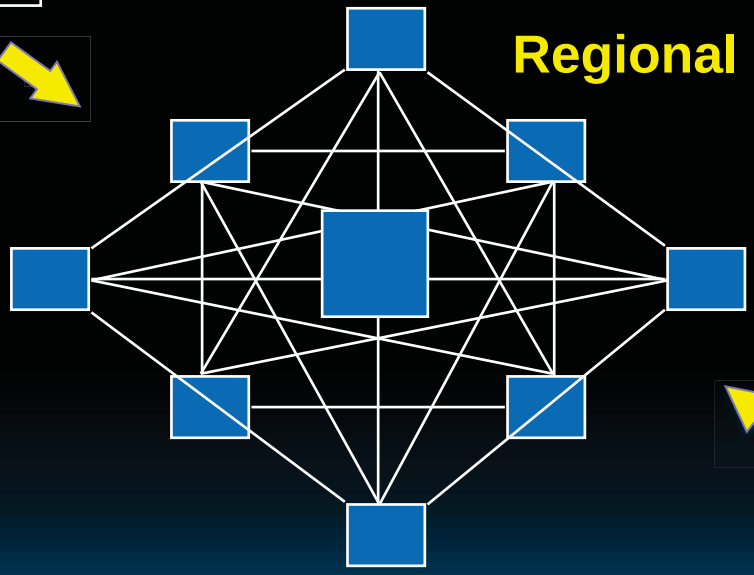
Here you may access the database of links to nuclear relevant resources on the Internet.

Read more

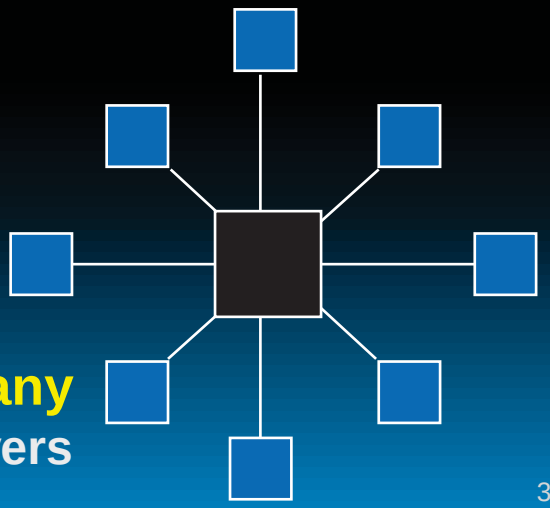
IAEA Integrated E-Learning Network



Users to Agency—many to one
(e.g. Agency Website)



Regional Networks—many to many

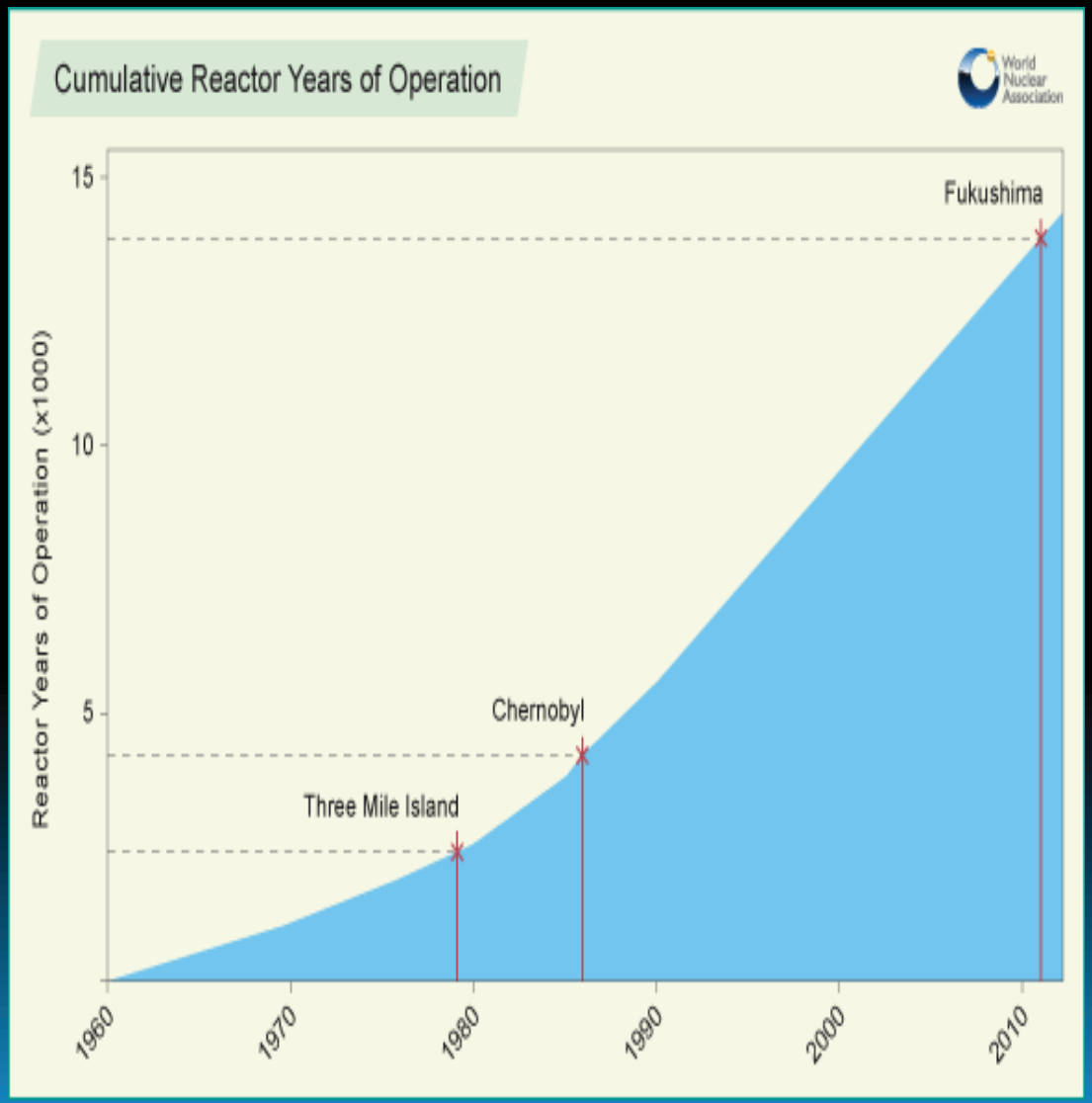


Agency System—one to many
Satellite servers

QUO VADIS?

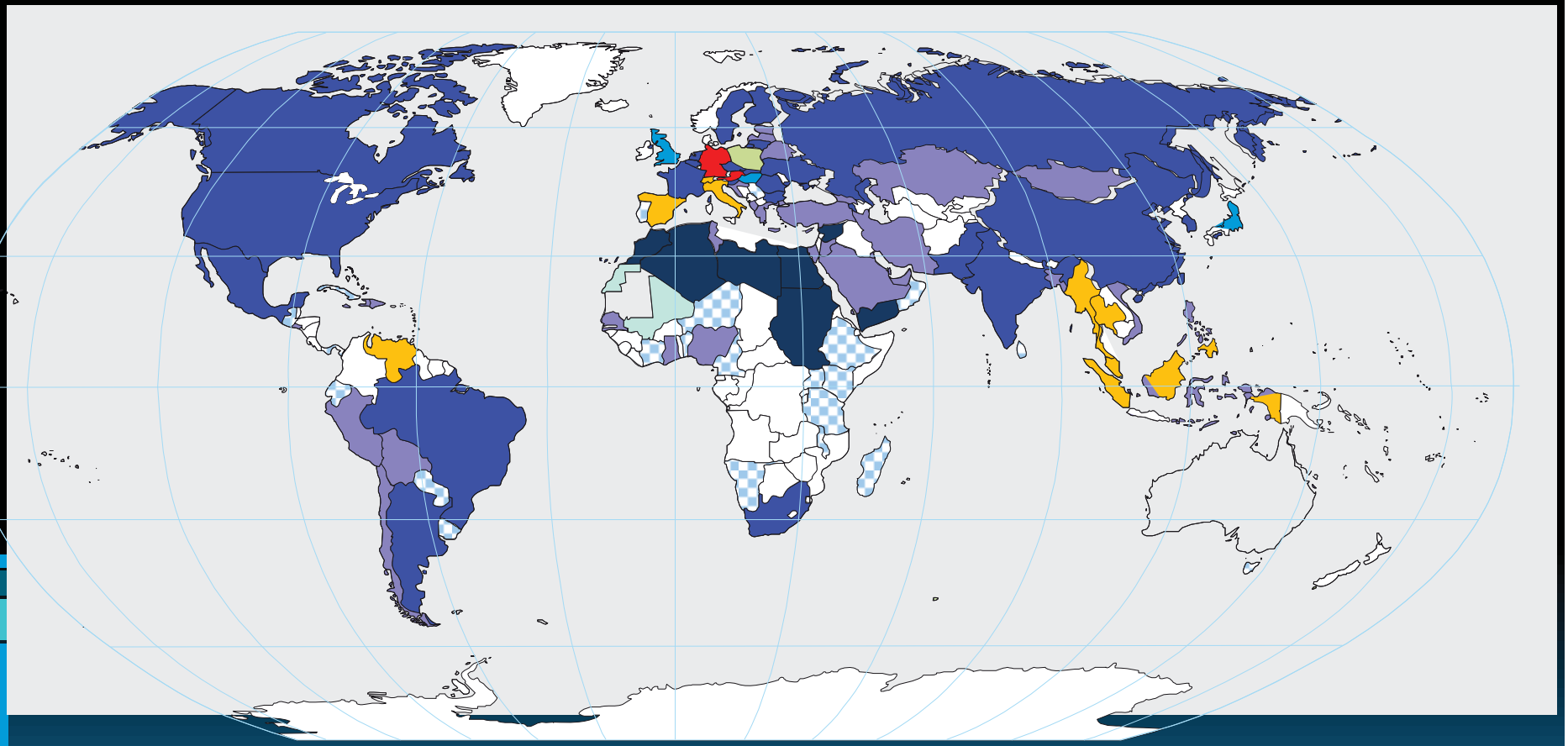
- When Saint Peter met Jesus as he was running from being crucified in Rome, Peter asked Jesus the question – **Quo Vadis?**
- Jesus' answered, "I am going to Rome to be crucified again".
- This prompted Peter to gain the courage to continue his ministry and eventually become a martyr.

Challenges of nuclear power development



- The Three Mile Island accident challenged **design development and training**
- Chernobyl showed that **safety culture** must be a fundamental attribute of any nuclear activity.
- Now nuclear power has faced unbelievable, **catastrophic external events** and while economic and other social losses have been incurred, human life has been preserved.
- The next critical challenge will be **maintaining competence and managing knowledge** and skills in the long term to guarantee safety and reliability at the highest level.

Nuclear power landscape
May 2011



Operating

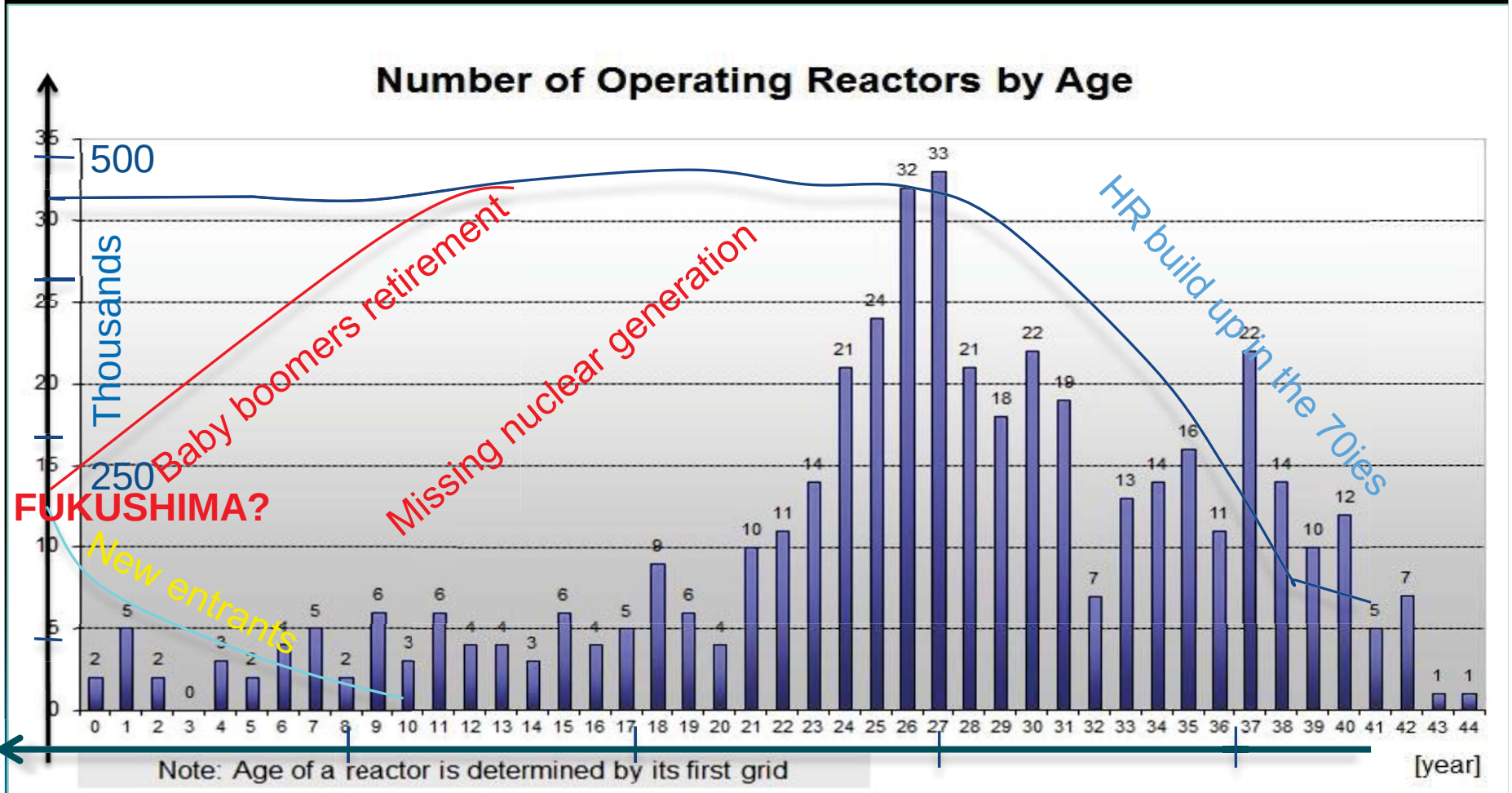
Expressing interest

Delaying

Considering

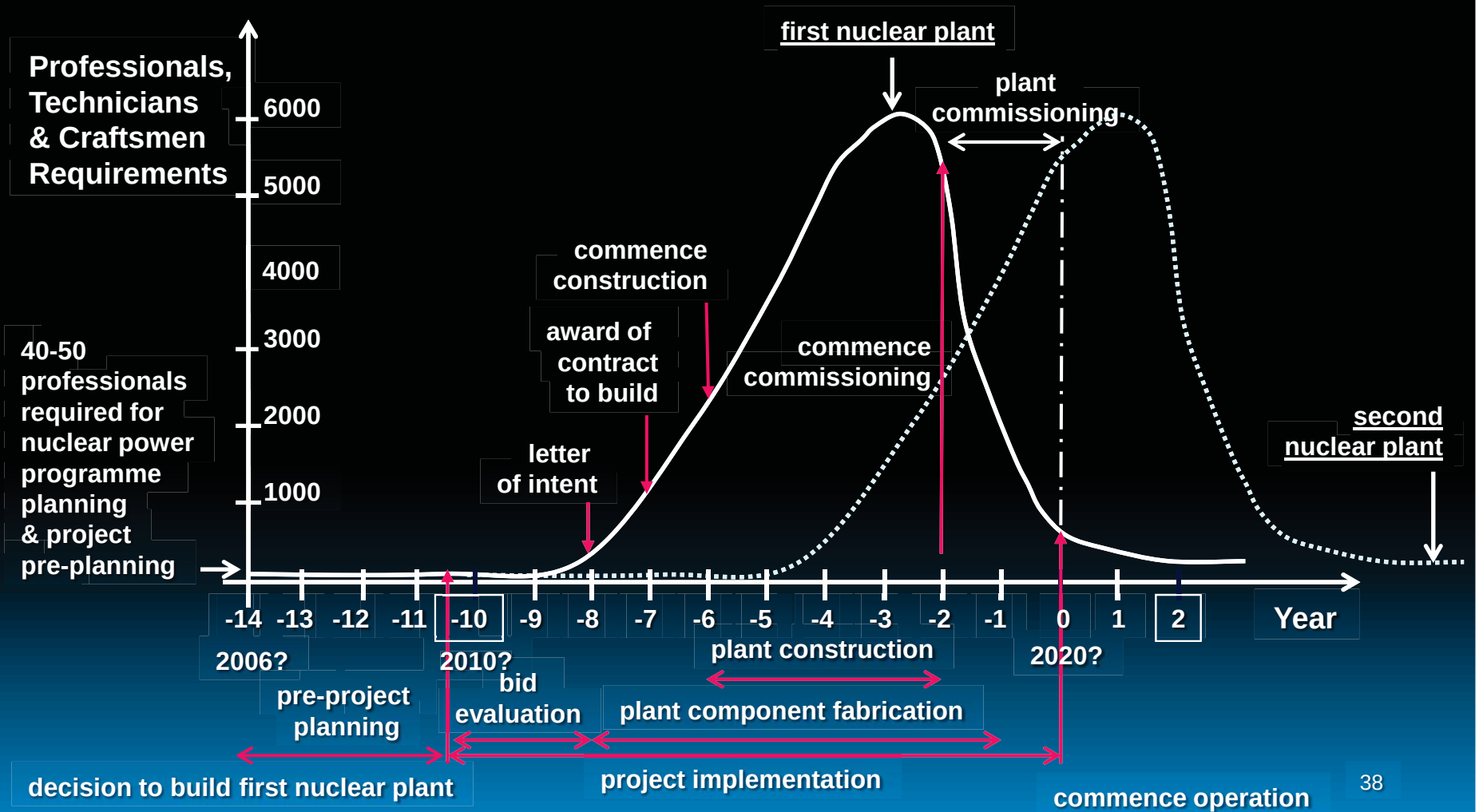
Negative

Nuclear Power and Human Resource Timeline

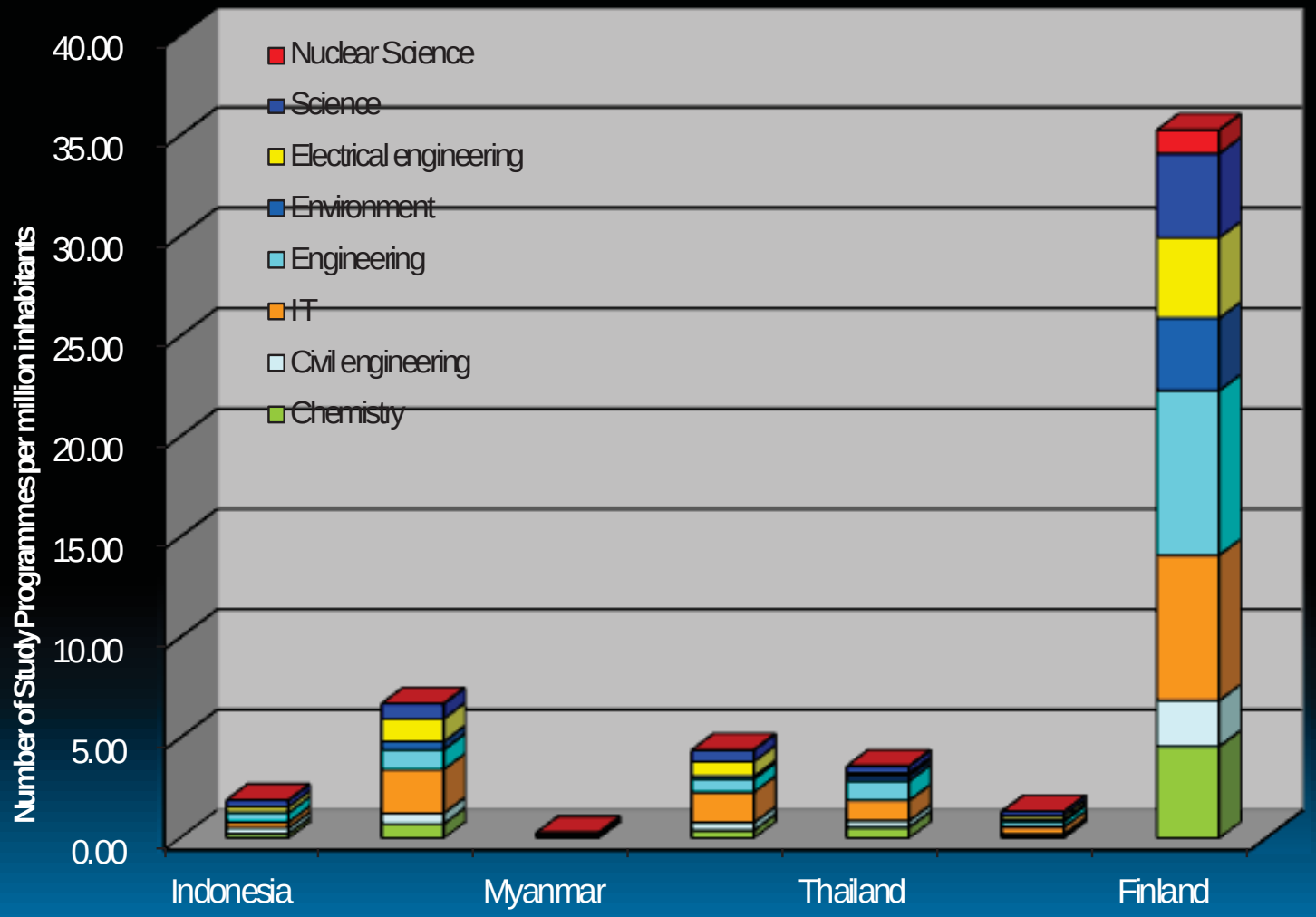


2000 1990 1980 1970

NPP HUMAN RESOURCE DYNAMICS



Education & Training



THE FUTURE CHALLENGES TO NUCLEAR KNOWLEDGE MANAGEMENT

Or what to remember…

The Next 4 challenges…

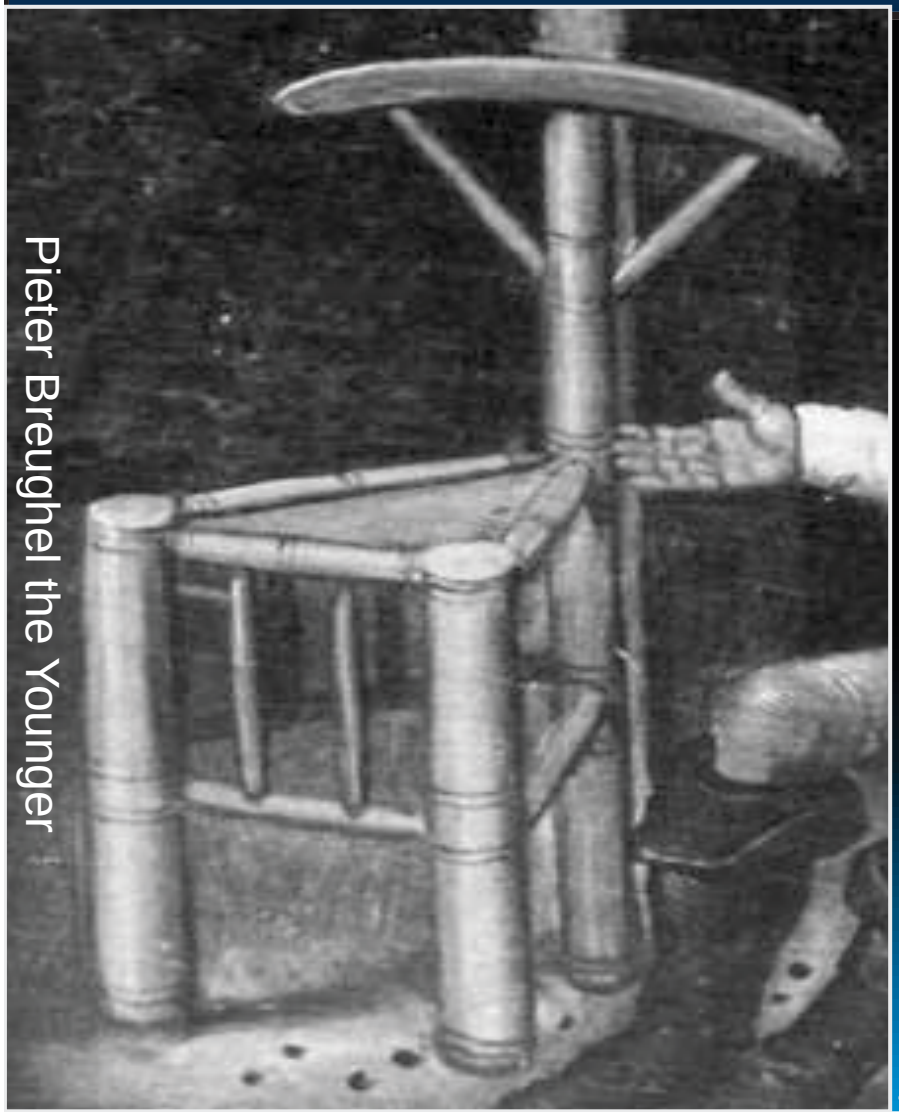
1. Operating facilities:
   - operation of these facilities and the associated activities could be affected adversely by deficient decision-making, lacking the sufficient level and quality of nuclear knowledge and competence at any future stage of the facility's life-cycle.
2. New Projects:
   - The increasing number of new-build projects especially in developing countries will require the same on-going diligence and oversight in design, delivery, and supply as we have today. Vendors may be involved with several projects, which will require careful allocation of their experienced human resources.

The next 4 challenges…

3. New comers:
   - While most new plants will be built initially in established nuclear power countries, there will also be plants built in countries without nuclear power experience. These new entrants will require international human resource commitments over an indeterminate time to assist with the establishment of the robust nuclear infrastructure that established countries have developed over several decades.

4. Education and training:
   - The number of skilled people at all levels has to expand substantially, which means increased requirements for education and training in all needed disciplines. This involves more than courses from educational institutions.

The three legs of the chair...and Nuclear Energy

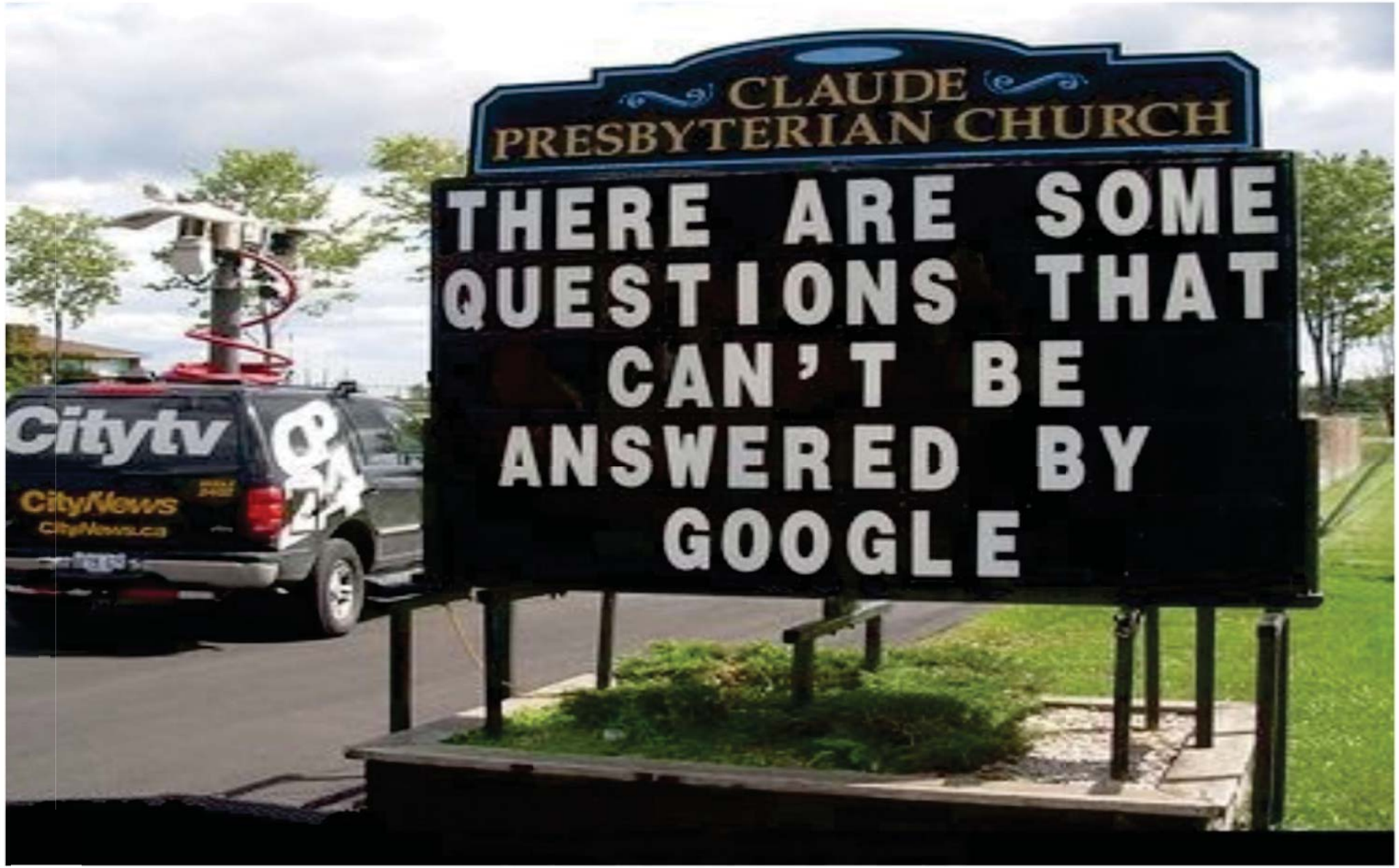


Pieter Breughel the Younger

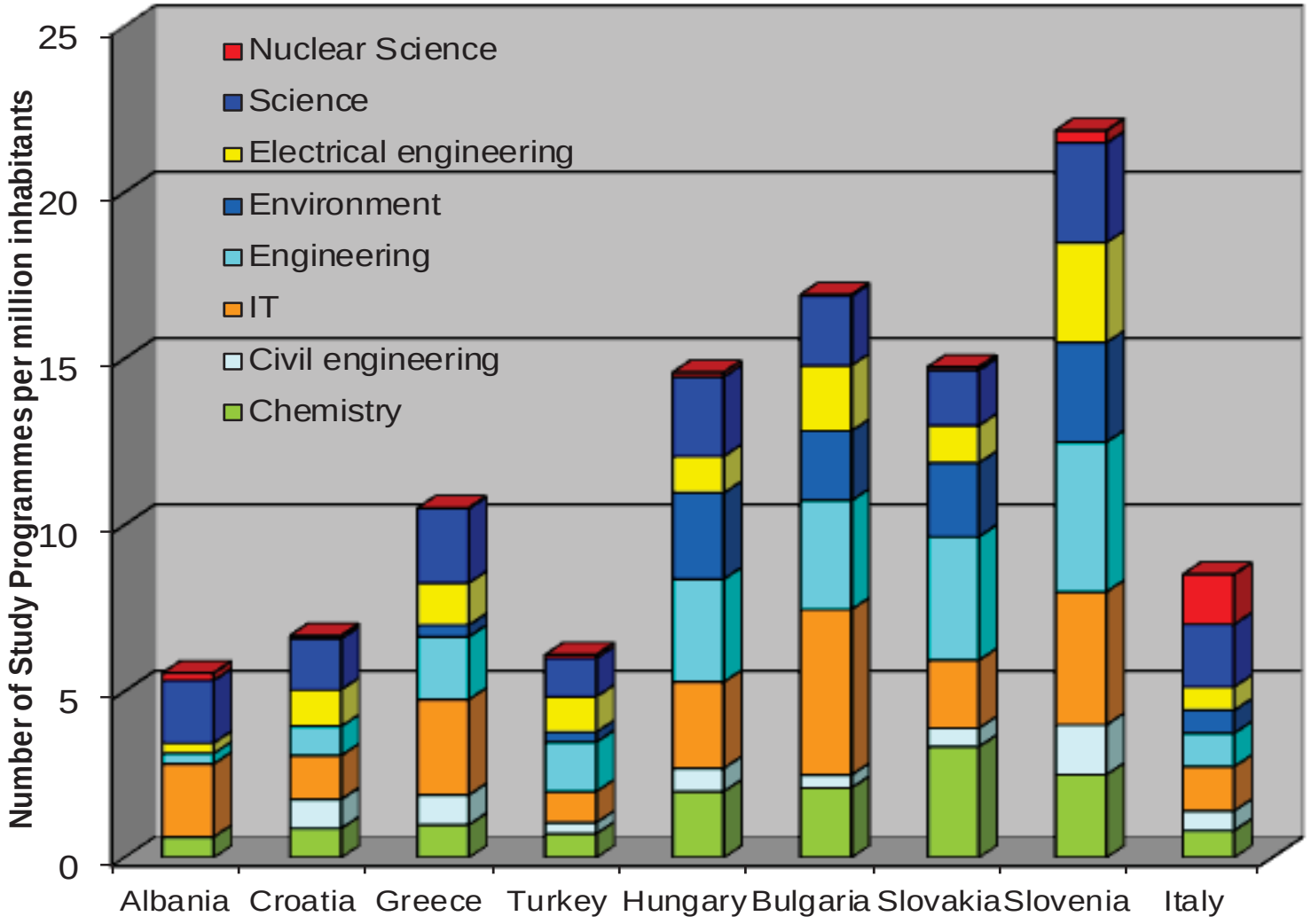
1. Society must be convinced in the benefit of nuclear power
2. Nuclear Power should be used responsibly.
3. Nuclear Knowledge must be sustained and developed.

Your best resource on Managing Nuclear Knowledge :
http://www.iaea.org/nkm

QUESTIONS?


CLAUDE
PRESBYTERIAN CHURCH
THERE ARE SOME QUESTIONS THAT CAN'T BE ANSWERED BY GOOGLE
Citytv
CityNews

South East Europe



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Education & Training