Nuclear Education & Training for Stakeholders in the Nuclear Value Chain

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By:
Sheriffah Noor Khamseah Al-Idid bt Dato' Syed Ahmad Idid
Innovation & Nuclear Advocate
Alumni, Imperial College, University of London, UK

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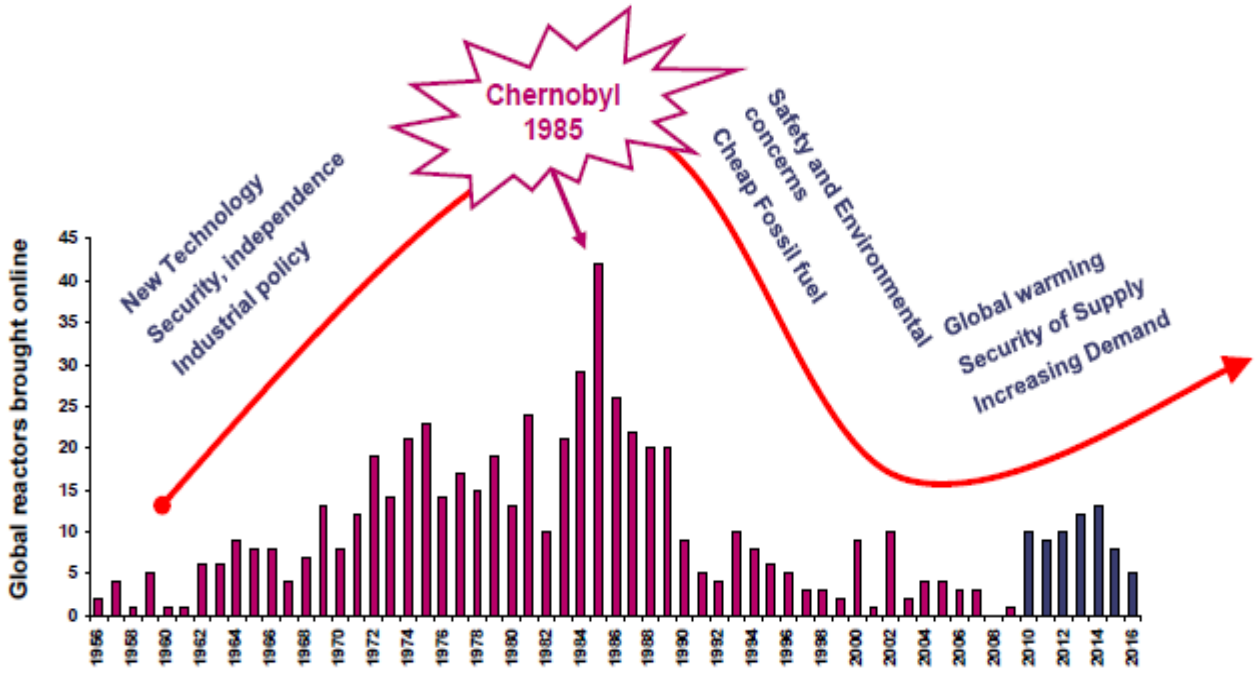
1a. Global Nuclear Power Expansion

Opportunities nuclear renaissance



Industry challenges

- Public acceptability?
- Attraction of talent?
- New designs and supply chain capabilities?
- Privatised industry, private capital?
- Liberalised and volatile markets?
- Competition from Far Eastern players?

438 reactors operational

56% are more than 25 years old

Western industrial decline, Far Eastern construction continues

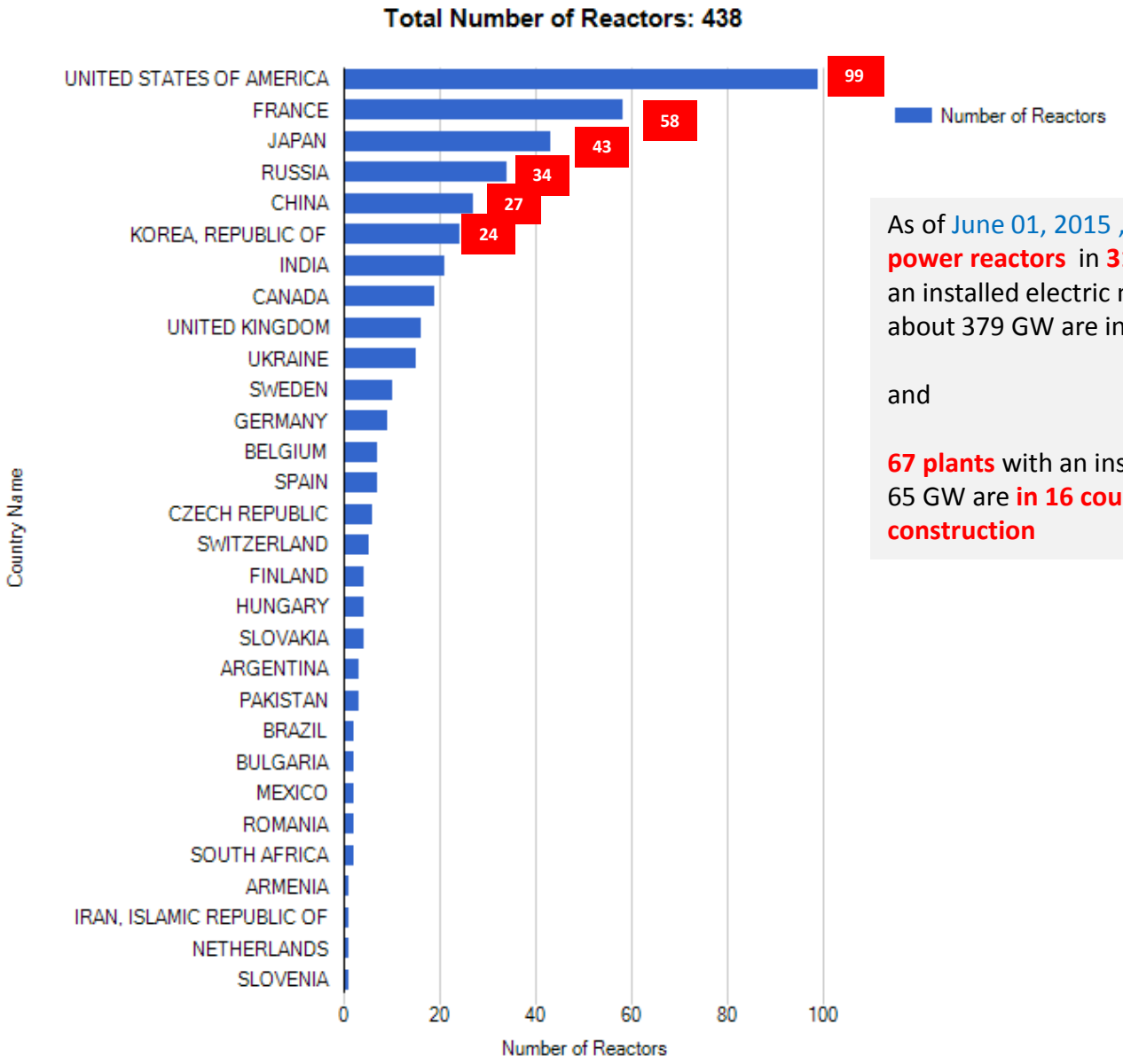
54 reactors under construction

148 ordered or planned

342 proposed

SOURCE: WNA April 2010

1b.Operational Nuclear Power Reactors as of 15 June 2015 by IAEA

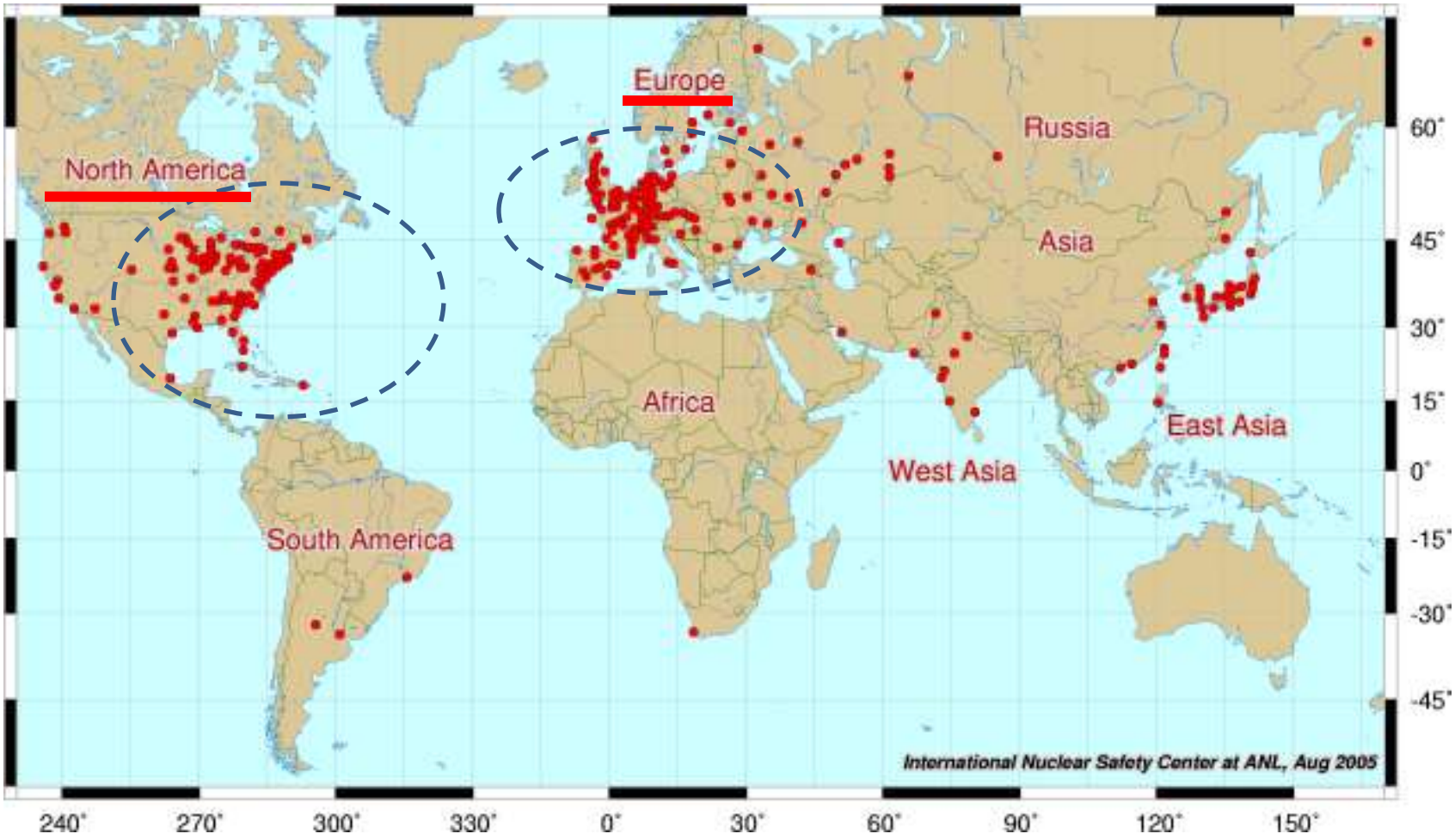


As of June 01, 2015 , **438 nuclear power reactors** in **31 countries** with an installed electric net capacity of about 379 GW are in operation

and

67 plants with an installed capacity of 65 GW are **in 16 countries under construction**

1c. Location of Operational nuclear power reactors in the World

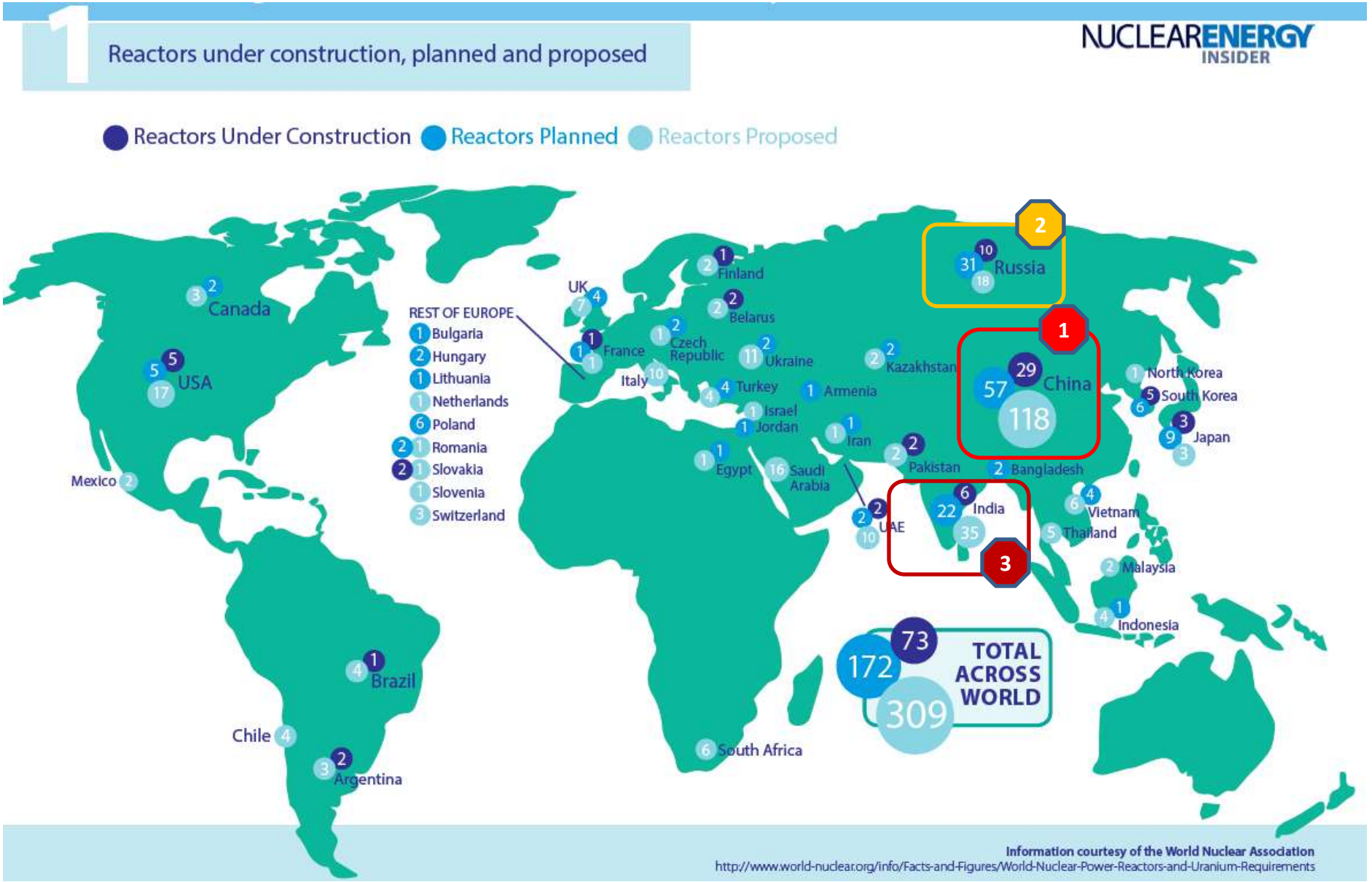


source: Nuclear power plants around the world, posted 4 July 2014

1d Reactors under construction,

source: Nuclear New Construction Market Map 2014 by Nuclear Energy Insider- edited 16 June 2015

1e. Nuclear Power Reactors under Construction, Planned and Proposed



source: Nuclear New Construction Market Map 2014 – Nuclear Energy Insider ,2014

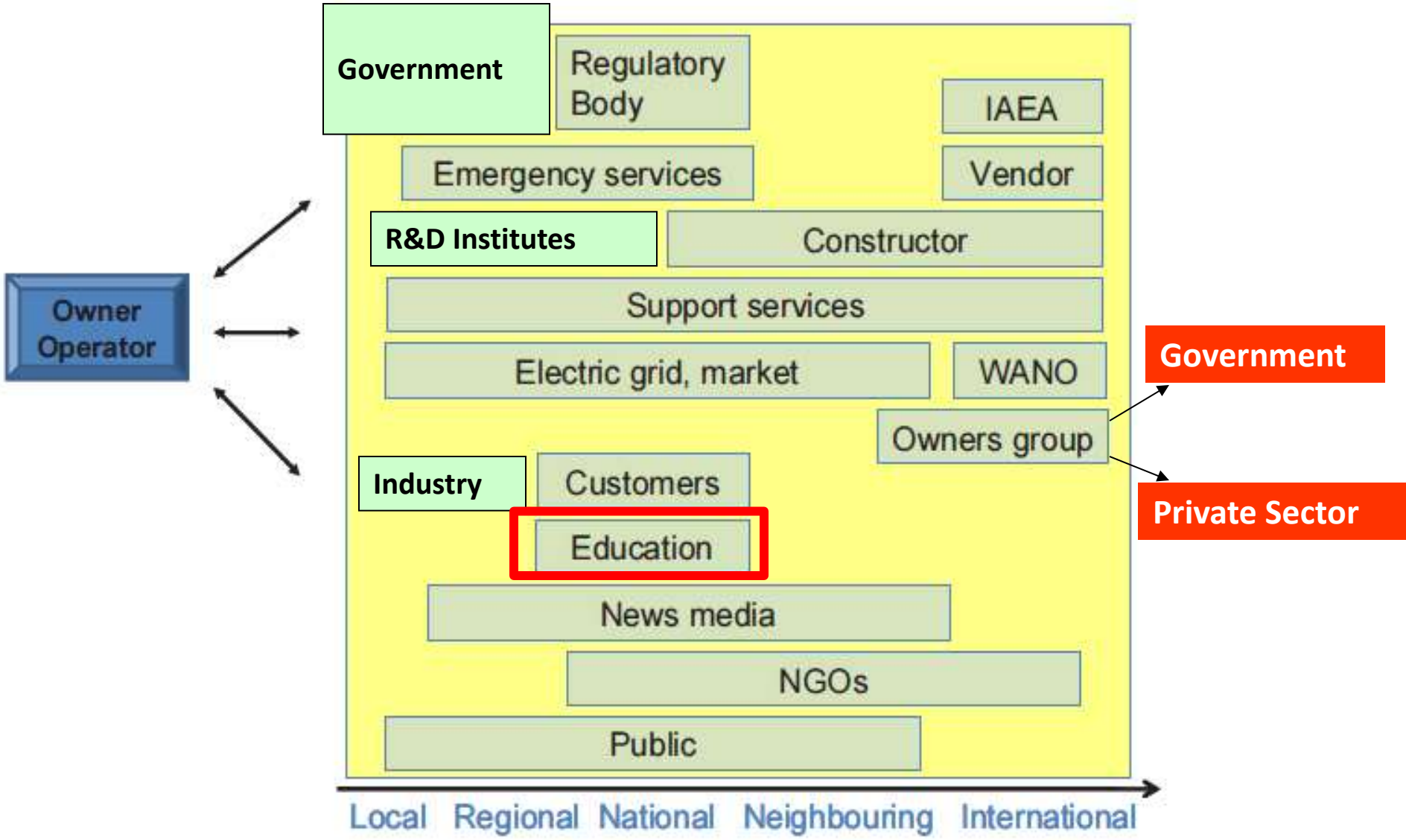
2. Future of Global Nuclear Power

- **Nuclear reactor construction primarily in Asia**
- **Nuclear reactor manufacture shifting to Asia**
  - South Korea emerges as major exporter
  - China is poised to be next major exporter
  - Russia is pushing very hard, French are also
  - Questions of US nuclear supply chain
- **Who will lead the regulatory and operations world?**

We are seeing tectonic shifts in all aspects of global nuclear power to Asia – is it prepared to lead?

source: Prospects and challenges for a global expansion of Nuclear Energy by Siegfried S Hecker, Stanford University

3. Stakeholders in a Nuclear Power Programme



4

All these organizations require competent people, should plan and ensure adequate human resources !


Nuclear facilities (including NPPs, fuel cycle, radwaste)

Operations & Maintenance

Government agencies (Ministries, etc.)

Nuclear Planning, Policy, Governance

Owners, Operating Organizations, Corporations (e.g. Headquarters)

Nuclear Planning, Management, Financing

Human Resources for a Nuclear Power Programme and for new NPP builds

Technical Support organizations

Nuclear Consultancy & Technical Support Services

Regulators (including nuclear)

Nuclear Law & Regulation

Educational institutions

Nuclear Education & Training

R&D organizations

Nuclear Technology Development

Specialized training organizations

Organizations involved in nuclear or rad activities (e.g. transport, security, org using sources of ionizing radiation)

Radiation Protection

Equipment Vendors, Suppliers, Construction

Nuclear Business, Construction & manufacturing

International and professional organizations

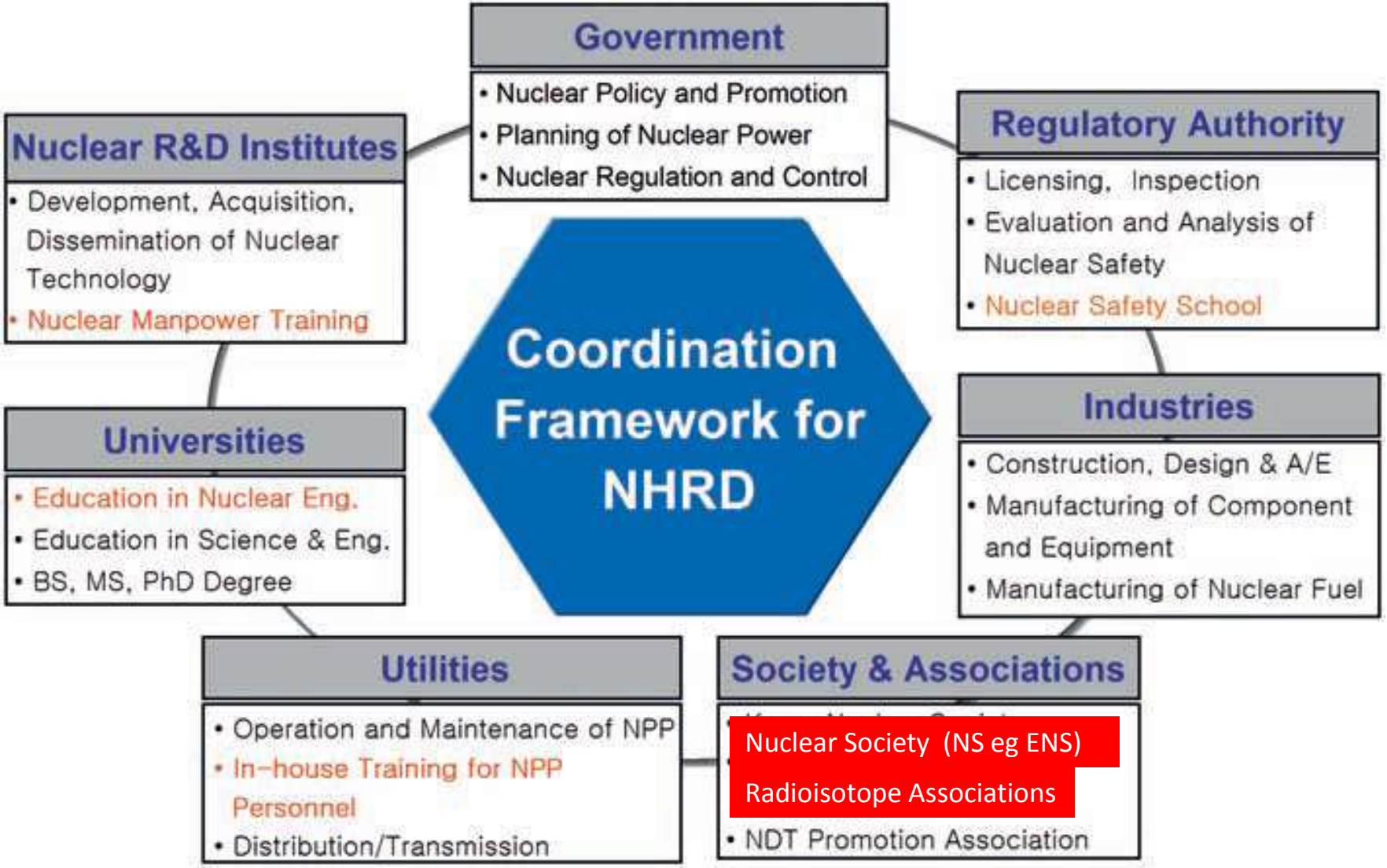
Nuclear Policy, Law, Governance, Negotiations

Media Agencies

Financial Institutions

Source: Managing Human Resources in the Field of Nuclear Energy – IAEA Nuclear Energy Series NG-G-2.1
International Atomic Energy Agency (IAEA), 2009

5. Coordination Framework for Nuclear HCD



6a. Milestones for the Implementation of NPP -The HRD Perspective, IAEA

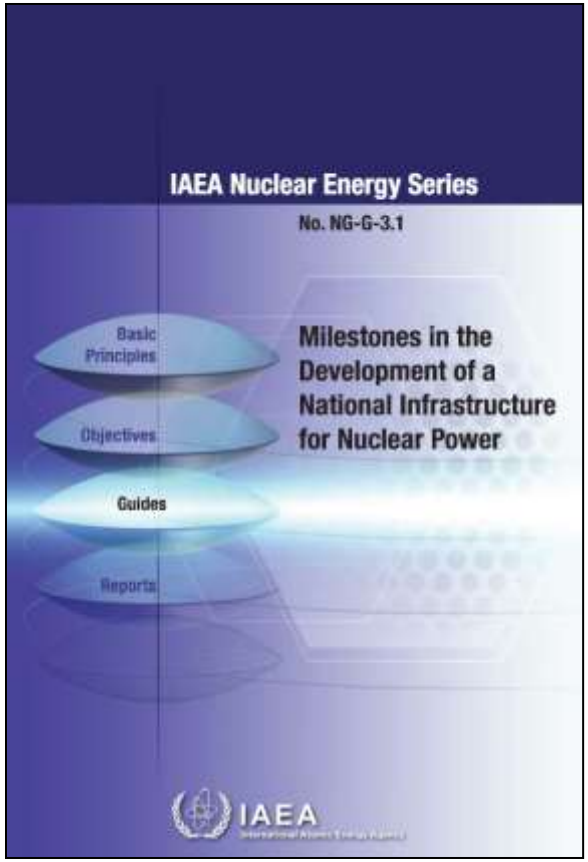


TABLE 1. INFRASTRUCTURE ISSUES AND MILESTONES

Issues	Milestone 1	Milestone 2	Milestone 3
National position			
Nuclear safety			
Management			
Funding and financing	Conditions	Conditions	Conditions
Legislative framework			
Safeguards			
Regulatory framework			
Radiation protection			
Electrical grid			
Human resources development			
Stakeholder involvement			
Site and supporting facilities			
Environmental protection			
Emergency planning			
Security and physical protection			
Nuclear fuel cycle			
Radioactive waste			
Industrial involvement			
Procurement			

6b. Milestones for the Implementation of NPP -The HRD Perspective, IAEA (TBC)

3.10.1. Human resource development: Milestone 1 — Ready to make a knowledgeable commitment to a nuclear programme

Important areas for consideration by the NEPIO include:

- Evaluating the attitudes and organizational culture prevailing in the national industries and management, their suitability for the nuclear environment, and practicality of instilling a safety culture in the required period of time;
- Recognition of the full range of scientific and technical disciplines needed for a fully functioning nuclear power programme;
- Assessment of the availability of those disciplines within the nation;
- Assessment of the educational capabilities within the nation or from foreign sources to produce individuals for those disciplines;
- Identification of the specialized training needed for even experienced personnel in nuclear safety, security, safeguards, radiation protection and management system;
- Assessment of the availability of specialized training from either foreign or domestic sources;
- Development of firm plans to obtain, either by purchasing or developing, the resources necessary for the initial start of the nuclear programme;
- Development of firm plans to obtain the flow of human resources over the life of the nuclear programme.

6c. Milestones for the Implementation of NPP -The HRD Perspective, IAEA (TBC)

3.10.2. Human resource development: Milestone 2 — Ready to invite bids for the first nuclear power plant

Specific human resource needs at this time may include, depending on the acquisition strategy:

- Business and technical expertise to develop technical and scientific expertise for site qualification and preparation of the construction permit request;
- Political and social expertise for public communication;
- Technical and regulatory expertise to develop and implement regulations, codes and standards for plant licensing, site approval, operator licensing, radiation protection, safeguards, physical protection, emergency planning, waste management and decommissioning;
- Business and technical expertise for fuel cycle procurement and management;
- Expertise to conduct training programmes for construction project management and the management system;
- Expertise to conduct training programmes for operation and maintenance personnel for system turnover and eventual operator licensing;
- Plans to fully staff and train the regulatory body for operational oversight;
- Plans to fully staff and train operating, maintenance and support organizations;

6d. Milestones for the Implementation of NPP -The HRD Perspective, IAEA (TBC)

3.10.3. Human resource development: Milestone 3 — Ready to commission and operate the first nuclear power plant

Specific human resource requirements at this time include:

- A fully staffed nuclear power plant operation, maintenance and technical support organization;
- A fully staffed regulatory body with specific expertise in operating plant oversight;
- Succession and personnel development planning to sustain the competence of all areas of the national nuclear programme;
- Enhanced educational opportunities for nuclear science and technology;
- Enhanced training programmes for the development of operator and technicians.

6e. Milestones for the Implementation of NPP -The HRD Perspective, IAEA (TBC)

SUMMARY OF CONDITIONS TO ACHIEVE THE MILESTONES

Infrastructure issue	Milestone 1 — Ready to make a knowledgeable commitment to a nuclear programme	Milestone 2 — Ready to invite bids for the first nuclear power plant	Milestone 3 — Ready to commission and operate the first nuclear power plant
3.9 Electrical grid	• Study of compatibility of nuclear power in the nation's development strategy conducted by NEPIO • Electrical grid requirements considered	• Detailed studies to determine grid expansion, upgrade or improvement undertaken • Plans, funding and schedule for grid enhancement exist	• Plans for grid enhancement executed • Grid ready to support commissioning and operation of a nuclear power plant
3.10 Human resources development	• Knowledge and skills needed to support a nuclear programme identified by NEPIO • Plan to develop and maintain the human resource base developed	• Sufficient human resources to issue bid request are in place • Initial education and training for remaining human resources for plant operation started and financial resources committed	• All human resources to commission and operate the first nuclear power plant are in place • Education and training programmes for continuing flow of qualified people are underway
3.11 Stakeholder involvement	• Open and timely interaction and communication regarding the nuclear programme addressed from the beginning • Strong public information and education programme initiated by government and NEPIO	• Public information and education programme developed by all involved organizations	• Reasonably credibility with stake-holders and public established • Communication efforts through construction and preparation for operation continued • Socio-political involvement maintained
3.12 Site and supporting facilities	• General survey of potential sites, conducted by NEPIO • Possible sites identified	• Detailed site characterization performed • Suitable sites for bid selected	• All site services and provisions in place and functional
3.13 Environmental protection	• Unique environmental issues analysed by NEPIO • Environmental impacts and improve-ments communicated	• Environmental studies for selected sites performed • Particular environmental sensitivities included in bid specifications	• Compliance with environmental laws and regulations assured • Programmes for monitoring and assessment fully implemented in compliance with international standards

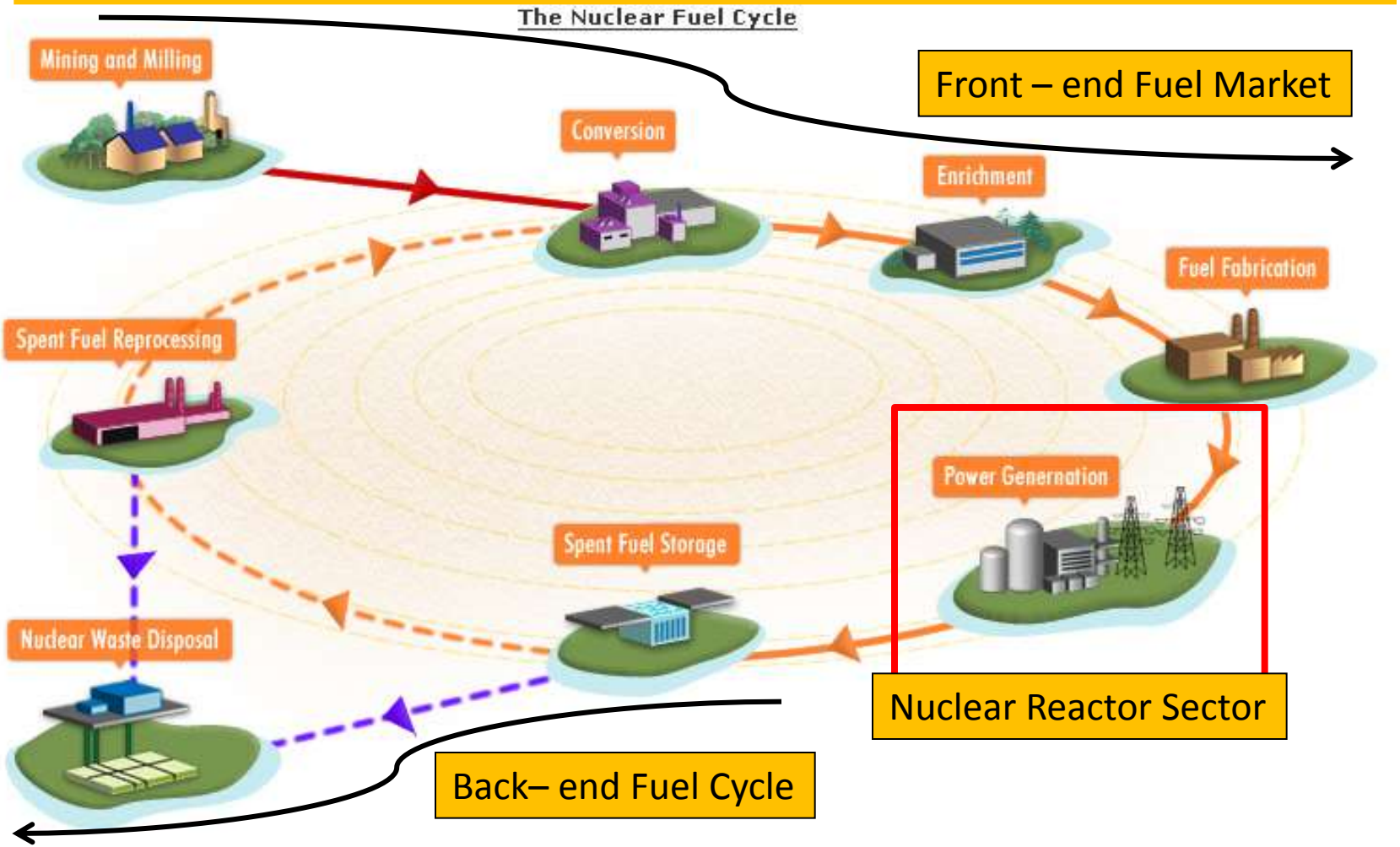
7. Nuclear Fuel Cycle

Nuclear Fuel Cycle includes,

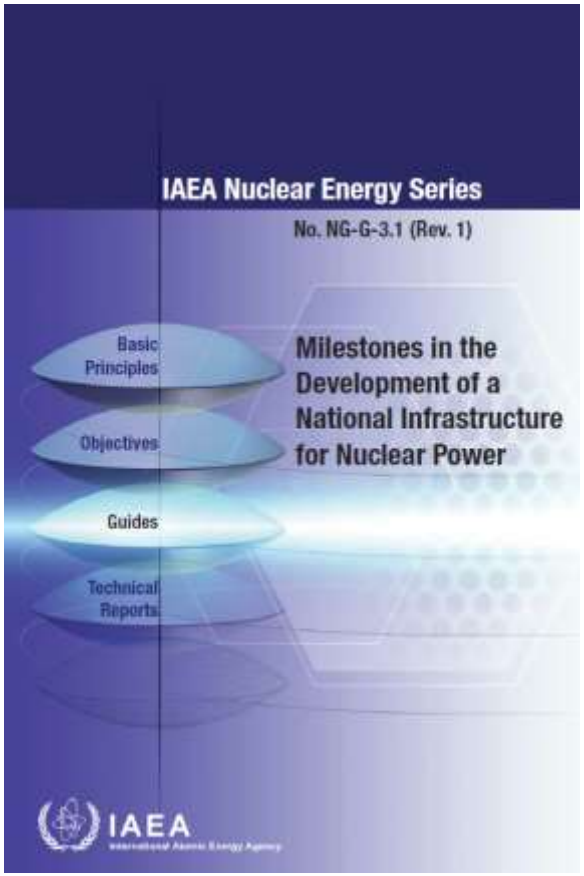
1) **Font-end fuel markets** (i.e. uranium mining through fuel fabrication).,

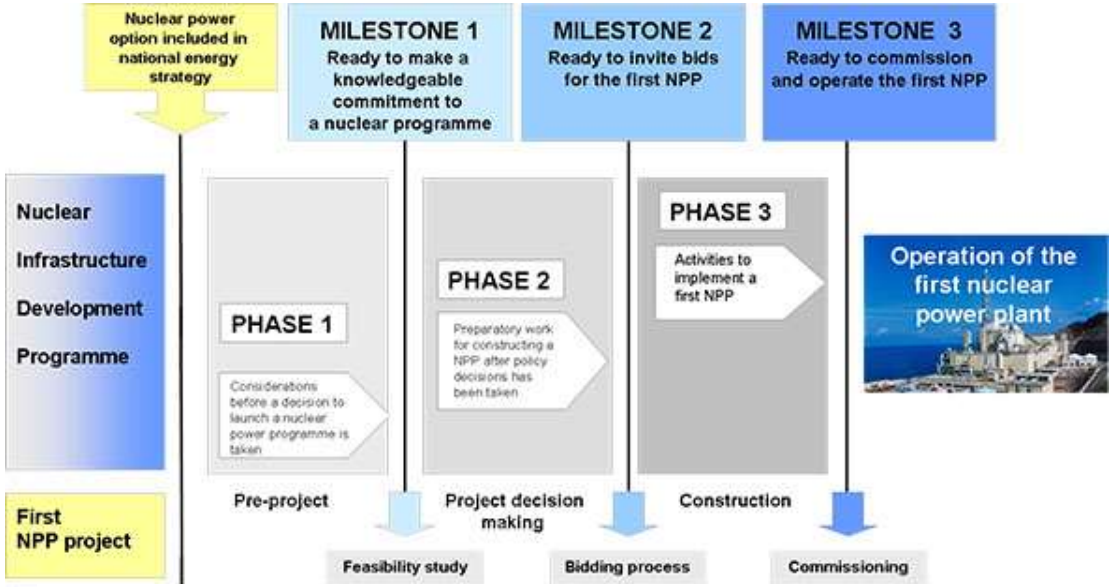
2) The overall **nuclear reactor sector** (nuclear reactor planning, construction , operations and maintenance and decommissioning) , as well as the

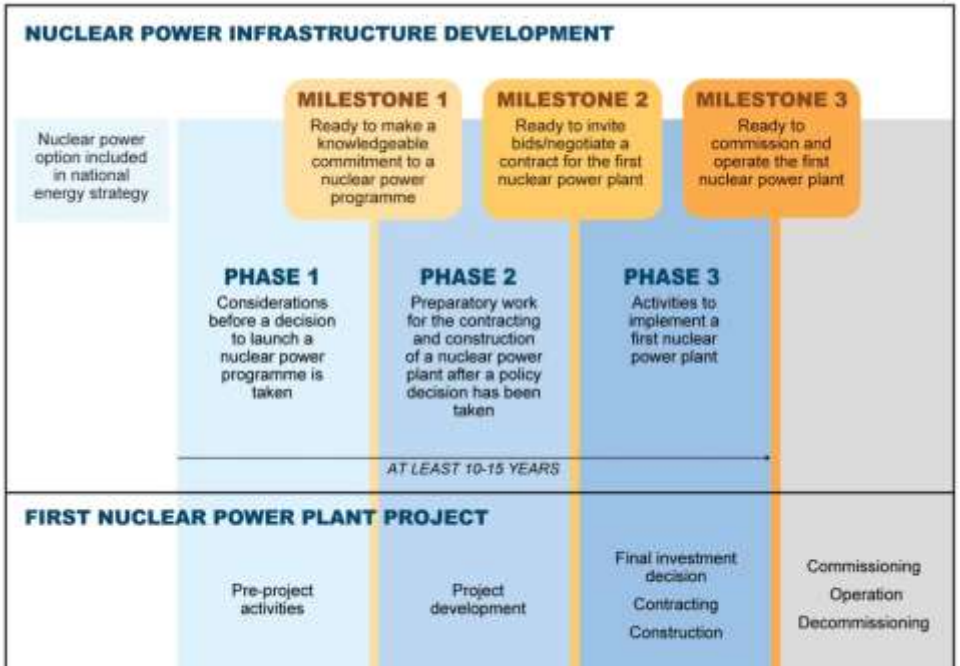
3)**Back-end of the fuel cycle**.(fuel treatment /reprocessing, storage and disposal)



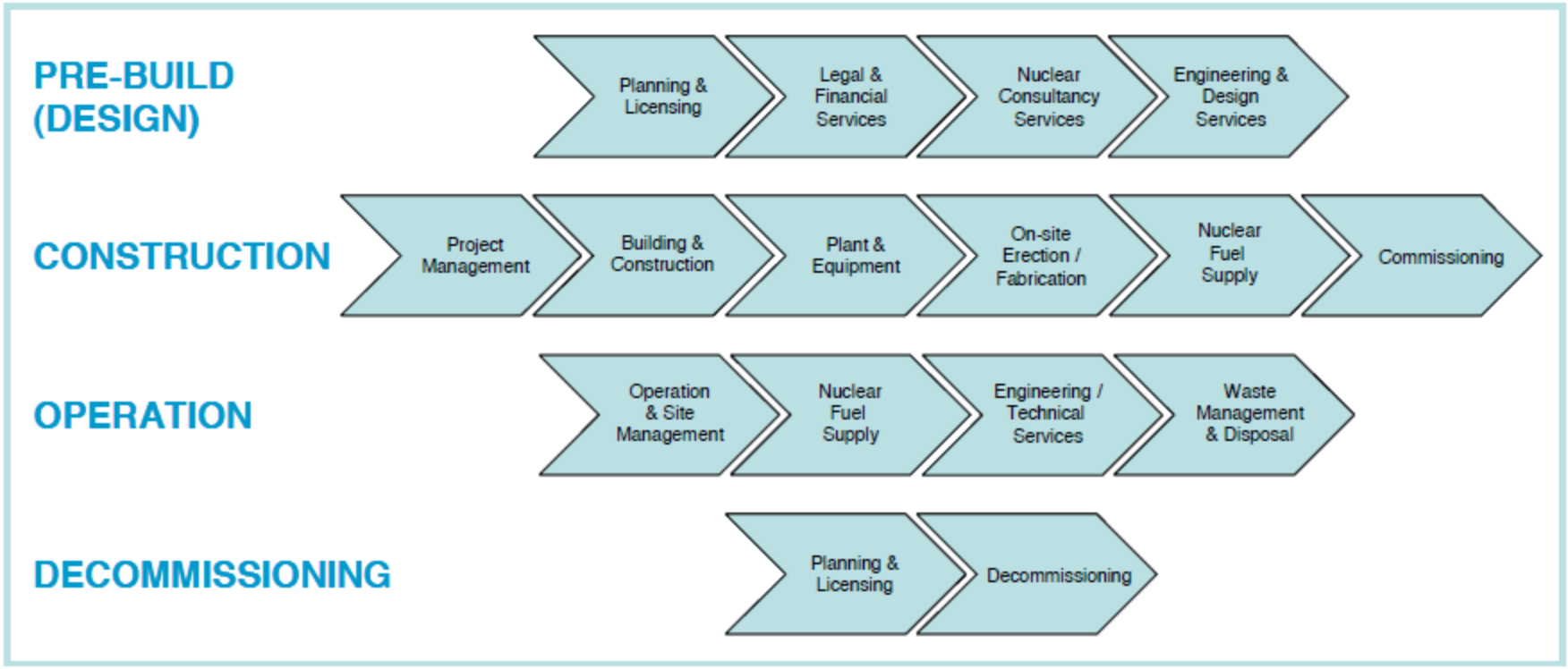
8 Milestones in the Development of a National Infrastructure for Nuclear Power



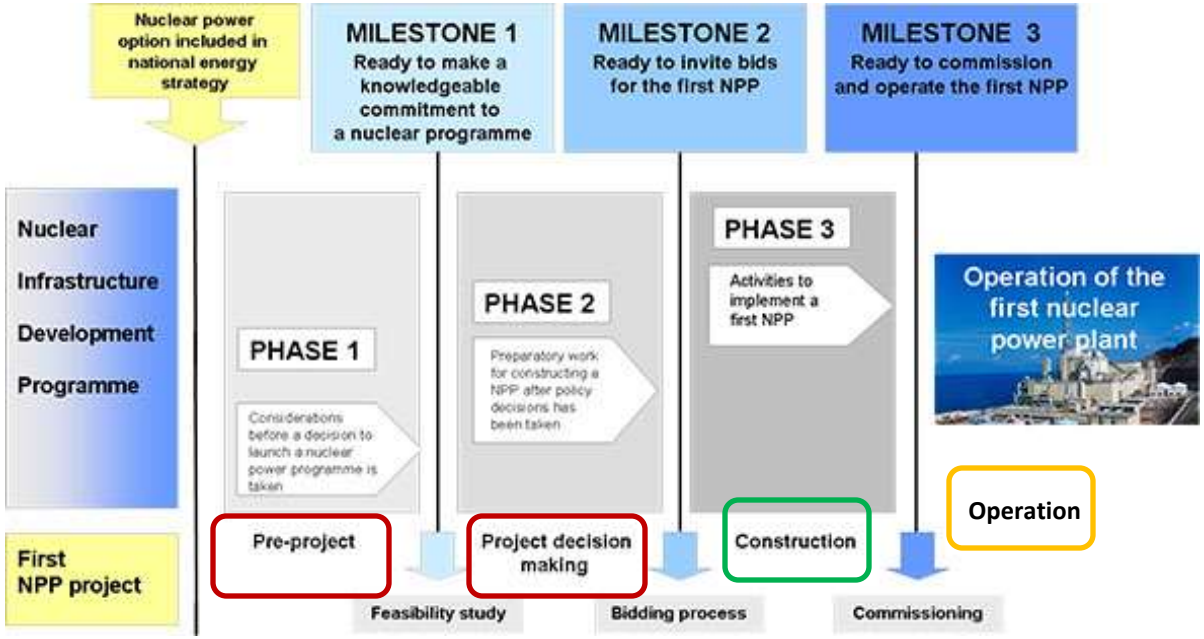


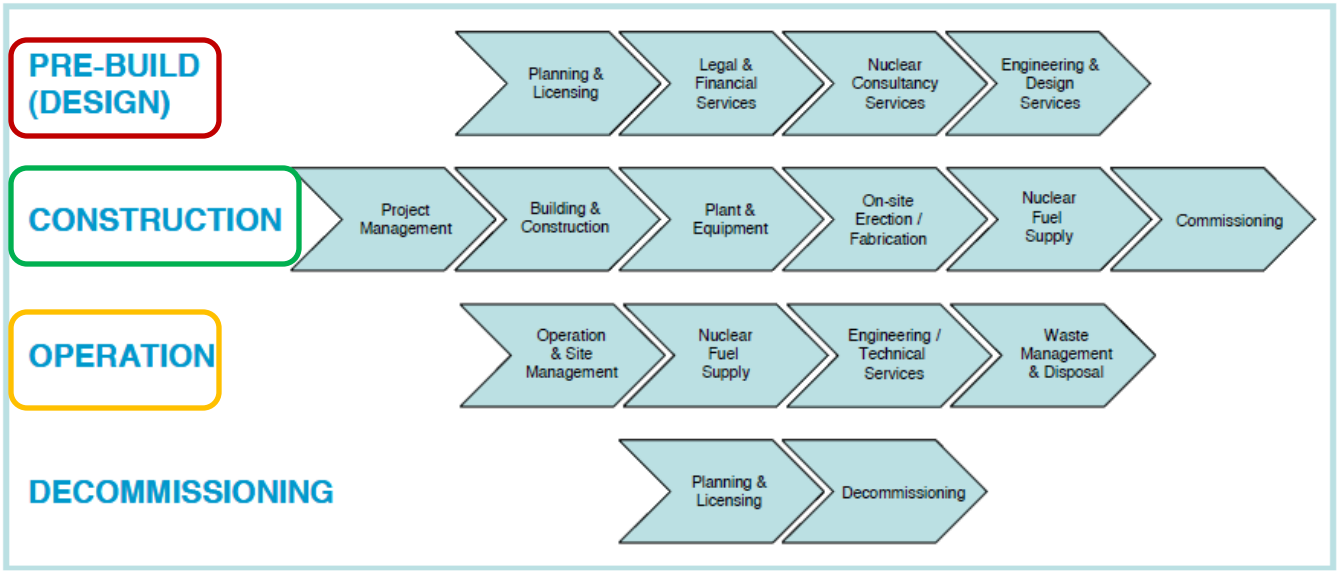


9 The main elements of the nuclear new build supply chain are shown in the diagram below:

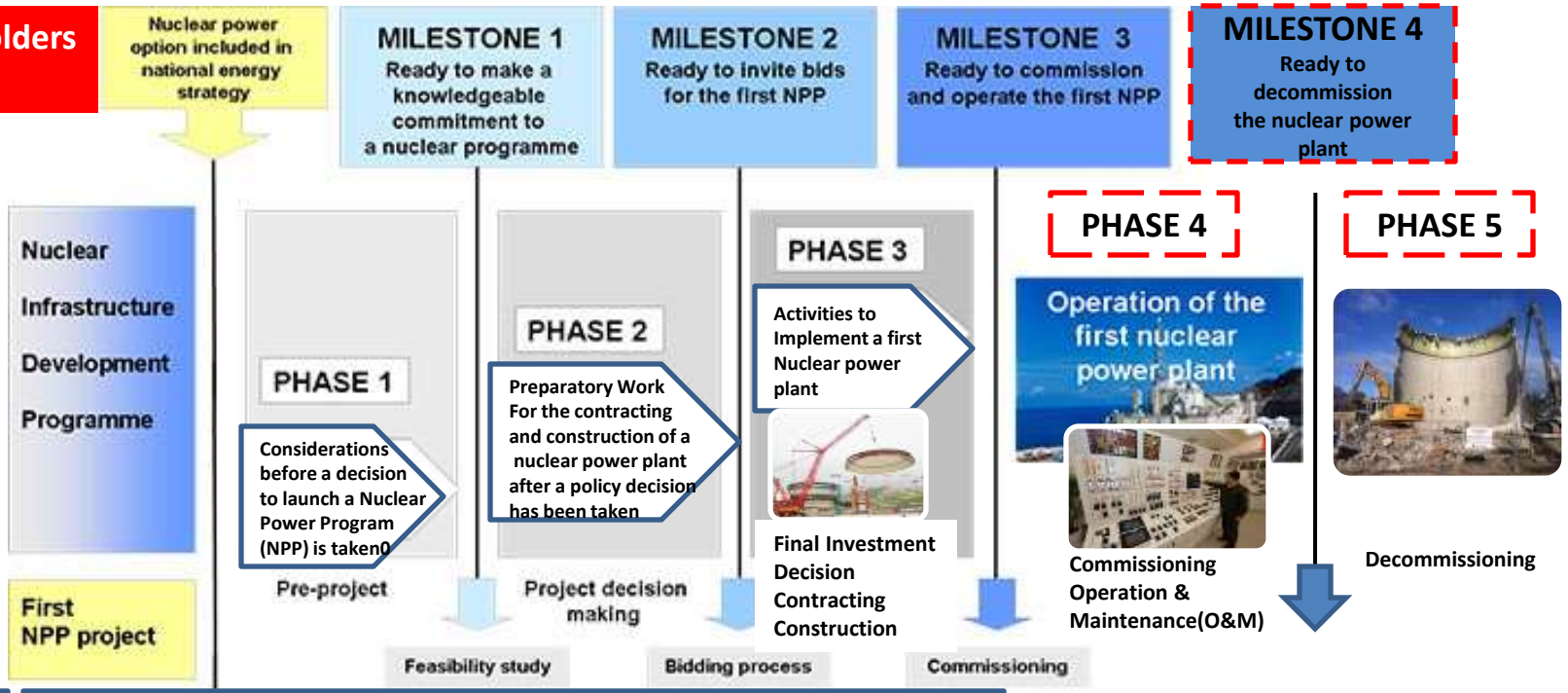


10 Integrating the Development of a National Infrastructure for Nuclear Power and Elements of Nuclear New Build Supply Chain to identify suitable Nuclear E&T





11a. Stakeholders



Key Stakeholders

1. Government -Cabinet Ministers & Opposition Parties
2. Senior and other Policy makers
3. Professionals with Potential to be Nuclear Leaders
4. Other Professionals
5. Students
6. Public
7. Media

Nuclear E&T & Awareness

What are the currently available Nuclear E&T as well as other recommended courses ?

source : Milestone Approach template by IAEA

Phase 4 & Phase 5 and Nuclear E&T Recommendation by author
Ms Sheriffah Noor Khamseah Al-Idid

11b. HUMAN RESOURCES to Support NPP
POLITICIANS, POLICY MAKERS, PROFESSIONALS, PRESS & PUBLIC

Politicians

Nuclear Leadership

- Policy & Decision Makers
  Management of Nuclear Power Plants
  Management of Nuclear R&D

Professionals with Potential to be Nuclear Leaders

Other Working Professionals

College Students

University Students

Media/ Press

General Public

11c. NUCLEAR HUMAN RESOURCES
PROFESSIONALS, TECHNICIANS & CRAFTSMEN

Nuclear Power Programme (NPP) Needs Workforce

PROFESSIONALS (P)
Normal Minimum Degree: BSc

ENGINEERS
- Entry-level
- Experienced

- Civil Engineer
- Mechanical Engineer
- Chemical Engineer
- Electrical Engineer
- Electronics Engineer
- Nuclear Engineer
- I&C Engineer
- Computer Engineer
- Power Plant Engineer
- Mining Engineer

SCIENTISTS
- Physicists
- Chemists
- Biologists
- Metallurgists
- Geologists
- Geophysicists

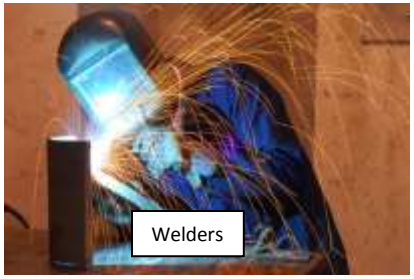
OTHERS
- Economist
- Business Admin
- Finance
- Commerce
- Law
- Accounting
- Journalism/PR

Source : IAEA Guidebook on Manpower Development for Nuclear Power , 1980

11d. HUMAN RESOURCES to Support NPP
BUSINESS LEADERS, INDUSTRY REPRESENTATIVES ,TECHNICIANS & CRAFTSMEN,

Business Leaders (Financial, Construction, Manufacturing Services)

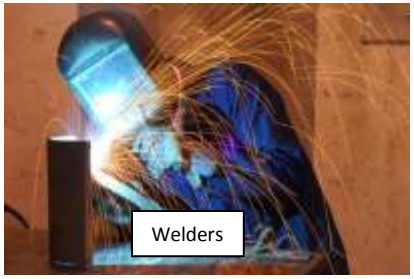
Technicians



Craftsmen

Fig 8. HUMAN RESOURCES to Support NPP
POLITICIANS, POLICY MAKERS, PROFESSIONALS, TECHNICIANS & CRAFTSMEN, PRESS & PUBLIC

Business Leaders (Financial, Construction, Manufacturing Services)



Technicians

Craftsmen

11e. NUCLEAR HUMAN RESOURCES
PROFESSIONALS, TECHNICIANS & CRAFTSMEN

Nuclear Power Programme (NPP) Needs Workforce

PROFESSIONALS (P)
Normal Minimum Degree: BSc

- ENGINEERS
  - Entry-level Engineer
  - Experienced Engineer
- SCIENTISTS
- OTHERS

TECHNICIANS (T)
-Sub-professional level personnel

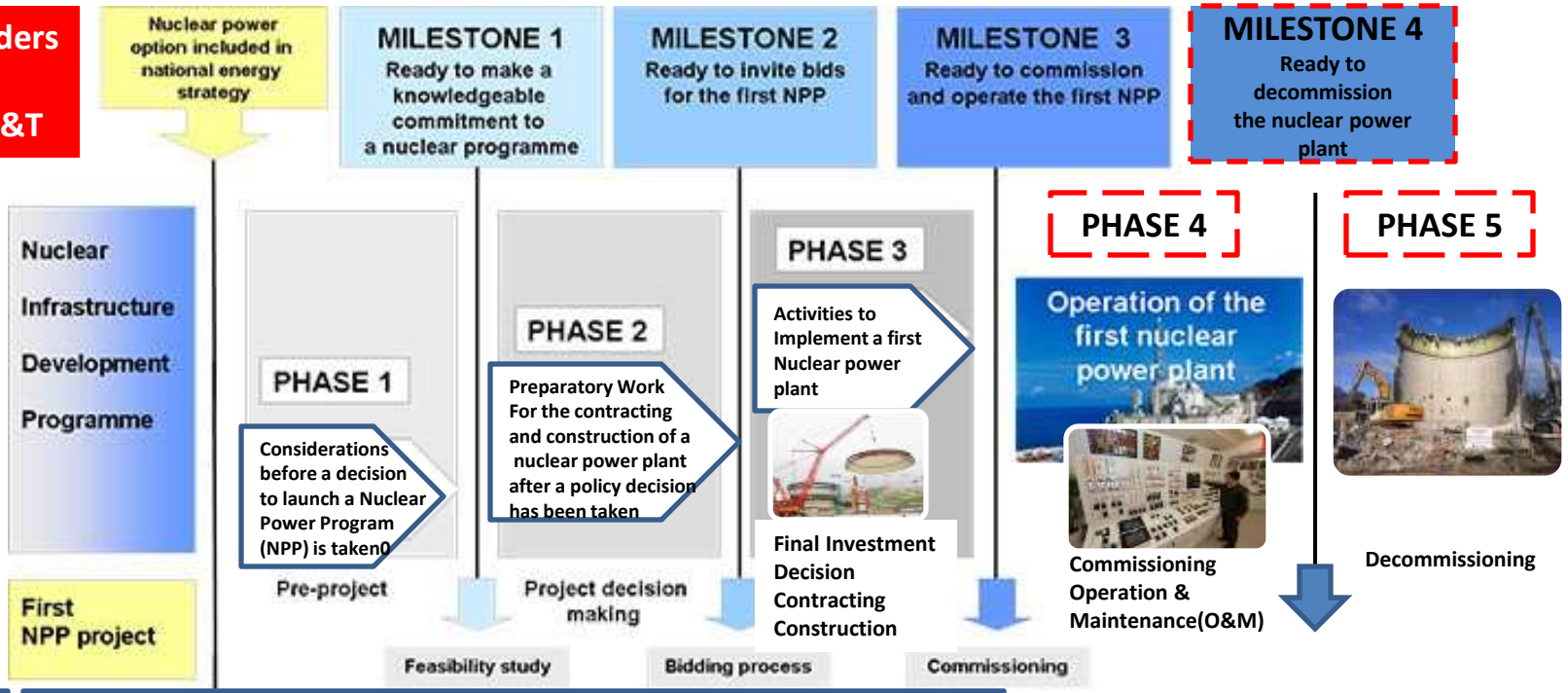
- **Mechanical Technician**
- **Electrical Technician**
- **Electronics Technician**
- **Instrumentation & Control (I&C) Technician**
- **Nuclear Reactor Technician**
- **Radiation Protection Technician**
- **QA/QC Technician**
- **Radiochemistry Technician**
- **Chemistry Technician**

CRAFTSMEN (C)
- Skilled through apprenticeship

- Boilermakers
- Carpenters
- Concrete Workers
- Electricians
- Insulators
- Iron Workers
- Asbestos Workers
- Bricklayers
- Millwrights
- Operators Heavy Equipt
- Pipe Fitters
- Sheet-metal workers
- Welders
- Cement Finishers
- Painters
- Miscellaneous eg truck drivers

Source : IAEA Guidebook on Manpower Development for Nuclear Power , 1980

12. Stakeholders and Nuclear E&T



Key Stakeholders

1. Government -Cabinet Ministers
2. Opposition Parties
3. Policy makers
4. Professionals
5. Students
6. Public
7. Media

Nuclear E&T & Awareness

1. Nuclear Energy Conference for Government (IAEA & Countries) for Cabinet Ministers & Opposition Parties
2. 2a. Nuclear Leadership Education Program and 2b Nuclear Energy Management Course for Policy makers & Potential Senior Nuclear Leaders
3. Nuclear Courses for Potential Nuclear Leaders (for Young Professionals with Potential for Promotion to Leadership Positions)
4. Nuclear CPD courses for Working Professionals including industry representatives (Construction, Manufacturing and Services ets)
5. Science, Engineering & Other related courses for Students at College & University Level
6. Specialized training for Technicians and Craftsmen
7. General Introduction to Nuclear Energy to General Public and Media
8. Specially arranged Visits to Countries with NPP for Politicians, Policy makers and Media Representatives

source : Milestone Approach template by IAEA

Phase 4 & Phase 5 and Nuclear E&T Recommendation by author
Ms Sheriffah Noor Khamseah Al-Idid

13. Nuclear Education & Training Programme for Politicians – Cabinet Ministers & Opposition Parties Members The IAEA Programme

Politicians

- Cabinet Ministers -
Opposition Party Members

13a. INTERESTS & ISSUES/CONCERNS regarding Nuclear Power for Specific Stakeholders

1a. Government – Making a Decision to invest in Nuclear Power - (Part 1)

Politicians





Interest	Issues/ Concerns
1. Getting elected with strong public support	1. Facing strong public opposition
2. Enhancing national economies – Increasing GDP i) Increasing products offered ii) Increasing jobs iii) Increasing number of domestic & international trade & commerce iv) Increasing FDI's	2. National economy impacted negatively
3. Ensuring energy security	3. Energy Security threatened
4. Ensuring public money spent has a return on investments (RoI)	4. Allay public fear of Government spending public money aimlessly
5. Be updated on various financing sources & models for investing in Nuclear Power	5. Building Nuclear Power Plants is too expensive. i) fear of no ROI's ii) Concerned about appropriate sources & models of financing nuclear power
6. Ensuring sustainability of Environment – international obligation (Kyoto Protocol)	

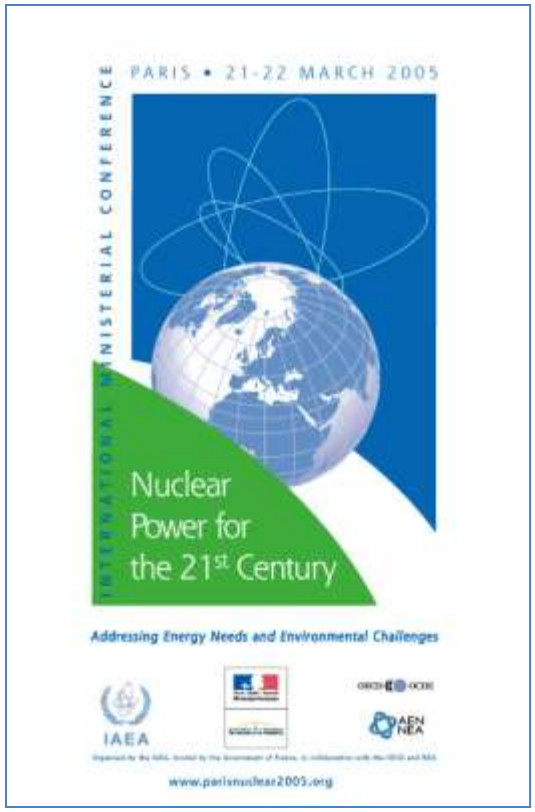
13b Training / Conferences for Politicians / Ministers by the IAEA

International Ministerial Conference on Nuclear Power

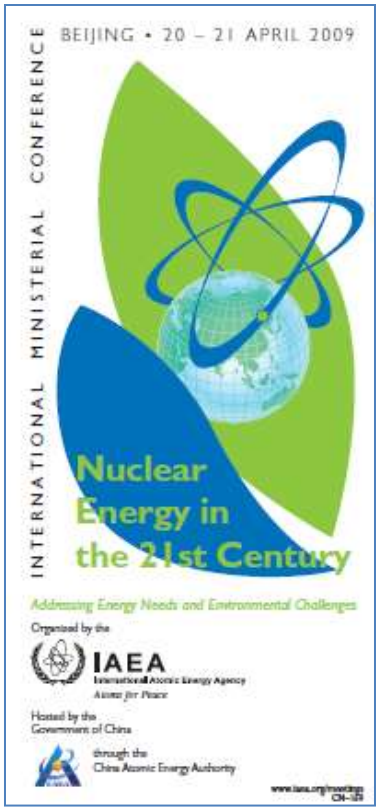
Politicians

- Cabinet Ministers
- Opposition Party Members

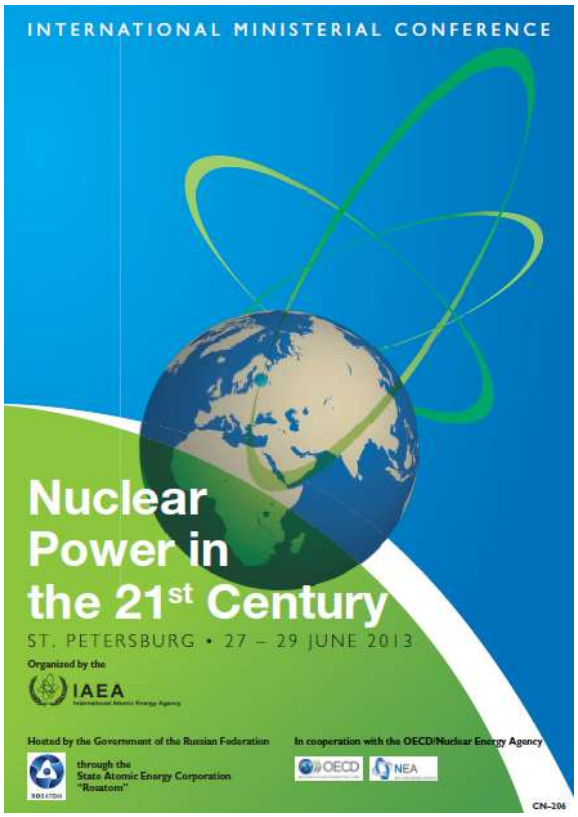
1st Conference
- March 2005



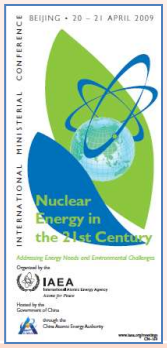
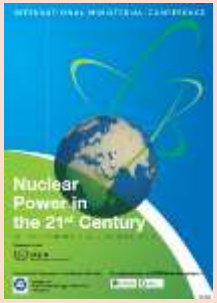
2nd Conference
- April 2009

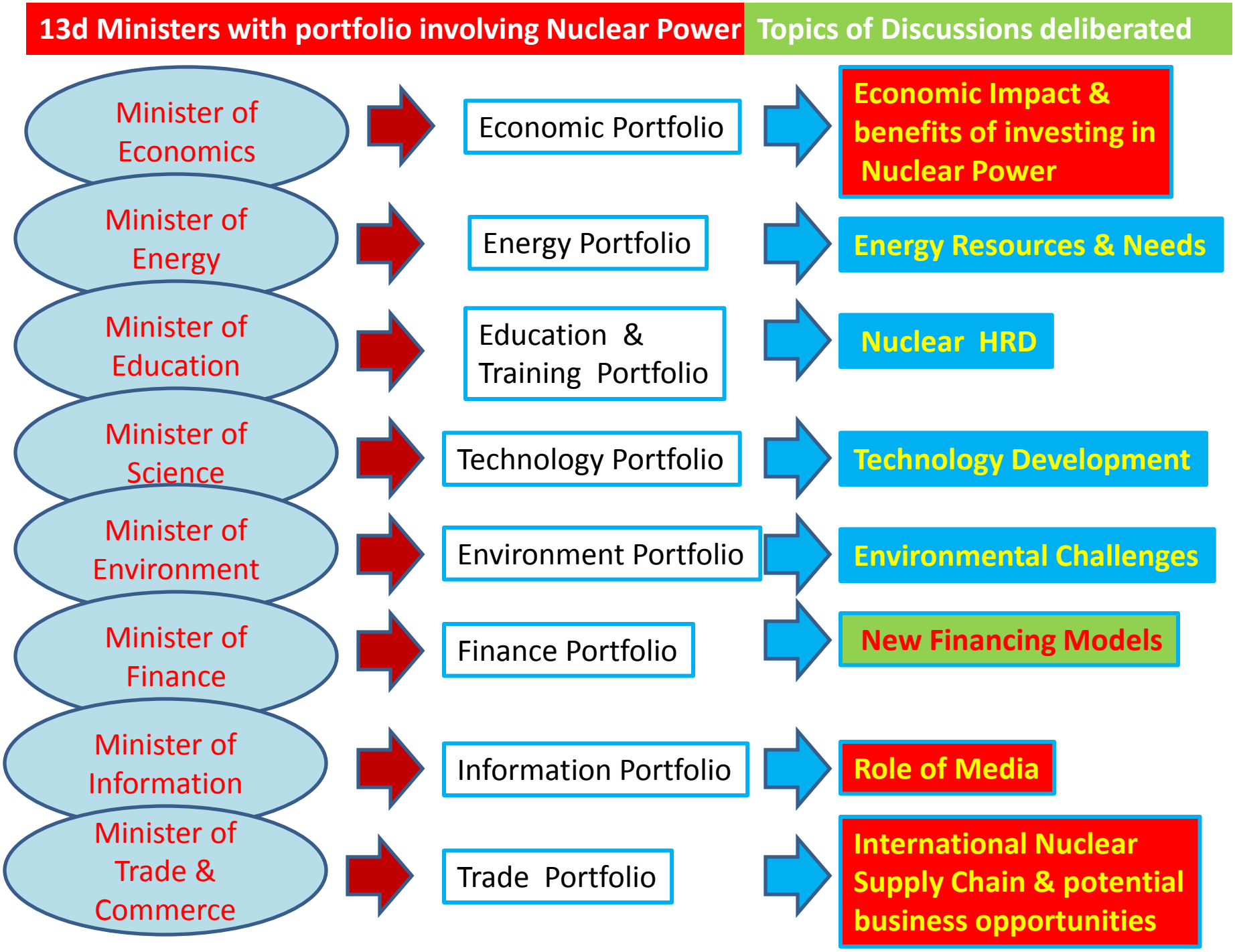


3rd Conference
- 27-29 June 2013



13c International Ministerial Conference on Nuclear Power

Nos/Year	Venue	Conference Title & Main Topics of Discussions	Attendees	Impact/Outcome - Tangible/Intangible
1st Conference 21-22 March 2005 	Paris, France	International Ministerial Conference on Nuclear Energy in the 21st Century: 1) *The World Energy resources and needs* 2) *The Environmental challenges of the 21st Century* 3) *Driving factors for nuclear industry strategies & choices* 4) *Governance (Role of Government, Social acceptance, Non proliferation, physical protection)*	Participants are expected to be Ministers and senior level advisors, or representatives of organisations that *can make or influence energy related decisions.*	
2nd Conference 20-21 April 2009 	Beijing, China	International Ministerial Conference on Nuclear Energy in the 21st Century: 1) *Energy Resources and the Environment* 2) *What technology is available & expected to be available in the future* 3) *Infrastructure development & support for countries considering introducing NP* 4) *Reliable fuel supply, spent fuel & waste management*	Among the 400 Participants expected to participate are Ministers and senior level advisors, or representatives of organisations that *can make or influence energy related decisions.*	
3rd Conference : 27-29 June 2013 	Saint Petersburg, Russian Federation	International Ministerial Conference on Nuclear Power in the 21st Century: 1) *Energy and Environment* 2) *Nuclear Safety and Reliability through International Cooperation* 3) *Infrastructure, Technology & Institutional Development-The Way Forward (HR, new financing models etc)* 4) *Drivers for deployment of Sustainable and Innovative Technology*	All persons wishing to participate in the conference are requested to register online in advance. & participation form is transmitted through Government of Member State.	


13d Ministers with portfolio involving Nuclear Power
Topics of Discussions deliberated
Minister of Economics
Economic Portfolio
Economic Impact & benefits of investing in Nuclear Power
Minister of Energy
Energy Portfolio
Energy Resources & Needs
Minister of Education
Education & Training Portfolio
Nuclear HRD
Minister of Science
Technology Portfolio
Technology Development
Minister of Environment
Environment Portfolio
Environmental Challenges
Minister of Finance
Finance Portfolio
New Financing Models
Minister of Information
Information Portfolio
Role of Media
Minister of Trade & Commerce
Trade Portfolio
International Nuclear Supply Chain & potential business opportunities

13e. Recommendations for Conferences for Politicians / Ministers by the IAEA

1. Decrease the cycle for this International Ministerial Conference from every 4 year to every 1-2 years- in view that new issues , challenges & Opportunities can be shared with the Ministers

2. IAEA could consider restructuring the International Ministerial Conference to not only focus on energy issues but also accord priority on matters relating to
   i) Economics
   ii) Finance
   iii) Media & Information

3. In view that most countries policy is to send only Minister of one portfolio (usually Minister of Energy) to attend the conference, IAEA may need to discuss & identify strategy to engage more Ministers to participate at these Conferences including Minister of Economics, Minister of Finance, Minister of Information etc
   a) IAEA could consider having parallel sessions on these specific topics after the general overview & status of NPP on first day for all Ministers
   or
   b) IAEA could consider separating the International Ministerial Conference on Nuclear Power to be held annually but with alternate focus.
   i) Year 1 – focus on Energy & Environment – with participation from Minister of Energy and Minister of Environment

   ii) Year 2 – focus on Human resource Development- with participation from Minister of Education

   iii) Year 3- Focus on Financing & Business Opportunities- with participation from Minister of Finance and Minister of Trade & Industry

14. Nuclear Education & Training Programe for High Level/ Senior Government Officials, Policy & Decision Makers

MIT International Nuclear Leadership Education Program (INLEP)

INLEP, provide leadership education in the governance structure, business strategies, operational practices and technologies needed to develop successful, safe and secure nuclear energy programme for:

-High level Government Officials
-Senior Executives of nuclear operating companies
-Senior Regulators

-Participation is by invitation only. Each class will consist of about 20 participants, drawn from several countries. The instructors include faculty from MIT and other universities as well as an group of prominent experts and practitioners from industry and government.
- Comprise two modules (each module 9-10 day duration) and site visits

First Course offering in 2013, continued in 2014 and 2015

Nuclear Leadership

- Politicians / Ministers
- Policy & Decision Makers

Management of Nuclear Power Plants
Management of Nuclear R&D Institutes

One week programme – This format of the IAEA Nuclear Energy Management School is a short and condensed version of the School and puts stronger emphasis on strategic and policy issues which need to be understood by those in key leadership roles in nuclear organizations.

It also emphasizes issues at the national and international level in the nuclear context and provides a broad overview of important nuclear issues and policy.

This curriculum is well suited for **nuclear organization leaders, newly appointed senior managers, managers who may be new to nuclear organizations, or senior nuclear government policy makers and decision makers.**

15a . Nuclear Education & Training for Nuclear Leaders (Professionals with Potential to be Leaders)

INMA International Nuclear Management Academy

Nuclear Leadership

- Politicians / Ministers
- Policy & Decision Makers

Management of Nuclear Power Plants
Management of Nuclear R&D Institutes

International Nuclear Management Academy (INMA) is ***a framework facilitated by the IAEA, through its*** Nuclear Knowledge Management (NKM) Section in the Department of Nuclear Energy ***in collaboration with nuclear engineering and business faculties at universities and with nuclear employers around the world***. Its goal is to support participating universities in the implementation of high quality master's level management programmes for the nuclear sector

NMA aims to make high quality management education that is tailored to the specific needs and challenges of the nuclear sector both more available and more accessible to :
- ***working nuclear managers or***
- ***nuclear professionals with potential to move into management.***

INMA programmes are intended for students in both developed and developing countries. INMA Member Universities are encouraged to offer courses in the form of online and distance learning, and also in short-format courses and on a part-time basis. This is intended to give working nuclear professionals more flexibility and options to successfully complete programmes.

Several participating universities have started work on introducing **INMA Nuclear Technology Management (NTM) master's level programmes,** with the first already commence in the fall of 2015 and others being introduced over the next one to three years.

MANCHESTER 1824 The University of Manchester

TEXAS A&M UNIVERSITY

東京大学

UPC

National Research Nuclear University (Moscow Engineering Physics Institute)

The **Manchester University in the United Kingdom** has recently introduced the first Nuclear Technology Management Programme. This programme is expected to be endorsed by IAEA as the first successfully peer reviewed INMA programme by the fall of 2015 . National Research Nuclear University (MEPhI) in the Russian Federation is expected to be the next university to introduce a Nuclear Technology Management Programme, and is targeting to start-up and be fully endorsed by the fall of 2016

15b. Nuclear Education & Training for Nuclear Leaders
(Professionals with Potential to be Leaders)

Nuclear Leadership

- Politicians / Ministers
- Policy & Decision Makers

Management of Nuclear Power Plants

Management of Nuclear R&D Institutes

CERTIFICATE COURSE

Participants of each IAEA NEM School interact and learn from some of the best specialists in the global nuclear industry and from the IAEA.

The IAEA NEM School is offered in several programme and curriculum formats that can be tailored to specific needs on request and can be conducted in three different formats, based on a member state's particular needs:

One week programme – This format of the IAEA Nuclear Energy Management School is a short and condensed version of the School and puts stronger emphasis on strategic and policy issues which need to be understood by those in key leadership roles in nuclear organizations. It also emphasizes issues at the national and international level in the nuclear context and provides a broad overview of important nuclear issues and policy.

This curriculum is well suited for **nuclear organization leaders, newly appointed senior managers, managers who may be new to nuclear organizations, or senior nuclear government policy makers and decision makers.**

Two week programme – This format of the IAEA Nuclear Energy Management School is well suited for **first level or middle level managers in nuclear facilities or organizations.** It will provide them with essential knowledge to better understand their role in the broader organizational and industry context and prepare them to work at a higher level in their organizations. A broad overview of nuclear energy challenges and policy issues is provided, with an emphasis being placed on facility management perspectives, and participant experience sharing, case study team work.

Three week programme - This format of the IAEA Nuclear Energy Management School is well suited for **young professionals working in nuclear organizations who show some managerial interest and potential.**

15b. Contd Nuclear Education & Training for Nuclear Leaders (Professionals with Potential to be Leaders)

Nuclear Leadership

- Politicians / Ministers
- Policy & Decision Makers

Management of Nuclear Power Plants
Management of Nuclear R&D Institutes

Certificate Course

Management Element	Knowledge Element
Organizational Management	Basics I — Nuclear Power
Financial Resource Management	Basics II — Nuclear Technology
Legal Aspects	Basics III — Nuclear Fuel Cycle
Knowledge Resource Management	Basics IV — Nuclear Safety
Human Resource Management	Basics V — Nuclear Security
Stakeholder Involvement	Basics VI — Nuclear Safeguards
International Cooperation	Practice — Technical Tours

Basics VI	Nuclear Safeguards	Overview of the Nuclear Non-Proliferation Regime IAEA Safeguards Implementation Drawing Safeguards Conclusions Non-Proliferation Analysis of the Fuel Cycle SSAC Support (Training, Advisory Service)
Organizational Management	Nuclear Leadership and Management	Integrated Management Systems Confidence and Trust Leadership and Management Managing a Nuclear Project How to Set up a Technical Cooperation Project with the IAEA
HR	Nuclear Human Resource Development	Human Resource Challenges in Nuclear Field Human Resource Development Competence Building and Nuclear Education Workforce Planning and Training
Knowledge Resource	Nuclear Knowledge Management	Knowledge Management Basics Nuclear Knowledge Management (NKM) Methods and Tools for NKM Risk Assessment/Management of Knowledge Loss
Stakeholder Involvement	Communication, Public Acceptance and Nuclear Sociology	Building Public Support Effective Stakeholder Communication for Nuclear Power Nuclear Sociology
Practical Element	Technical Tours	Arranged visits to training centres, nuclear power plants, research facilities, etc.

15c. Nuclear Education & Training for Nuclear Leaders
(Professionals with Potential to be Leaders)

2 November 2015 - 13 November 2015
Trieste - ITALY

International Atomic Energy Agency (IAEA)

The Abdus Salam International Centre for Theoretical Physics

Joint ICTP-IAEA School on Nuclear Energy Management

3-14 October 2016

Nuclear Leadership

- Politicians / Ministers
- Policy & Decision Makers

Management of Nuclear Power Plants

Management of Nuclear R&D Institutes

The Abdus Salam International Centre for Theoretical Physics (ICTP, Trieste, Italy) in co-operation with the International Atomic Energy Agency (IAEA, Vienna, Austria) is jointly organizing the School of Nuclear Energy Management,

The purpose of this school is to provide a unique international educational experience aimed at building future leadership in managing nuclear energy programmes from among promising young professionals, particularly from newcomer countries that seek to develop nuclear power or other nuclear applications, who show promise as future leaders of the nuclear industry, academia and public sector entities. It will enable the transfer of IAEA specific knowledge to Member States towards their capacity building efforts.

The prospect of a continuing worldwide use of nuclear technologies – for electricity generation and electricity and applications in medicine, agriculture and industry, as well as the ageing cadres in the field points to the need for new cadre of nuclear professionals. A highly competent management is vital to the success at all stages of nuclear programmes. The school will train young professionals from developing and developed countries with managerial potential on aspects of the industry to ensure their broad understanding of the current issues that need to be tackled in their countries. The School will consist of a series of keynote presentations by leading IAEA specialists on topics relevant to managing nuclear energy programmes followed by practical sessions. All participants will be expected to be actively involved in discussions, assigned projects, panel reviews and other activities.

The following topics will be covered:

- **World Energy Balance, Geopolitics and Climate Issues;**
- **Energy Planning, Energy Economics and Nuclear Power Economics and Finance;**
- **Nuclear Power - Technology and Life Cycle;**
- **Nuclear Safety and Security;**
- **Nuclear Law, International Conventions and Relevant Mechanisms;**
- **Nuclear Non-Proliferation and Safeguards;**
- **Human Resource Development and Knowledge Management;**
- **Nuclear Leadership, Management and Sociology;**
- **Emergency Planning and Preparedness**
- **Radioactive Waste Management and Decommissioning**
- **Communicating Radiation Risks to the Public**
- **IAEA Support for Nuclear Power Development.**

15d. Nuclear Education & Training for Nuclear Leaders
(Professionals with Potential to be Leaders)

Nuclear Leadership

- Politicians / Ministers
- Policy & Decision Makers

Management of Nuclear Power Plants

Management of Nuclear R&D Institutes

Japan-IAEA Joint Nuclear Energy Management School

1 to 17 June, 2015

11-27 July 2016

This School will be organized by the Japan Nuclear Human Resource Network (JN-HRD.net), Japan Atomic Energy Agency (JAEA), University of Tokyo , Japan Atomic Industrial Forum (JAIF) and JAIF International Cooperation Centre (JICC) in Cooperation with the International Atomic Energy Agency (IAEA)

The purpose of the Japan-[1 to 17 June, 2015] Management School is to provide a unique international educational experience aim[1 to 17 June, 2015]ership to manage nuclear energy programmes, to nourish a wide range of knowledge on issues related to the peaceful use of nuclear technology and to broaden individual networking with people interested in nuclear energy from all over the world.

The Session topics will be covered:

- **Energy Policy Making and the Role of Nuclear Power**
- **Management of New Nuclear Power Projects**
- **Nuclear Material Control;**
- **Protecting People and the Environment;**
- **Developing National Capacity for Nuclear Energy**

Participants Qualification: Young Professionals (preferrably less than 40 years old) with managerial potential who have worked in the nuclear field for at least 3 years and shall make good use of the fruits of the Management School for their current and/or future jobs

Suitable for : Employees of NPPs, R&D Organizations, Utilities, Regulators, Suppliers, Executive Authorities Education & Training Organizations

15e. Nuclear Education & Training for Nuclear Leaders
(Professionals with Potential to be Leaders)

Joint UAE-IAEA Nuclear Energy Management School
17 - 28 May 2015, Abu Dhabi, UAE

Nuclear Leadership

- Politicians / Ministers
- Policy & Decision Makers

Management of Nuclear Power Plants
Management of Nuclear R&D Institutes

Project title and number :

The Nuclear Energy Management School, organized by the International Atomic Energy Agency (IAEA) in cooperation with the Khalifa University (KU), the Federal Authority for Nuclear Regulation (FANR), Emirates Nuclear Energy Corporation (ENEC) and the Critical Infrastructure and Coastal Protection Authority (CICPA), will be held from 17 to 28 May 2015 in Abu Dhabi, United Arab Emirates.

The purpose of the Joint UAE-IAEA Nuclear Energy Management School is to provide a unique, international educational experience aimed at building future leadership to manage nuclear energy programmes, to promote and foster knowledge of a wide range of issues related to the peaceful use of nuclear technology, and to provide a unique worldwide networking opportunity for future managers in the area of nuclear energy.

- **Energy Policy Making and the Role of Nuclear Power**
- **Management of New Nuclear Power Projects**
- **Nuclear Material Control;**
- **Protecting People and the Environment;**
- **Developing National Capacity for Nuclear Energy**

Participants Qualification: Young Professionals (preferrably between 25 and 40 years old) with managerial potential from developing countries with plans to newly introduce nuclear power and from countries with an established nuclear programme

Suitable for : Employees of NPPs, R&D Organizations, Utilities, Regulators, Suppliers, Education & Training Organizations

The school is open to approximately 35 participants of which 15 are foreign participants from participating Member States of TC Project RAS/2/2015 and Member states in Asia and the Pacific embarking or considering embarking on NPP.
Their participation to this NEM School should be supported through their respective National TC project

16. Nuclear Power Programme (NPP) : HR Requirements by Selected Countries - Korea and Brazil

NUCLEAR TECHNICAL MANPOWER DEMAND - Case for Korea

Category \ Year	1977	1981	1986
❶ Manufacturing companies	90	230	2 340
❷ Construction companies	90	380	1 030
❸ Architect- engineering companies	160	577	1 300
❹ Utility	435	1430	3 000
❺ Research & development institutes	495	1013	2 170
❻ Educational institutes	20	30	100
❼ Regulatory organizations	20	100	140
❽ Organizations for radioisotope utilization	80	120	200
Total	1390	3880	10 280

Industry

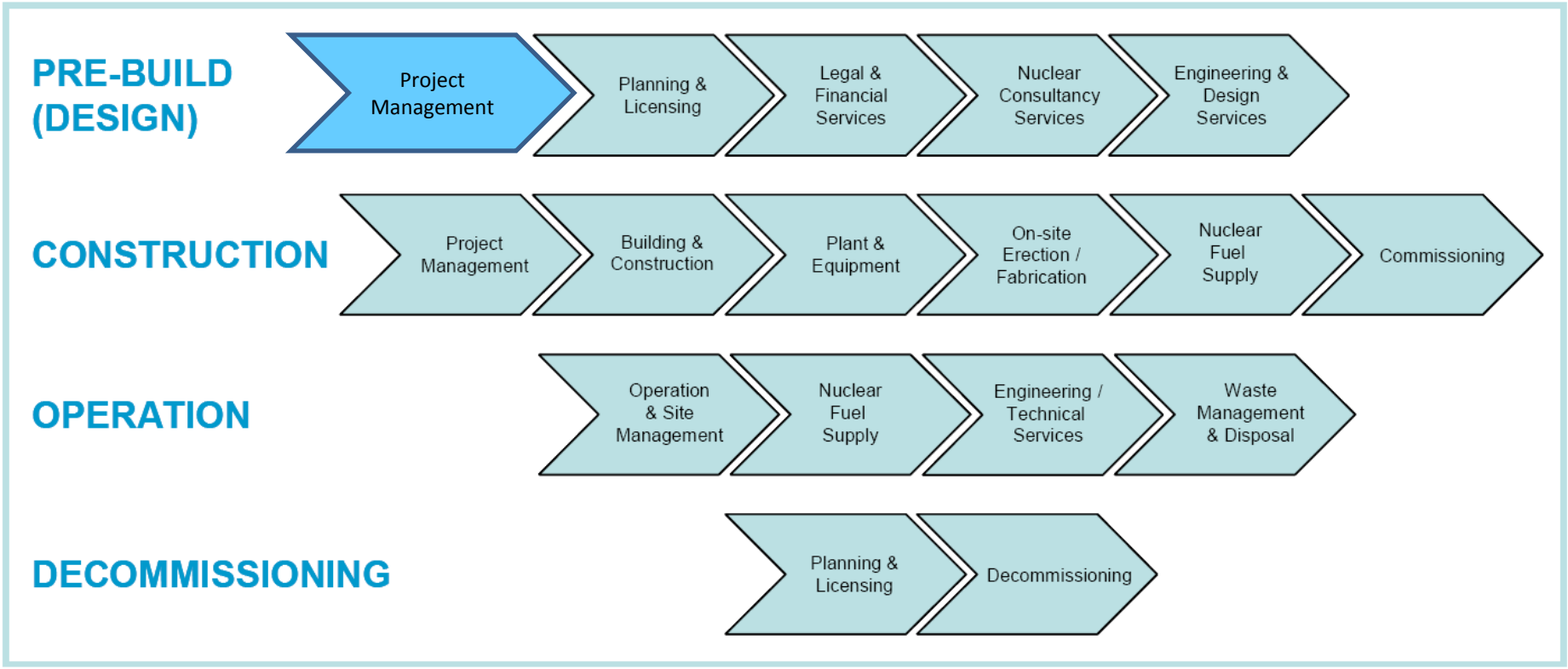
R&D Institute

Univer sities

17a Nuclear Education & Training for Students & Working Professionals
- The United Kingdom's Experience
- The Nuclear New Build Supply Chain Perspective

Nuclear New Build Supply-Chain

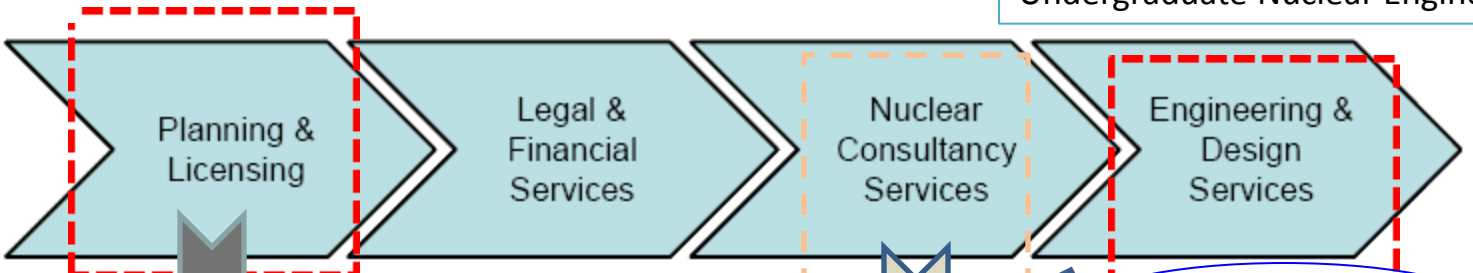
The main elements of the nuclear new build supply chain are shown in the diagram below:



Source: The Supply Chain for a UK Nuclear New Build Programme by Dr. Stephen A Court
National Metals Technology Centre (NAMTEC) , February 2009

PRE-BUILD (DESIGN)

Undergraduate Nuclear Engineering



Planning, Policy, Legal & Regulatory (Nuclear Law) , Safety & Security

Engineering, Design

Dalton Nuclear Institute

Imperial College London

UNIVERSITY OF CAMBRIDGE

MPhil Nuclear Energy which combines nuclear technology with nuclear policy and business

MEng in "Mechanical and Nuclear Engineering"
MEng in "Chemical and Nuclear Engineering"
MEng in "Materials and Nuclear Engineering"

University of Dundee

Masters of Law (LLM)
International and Comparative Nuclear Law and Policy

UNIVERSITY OF CAMBRIDGE

MEng with Nuclear Power Engineering & Sustainable Energy

uclan

MSc Nuclear Safety ,Security and Safeguards

MA Degree in N uclear Regulation

University of Central Lancashire

LANCASTER UNIVERSITY

MEng in "Nuclear Engineering"

Note : A group of universities in Austria, Germany, the Netherlands, Norway and the United Kingdom will launch the first comprehensive Master's Degree Programme in Nuclear Security in the first quarter of 2013, using the material produced by International Nuclear Security Education Network (INSEN)

Nuclear Engineering Doctorate

Universities of Bristol, Leeds, Sheffield and Strathclyde.

Nuclear Engineering Doctorate Scheme

EPSRC: £4M award for 50 Research Engineers (4 cohorts)

Launched: September 2006

Research areas: Reactor Technology; Waste Management; Decommissioning; Materials; Socio-Economics; Safety systems

CONSTRUCTION - Project Management

Project Management → Building & Construction → Plant & Equipment → On-site Erection / Fabrication → Nuclear Fuel Supply → Commissioning

uclan University of Central Lancashire

FdSc in "Nuclear Project Leadership" (From 2009)

FdSc Nuclear Project Management & Control

UNIVERSITY OF CAMBRIDGE

MPhil Nuclear Energy which combines nuclear technology with nuclear policy and business

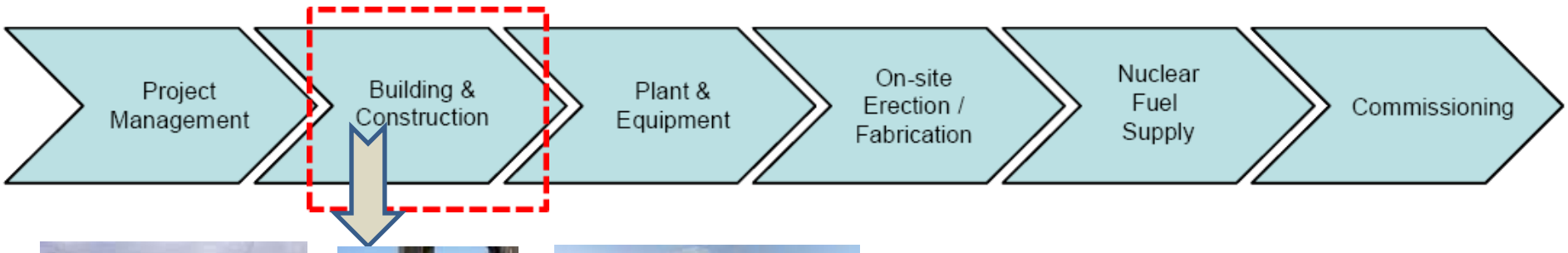
i) Aston University
ii) 20/20 Business Insight
iii) UCLAN University
iv) Open University

Certificate of Nuclear Professionalism (CoNP)

Certificate , introduced in 2011 Covers 7 Modules
Safety, Environmental and Security Management
Technical Leadership
Communications
Commercial Awareness
Project Management
Nuclear Principles, Protections & Frameworks
Safety Case Production and Evaluation.

Certificate of Nuclear Professionalism *is developed in partnership with employers and the Open University and was introduced in 2011 focus on nuclear principles, safety, behavioural, commercial and* ***project management skills***

CONSTRUCTION -Building & Construction (1)



1 Imperial College London

2 The National Skills Academy CONSTRUCTION

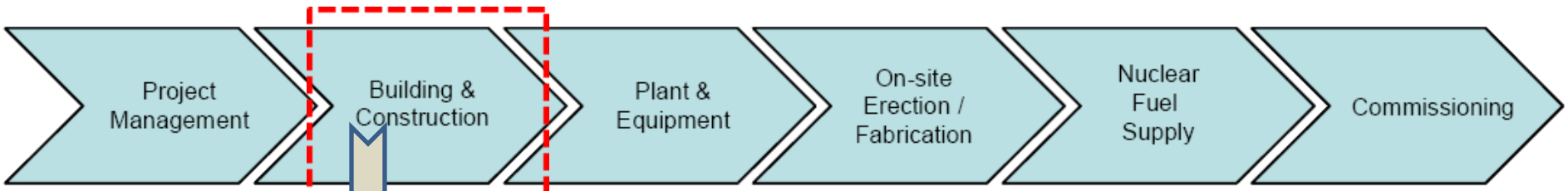
3 ecITB Engineering Construction Industry Training Board

4 CITB constructionskills

5 BRIDGWATER COLLEGE

6

CONSTRUCTION -Building & Construction (1)



1 **Nuclear Island**

Programme launched in 15 June 2011 for engineering students to have hands-on experience in designing and constructing a scaled down nuclear power plant in Constructionarium facility at Bircham Newton in Norfolk . Students will be assessed on radiation protection, site licensing, budgetary control and project management.

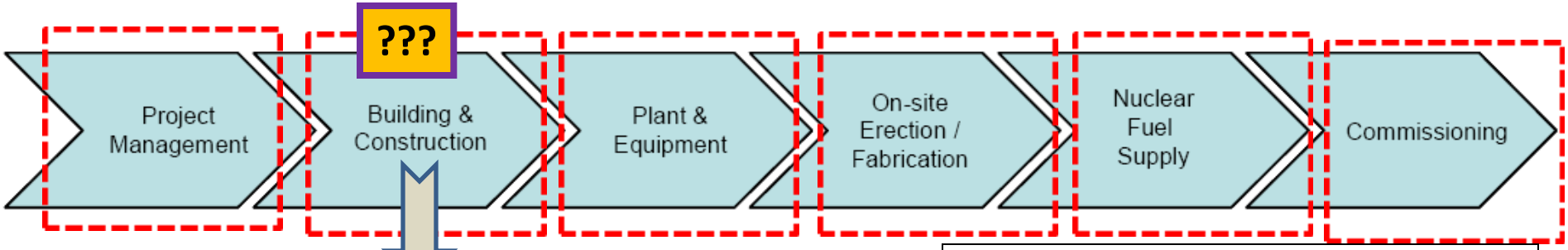
2 The National Skills Academy CONSTRUCTION

3 ecITB Engineering Construction Industry Training Board

The Engineering Construction Industry Training Board (ECITB) is the statutory organisation, national training provider and awarding body with responsibility for the training and development of the UK's engineering construction

4 CITB constructionskills

CONSTRUCTION



Nuclear Island

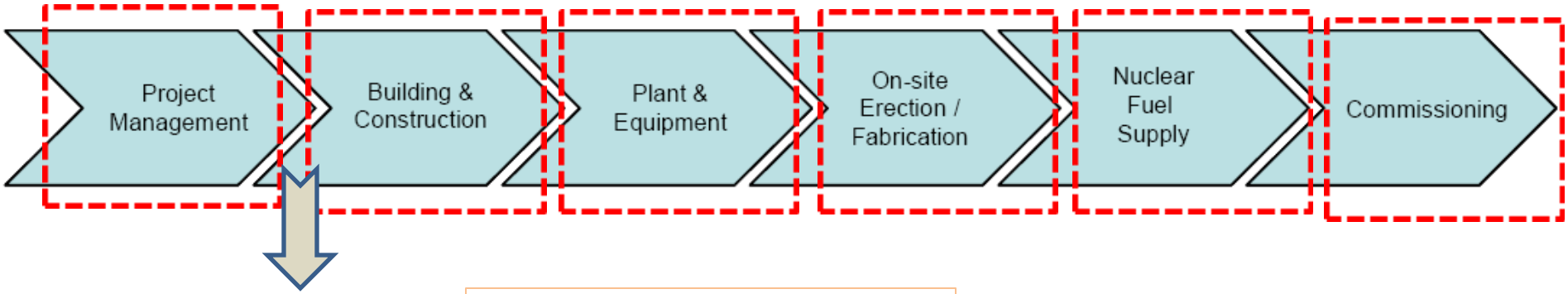
Photo source: Clive Smith Strategy Director Nuclear COGENT SSC:

Programme launched in 15 June 2011 for engineering students to have hands-on experience in designing and constructing a scaled down nuclear power plant. Students will be assessed on radiation protection, site licensing, budgetary control and project management

The Nuclear Island has been developed by a partnership of :
- Imperial College London,
- Constructionarium,
- Cogent Sector Skills Council,
- Engineering Construction Industry Training Board (ECITB) and
- Construction Skills.

The partnership received funding to develop the project from the National Higher Education Science, Technology, Engineering and Mathematics (HE STEM) Programme and the Royal Academy of Engineers.

CONSTRUCTION: NUCLEAR LEADERSHIP & GOVERNANCE



MANCHESTER 1824

Dalton Nuclear Institute

The **Dalton CPD Centre** design short courses for specific business needs covering the nuclear landscape, governance, policy, **supply chain and material**

22- 24 Mac 2012 **Nuclear leadership and governance for senior managers** facing nuclear industry change.

1 day Introduction to Nuclear Energy is particularly suited to employees of companies thinking about **entering the nuclear supply chain**

uclan **University of Central Lancashire**

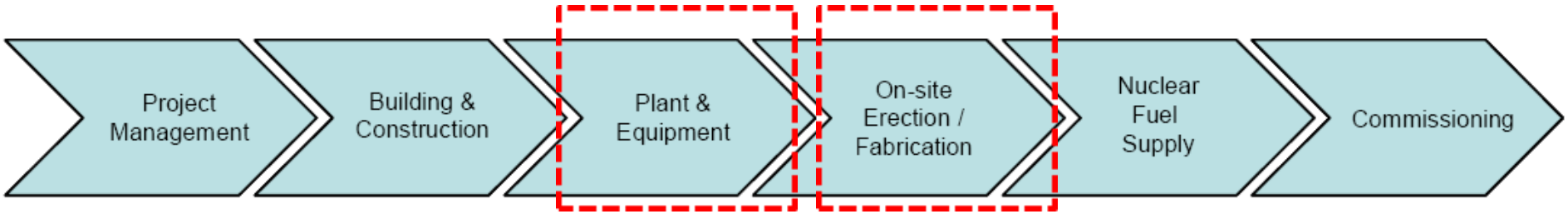
PGCert Governance of the UK Civil Nuclear Industry (e-Learning)

The Supply Chain for a UK Nuclear New Build Programme

namtec national metals technology centre

Updated February 2009

NUCLEAR MANUFACTURING & FABRICATION – Part One



1

The University Of Sheffield.

MANCHESTER 1824
The University of Manchester
Dalton Nuclear Institute

New Nuclear Build and Manufacturing (NNUMAN) programme has been awarded £4m funding by the Engineering and Physical Sciences Research Council (EPSRC) to research for new, innovative and efficient manufacturing technologies to enable UK manufacturing companies to learn the benefits of the new methods and apply them to new nuclear power plants

2

NUCLEAR AMRC

Nuclear Advance Manufacturing Research Centre

The most improved manufacturing processes developed in NNUMAN will be taken forward to prototype by Nuclear AMRC to enable UK manufacturing companies to learn the benefits of the new methods and use them to enable consortium members to become the suppliers of choice to the global nuclear industry

3

National Skills Academy Nuclear – Manufacturing; a tri-partite collaboration between :

The Su

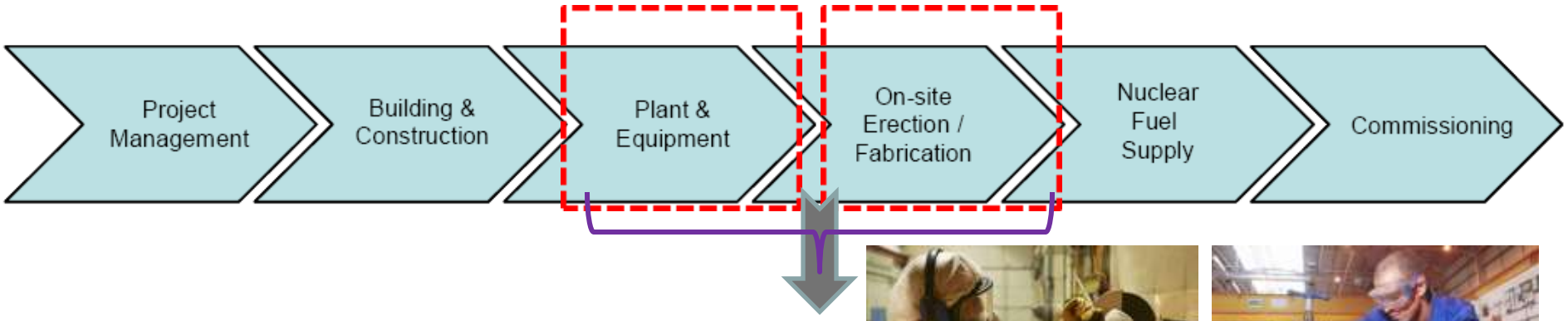
The National Skills Academy NUCLEAR

semta
people · productivity · performance

NUCLEAR AMRC

A one stop shop for skills for nuclear manufacturing & further development of key training courses and qualifications to support the up-skilling of manufacturers

NUCLEAR MANUFACTURING & FABRICATION – Part Two



The National Skills Academy Nuclear - Manufacturing is a collaboration between the National Skills Academy for Nuclear, Semta (Sector Skills Council for the Advanced Manufacturing and Engineering sectors) and the NAMRC.

A collaboration between:

The National Skills Academy NUCLEAR

semta people · productivity · performance

NUCLEAR AMRC

In addition, the dedicated manufacturing team will also look at ways of addressing the most critical technical skills shortages identified in the manufacturing segment of the nuclear supply chain, such as:

- Project Management
- High Integrity Welding
- Control and Instrumentation
- Planning and Estimating
- Non-Destructive Engineering
- Manufacturing and Design Engineering

The collaboration will work together to provide:

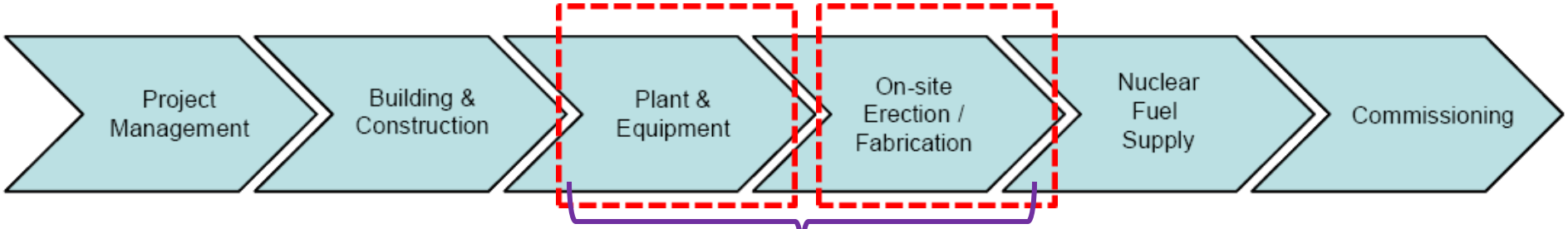
A one stop shop for skills for nuclear manufacturing.
High Quality Provider Network
Innovative support tools
Further development of key training courses and qualifications to support the up-skilling of manufacturers.

The Supply Chain for a UK Nuclear New Build Programme

namtec national metals technology centre

Updated February 2009

NUCLEAR MANUFACTURING & FABRICATION – Part Three



GEN II offers

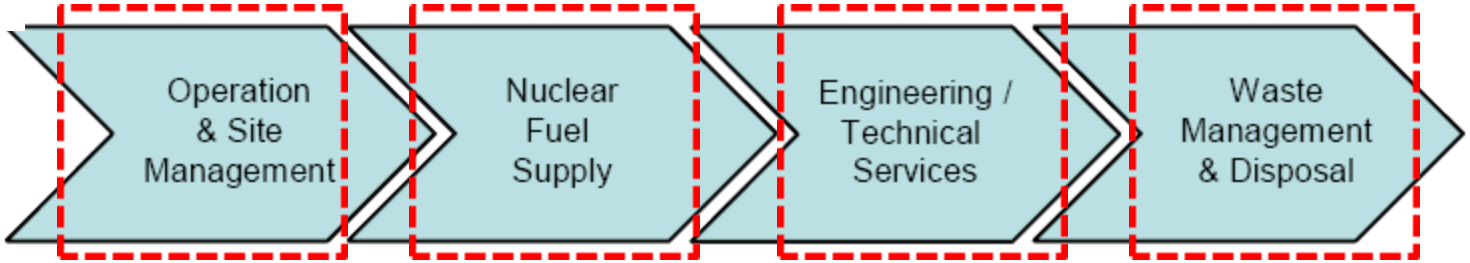
Gen II established in June 2000 by five partner companies – Sellafield Ltd, Tata Steel Europe (formerly Corus), Amec, Iggesund Paperboard and Innovia Films. offers:

Advanced manufacturing short courses
i) Instrumentation system, control & testing
ii) Process Plant pumping & piping system
iii) Technology of Fluid Flow in Pipelines

Nuclear Worker Apprenticeship
i)Electrical Apprenticeship-12 month course
ii)Pipefitting Apprenticeship- 12-18 months
iii)Welding, Fabrication and Pipefitting Apprenticeship – 12-18 months
iv)Fabrication (Fabrication is the term use to cover a wide range of occupations including: Welders, Platers, Sheet Metal Workers, Pipe Fitters) **Apprenticeship – 15 months**
v)Mechanical Apprenticeship – 15 months
vi)Nuclear Worker Apprenticeship – 24 months
vii)Process Apprenticeship – 12 months

OPERATION - Part I

Operations & Maintenance



uclan
University of Central Lancashire

FdSc in "Nuclear Related Technology - Commissioning & Maintenance"

BEng (Hons) Nuclear Plant

Imperial College London

MEng in "Mechanical and Nuclear Engineering"
MEng in "Chemical and Nuclear Engineering"
MEng in "Materials and Nuclear Engineering"

UNIVERSITY OF LEEDS

MEng Mechanical and Nuclear Engineering
MEng Chemical and Nuclear Engineering

MANCHESTER 1824

MEng Mechanical and Nuclear Engineering

MSc "Nuclear and Radiation Physics"

The University Of Sheffield.

MEng Mechanical and Nuclear Engineering
MEng Material Science and Nuclear Engineering
MEng Chemical and Nuclear Engineering

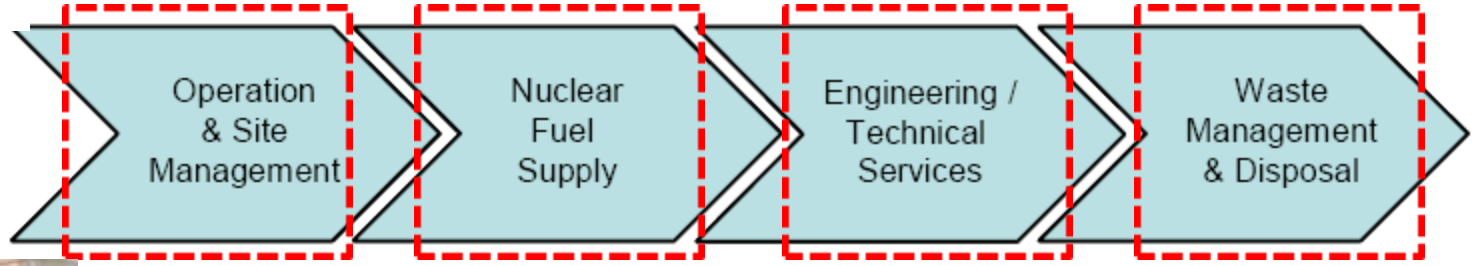
University of Strathclyde Glasgow

MPhil Nuclear Engineering

Certificate of Professional Development in Radiation Protection

OPERATION - Part 2

Operations & Maintenance



UNIVERSITY OF BIRMINGHAM

- *MSc "Physics & Technology of Nuclear Reactors"*
- *BSc Nuclear Science and Materials*

LANCASTER UNIVERSITY

- *MSc in "Safety Engineering"*
- *MEng Nuclear Engineering*

UNIVERSITY OF SURREY

- *MSc in "Radiation and Environmental Protection"*
- *MSc in "Radiation Detection & Instrumentation"*

University of Strathclyde Glasgow

- ***Certificate of Professional Development in Radiation Protection***

University of Glasgow

- *MSc Physics and Advanced Materials*

University of BRISTOL

- **Nuclear Engineering Doctorate**

Universities of Bristol, Leeds, Sheffield and Strathclyde.

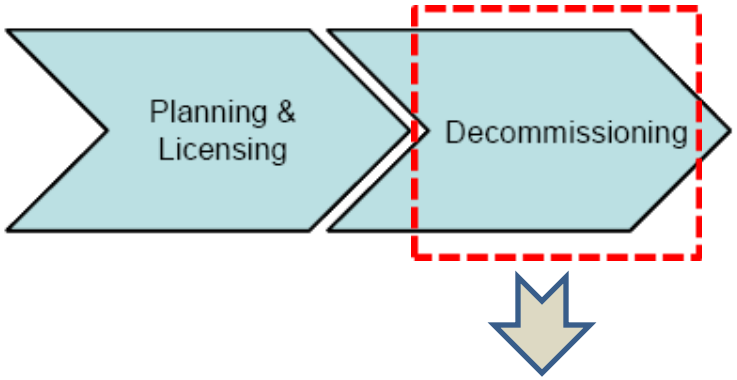
UNIVERSITY OF LEEDS

The University Of Sheffield.

University of Strathclyde Glasgow

DECOMMISSIONING

Decommissioning



University of Central Lancashire

- *FdSc in "Nuclear Decommissioning"*
- *PGCert in "English for Nuclear Decommissioning"*

UNIVERSITY OF BIRMINGHAM

Postgraduate Diploma(PGDip)/Certificate (PGCert) in "Radioactive Waste Management and Decommissioning"

LANCASTER UNIVERSITY

MSc in "Decommissioning and Environmental Clean-up"

17b Nuclear Education offered by Consortium of Institutions in the United Kingdom

i) NUTEC

ii) National Skills Academy for Nuclear (NSAN)

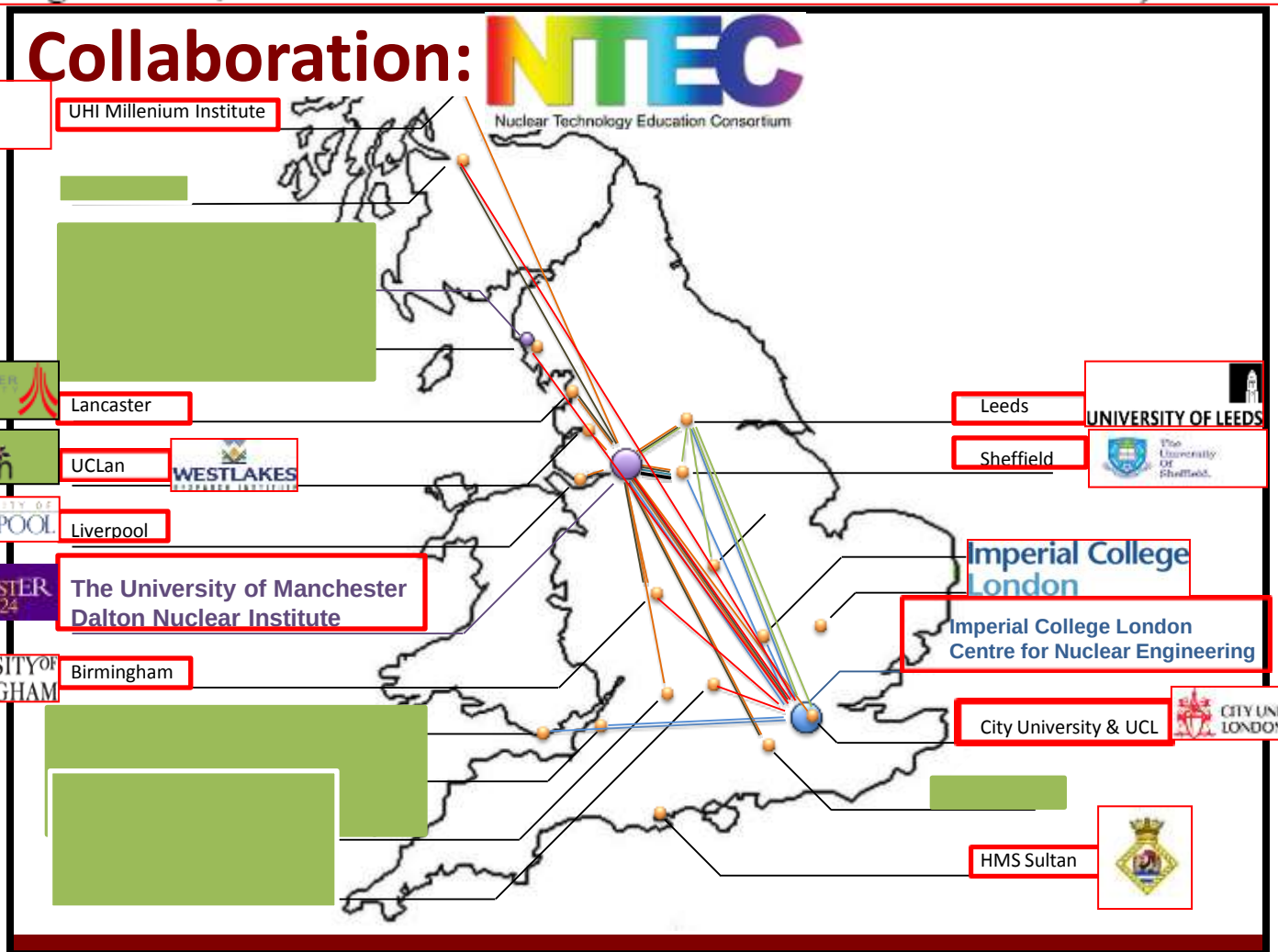
Nuclear Technology Education Consortium

A consortium of UK universities and other institutions providing postgraduate education in Nuclear Science & Technology

(a consortium of 11 institutions: Universities of Birmingham, Lancaster, Leeds, Liverpool, Manchester and Sheffield, City University, London, HMS Sultan, Imperial College London, UHI Millennium Institute & Westlakes Research Institute)

Collaboration: NTEC

Nuclear Technology Education Consortium



NTEC

Nuclear Technology Education Consortium

NTEC MSc is accredited by

i) Institution of Engineering and Technology

ii) Institution of Mechanical Engineers

iii) the Energy Institute

iv) Institute of Materials, Minerals and Mining

Master's degree in *Nuclear* Science and *Technology* provided by a *consortium* of UK universities

i) part-time basis over a period of 3 years
as well as
ii) full-time in 1 year

MSc in "Nuclear Science & Technology"
PG Dip. in "Nuclear Science & Technology"
PG Cert. in "Nuclear Science & Technology"
(Modules of which are also made available to Industry for CPD Training)
http://www.ntec.ac.uk/

Course Structure
The qualifications offered are available on a full-time or part-time basis.

I) Full-time MSc taken over 1 year:
4 core and 4 elective modules are taken over a period of approximately 9 months.
The project and dissertation then follows.

II) Part-time MSc taken over 3 years:
Year 1 : 4 Core modules (Successful completion attains Postgraduate Certificate= PG Cert)
Year 2 : 4 Elective modules (Successful completion attains Postgraduate Diploma= PG Dip)
Year 3 : Project & Dissertation

Continuing Professional Development (CPD)

Individual subjects are presented in 'short course' modules for engineers and managers in full-time employment who wish to advance their skill and knowledge base.

The core of each module is one week of direct teaching at the relevant institution, minimising the time away from the workplace for an employee whilst maximising its effectiveness.

Certificate of Nuclear Professionalism

The National Skills Academy NUCLEAR

The Open University

The modules which make up the Certificate of Nuclear Professionalism are;

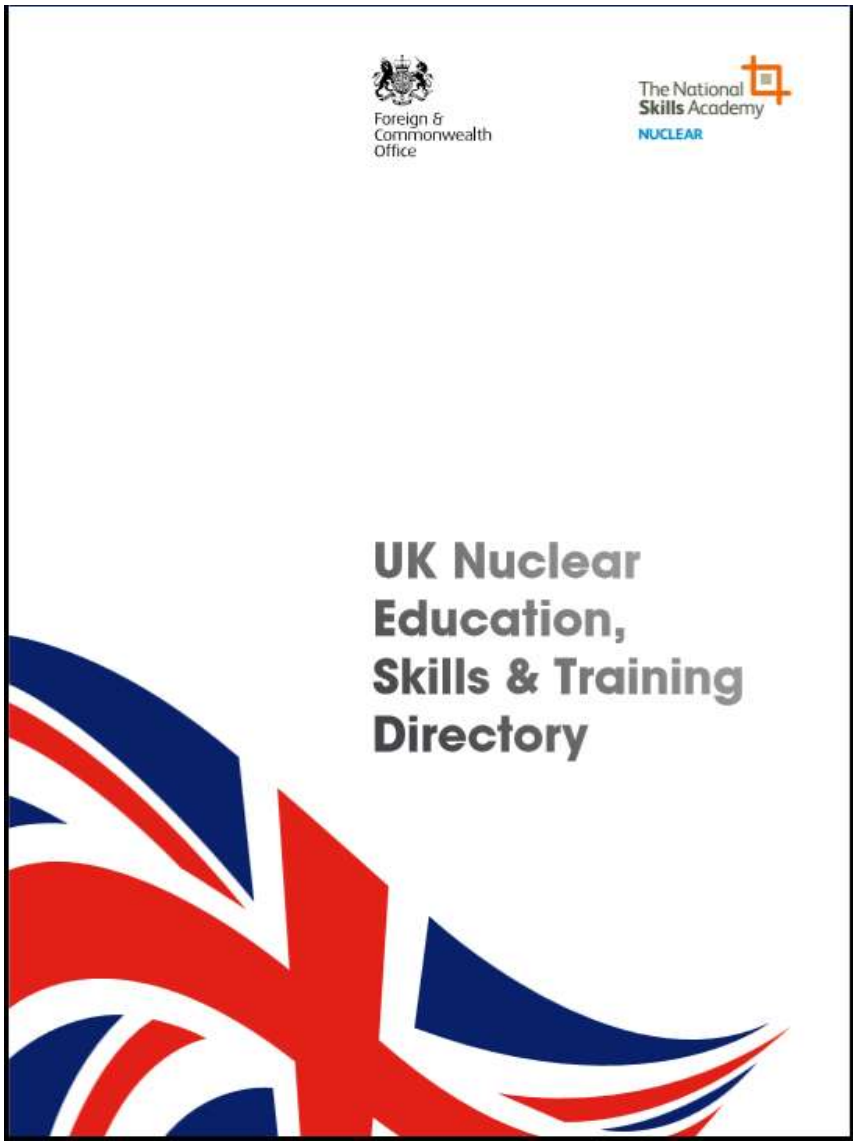
Modules	Module Titles	Institutions offering the courses
Module 1	Safety, Environmental and Security Management	UCLan
Module 2	Technical Leadership	Aston Business School
Module 3	Communications	Business Insight 20|20
Module 4	*** Commercial Awareness**	Aston Business School
Module 5	Project Management	Aston Business School
Module 6	Nuclear Principles Protections & Frameworks	UCLan Note: Open University offer module 6 as e-learning.
Module 7	Safety Case Production and Evaluation	UCLan

The modules are available through a number of providers of the Skills Academy

17c

UK's Nuclear Education & Training Directory

UK'S Nuclear Education, Skills & Training Directory



FOREWORD

Alistair Burt MP — David Willetts MP

Alistair Burt MP,
Parliamentary Under Secretary of State,
Foreign and Commonwealth Office

David Willetts MP,
Minister of State for Universities
and Science

The National Skills Academy for Nuclear is pleased to have produced the UK Nuclear Education, Skills and Training Directory showcasing the excellence in education and skills for nuclear provision offered by learning institutions and providers across the UK.

Funded by the Foreign and Commonwealth Office, the Directory showcases the very best of nuclear provision offered by UK Universities, FE Colleges as well as private companies specialising in nuclear skills development, education and training. The publication covers a wide range of education, training and services that are relevant to the nuclear industry including apprenticeships, degree courses, continuing professional development (CPD) as well as information about the nuclear Research and Development capability of each of our leading Universities.

Directory is Accessible via National Skills Academy for Nuclear (NSAN website

http:www.nuclear.nsacademy.co.uk

FOREWORD

Jean Llewellyn OBE

The skills and training of the nuclear workforce is crucial for a sustainable future for the industry and to support its strategic contribution to the infrastructure of our society and the economy. Promotion of sustained high levels of safety culture and nuclear professionalism are crucial factors in the social acceptance and economic benefits of nuclear power. That is why it is our mission to bring together organisations to identify and develop skills solutions for the nuclear industry of today and tomorrow.

We are therefore delighted to be part of this ground breaking production that showcases the very best of nuclear provision offered by our universities, Further Education colleges as well as private companies specialising in nuclear skills development, education and training. We have included a wide range of education, training and services that are relevant to the nuclear industry including apprenticeships, degree courses, continuing professional development (CPD) as well as information about the nuclear research capability of each of our leading universities.

The National Skills Academy for Nuclear is an employer-led membership organisation representing over 80% of nuclear employers across the UK Nuclear Industry, and works with these organisations to respond to the skills needs across the sector. The Skills Academy puts employers at the forefront of skills solutions which are tailored for their specific needs – **enabling Skills Development for the Nuclear Industry, by the Nuclear Industry.** We work not only in the UK but also in partnership with international organisations including the Institute of Nuclear Power Operations (INPO) for the development of global standards for training of nuclear professionals.

The Skills Academy has established a High Quality Training Provider Network that geographically covers the whole of the UK Nuclear Industry and members of this network are highlighted in this directory. The Skills Academy is continuing to appoint further members and this is done by an open and competitive application process that is underpinned by rigorous quality assurance standards or by employer nomination. We would encourage you to visit our web-site www.nuclear.nsacademy.co.uk to find out more about how this operates.

The idea for this directory came during an FCO Civil Nuclear Mission to Malaysia with Professor Andrew Sherry (Director of the Dalton Nuclear Institute at Manchester University), Professor Robin Grimes (Director of the Centre for Nuclear Engineering at Imperial College, London) and Dr Andy Hall (Deputy Chief Inspector – Office of Nuclear Regulation). I would like to thank them for their vision and support and additionally I would like to express my special thanks to Sheriffah Noor Khamseah Al-Idid, Malaysia, for her energy and enthusiasm in supporting the development of this concept and some of the initial design ideas.

Jean Llewellyn OBE,
Chief Executive,
National Skills Academy for Nuclear

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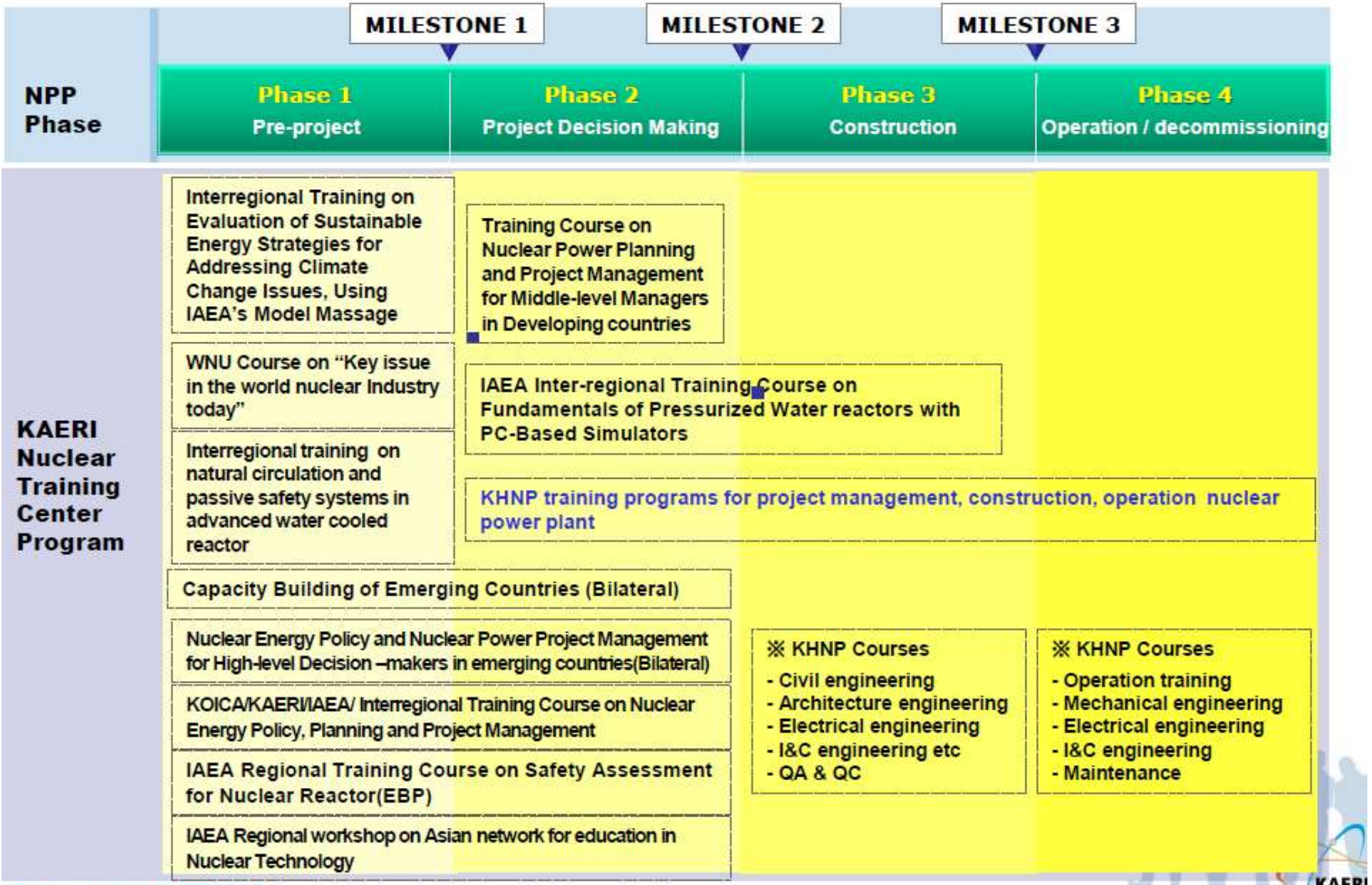
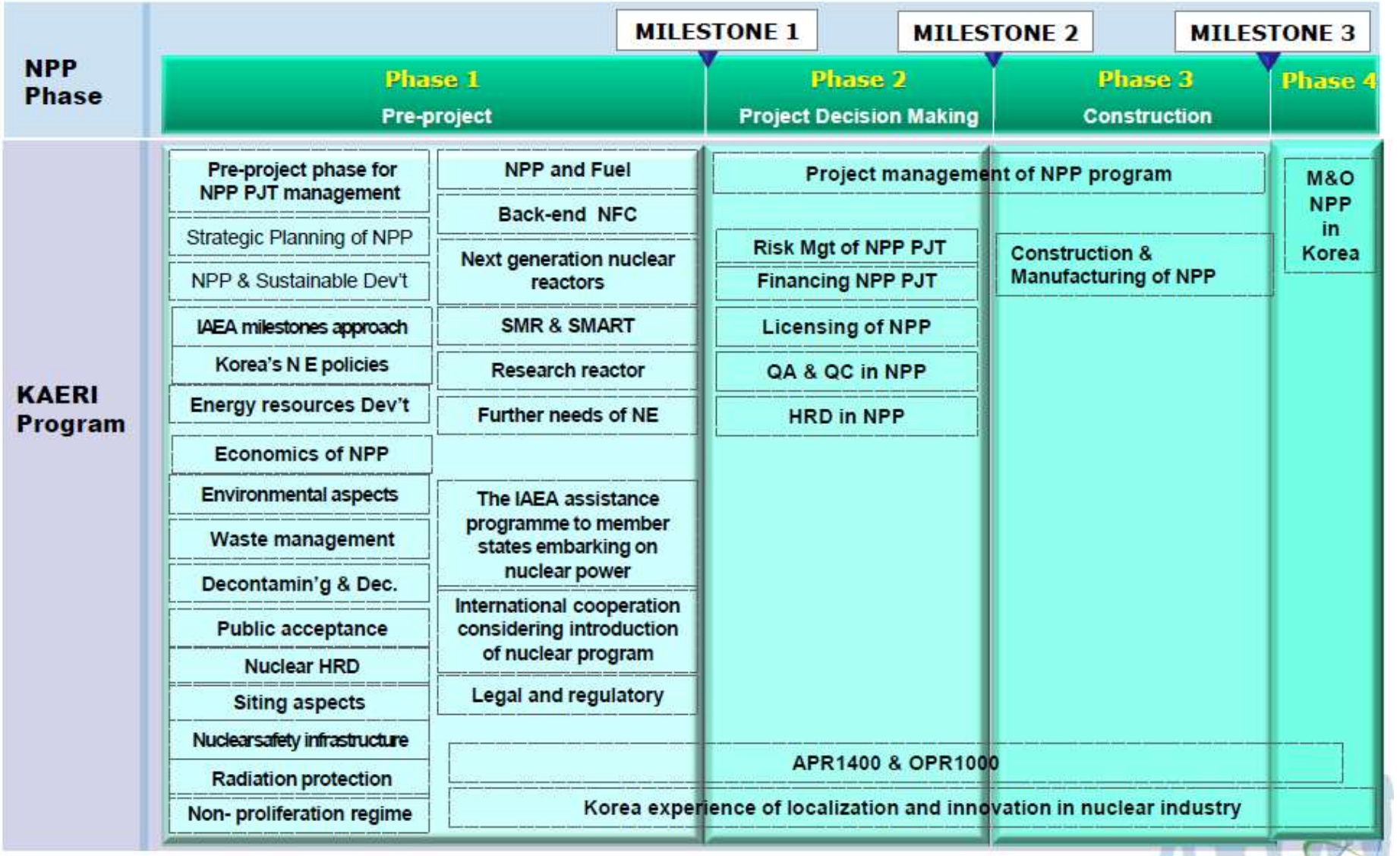
Nuclear Education & Training - The Korean Perspective : NTC KAERI
The IAEA Milestone Approach

KAERI Training Programs by Course



KAERI Training Programs by Subject



19 Recommendations

Recommendations - Part One

1.Set up a Task Force on Nuclear Education & Training , could be chaired by Minister of Education with membership of all Nuclear HRD stakeholders

Invite Universities, Industry, Government Agencies & Others to sit & talk TOGETHER on the way forward for Nuclear Education &Training

Partnership or Consortium may be established for offering
Degree courses , Continuing Professional Development
May refer to UK & French Best Practices
- Avoid Duplication & Competition (resources wasted-people, time & money!!!)

2. Identify Nuclear Education & Training Needs for stakeholders:

eg a)Government – Planning/ Policy/Governance/ Risk/ Export Control
b) Industry – Business opportunities: manufacturing, construction engineering etc
c) Regulatory body- Law & Regulations
d) Academia & R&D Agencies – Nuclear S&T, R&D

Recommendations - Part Two

3. Critical to remember – Manpower trained is NOT JUST to work in a nuclear power plant or station but in other organizations in the nuclear power sector value-chain eg Government, Industry and | Businesses, Media, Finance etc

4. Prepare Nuclear HRD Roadmap to outlining areas/fields/| number of personnel/ timeframe/funds required

5. . **It may not be strategic for a number of universities to be offering same or similar courses on nuclear engineering**

It may be more relevant for each university to identify its strengths and then offer the selected courses to support nuclear power

eg *University A offers Nuclear Engineering*

University B offers Nuclear Safety and Security

University C offers Nuclear Law and Policy

University D offers Nuclear Energy incorporating Business

Recommendations - Part Three

6. For institutions currently offering only Nuclear Engineering courses it may be relevant to introduce other related courses- independently or as part of an existing module **covering Nuclear Energy, Law, Governance , Risk , Business, Finance, Economics etc**

7. Apart from the offer of Nuclear Engineering courses for undergraduates/ graduates, institutions of Higher Education as well as private E&T Centres could **consider also offering courses to:**

a) Working professionals

b) Technicians

c) Craftsmen

Recommendations - Part Four

8. In view of the great importance of public opinion and the significant role of the media must be given due recognition

- Open/ Introduce & offer Nuclear Education & Training to Media representatives

i) Develop specialized topics/curriculum to encourage media participation and

ii) consider inviting foreign media to share their views and experiences on nuclear power with local media and the general public

9. As Financing is amongst the critical factors for Nuclear Power Projects to be realistically implemented,

- Open/ Introduce & offer Nuclear Education & Training to representatives from the Banking & Financial Sector

i) Develop specialized topics/curriculum for financiers and

ii) consider foreign investors in NPP to share their views & experiences

Recommendations - Part Five

10. As Nuclear Leadership is fundamental to ensure the safe, secure and profitable operations of nuclear power plants (to the NP plant owners as well as national economy) **relevant Nuclear E&T Agencies/ organizations (including the IAEA/WNA/WNU NEA/OECD and others including ENS) could consider introducing**

a) Nuclear Training Programmes (short courses) for Nuclear Leaders covering :
i) Politicians
ii) Policy and Decision Makers
iii) Senior Management of Nuclear Power Plants
iv) CEOs of Nuclear Businesses
in place of ENEL which had just closed down.

[Note: As the World Nuclear University (WNU) 's 6 weeks summer course targets young professionals up to the age of 40 years the Nuclear Leadership course could cover Politicians, Policy & decision makers as well as Professionals above 40 years who are given leadership roles in Nuclear related initiatives/organizations]

b) also for Financial & banking sector Officials as well as
c) Media Representatives

Recommendations - Part Six

11. European Nuclear Society (ENS) in partnership with ENEN can take the initiative and lead to prepare a softcopy and hardcopy Directory of Nuclear Education and Training offered by EU Member States covering all stakeholders including:

i) Politicians
ii) Policy and Decision Makers
iii) Professionals with Potential to be Nuclear Leaders
iv) Other Working Professionals
v) Business Leaders and Industry Representatives
vi) Students
vii) Technicians
viii) Craftsmen
ix) Public and
x) Media Representatives

And I would be happy to offer my support and ideas to the ENS and ENEN for this initiative


UK OFFICE OF THE EUROPEAN PARLIAMENT
to find out more www.europarl.org.uk
THE EUROPEAN UNION
27 Member States
Joined in 1957
Belgium
10.5 million
24 MEPs
France
62.8 million
78 MEPs
Germany
82.4 million
99 MEPs
Italy
58.7 million
78 MEPs
Luxembourg
0.4 million
6 MEPs
Netherlands
16.3 million
27 MEPs
Joined in 1973
Denmark
5.4 million
14 MEPs
Ireland
4.2 million
13 MEPs
United Kingdom
60.3 million
78 MEPs
Joined in 1981
Greece
11.1 million
24 MEPs
Joined in 1986
Portugal
10.5 million
24 MEPs
Spain
43.7 million
54 MEPs
Joined in 1995
Austria
8.2 million
18 MEPs
Finland
5.2 million
14 MEPs
Sweden
9.0 million
19 MEPs
Joined in 2004
Cyprus
0.7 million
6 MEPs
Czech Republic
10.2 million
24 MEPs
Estonia
1.3 million
6 MEPs
Hungary
10.0 million
24 MEPs
Latvia
2.2 million
9 MEPs
Lithuania
3.4 million
13 MEPs
Malta
0.4 million
5 MEPs
Poland
38.1 million
54 MEPs
Slovak Republic
5.3 million
14 MEPs
Slovenia
2.0 million
7 MEPs
Joined in 2007
Bulgaria
7.7 million
18 MEPs
Romania
21.6 million
35 MEPs
3 Candidate Countries
Croatia
4.4 million
FYR Macedonia
2.0 million
Turkey
72.6 million
SEA OF NORWAY
NORWAY
SWEDEN
FINLAND
RUSSIA
NORTH SEA
UNITED KINGDOM
IRELAND
THE NETHERLANDS
GERMANY
POLAND
BELARUS
UKRAINE
FRANCE
AUSTRIA
HUNGARY
ROMANIA
BULGARIA
PORTUGAL
SPAIN
ITALY
GREECE
TURKEY
BLACK SEA
MEDITERRANEAN SEA
MOROCCO
ALGERIA
TUNISIA
SYRIA
IRAQ

Proposed First Page for each EU Member States outlining Nuclear courses offered

University of Natural Resources and Applied Sciences, Vienna

Universität für Bodenkultur Wien

List of Projects of Institute of Risk Research

University of Salzburg

UNIVERSITÄT SALZBURG

Research Projects of Radiology

University of Innsbruck

Master of Chemistry

Vienna University of Technology

Bachelor of Physics

University of Vienna

Masters in Nuclear and Isotope Physics

University of Graz

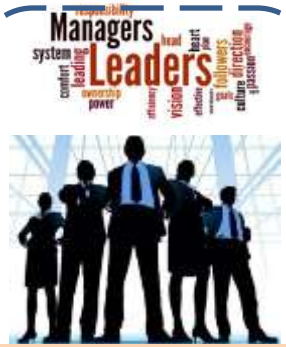
1.Bachelor of Technical Physics
&
2. Master of Technical Physics

FH campus Wien

1. Bachelor of Radiology Technology
&
2. Master of Radiology Technology

HUMAN RESOURCES to Support NPP
POLITICIANS, POLICY MAKERS, PROFESSIONALS, PRESS & PUBLIC

Politicians



Nuclear Leadership

- Policy & Decision Makers
  Management of Nuclear Power Plants
  Management of Nuclear R&D

Professionals with Potential to be Nuclear Leaders

Other Working Professionals

ENS Current Focus

College Students

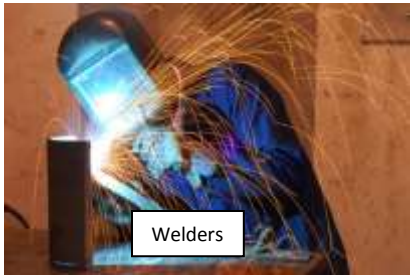
University Students

Media/ Press

General Public

HUMAN RESOURCES to Support NPP
BUSINESS LEADERS, INDUSTRY REPRESENTATIVES ,TECHNICIANS & CRAFTSMEN,

Business Leaders (Financial, Construction, Manufacturing Services)



Technicians

Craftsmen








Directory of Nuclear Education and Training offered by the European Union Member States

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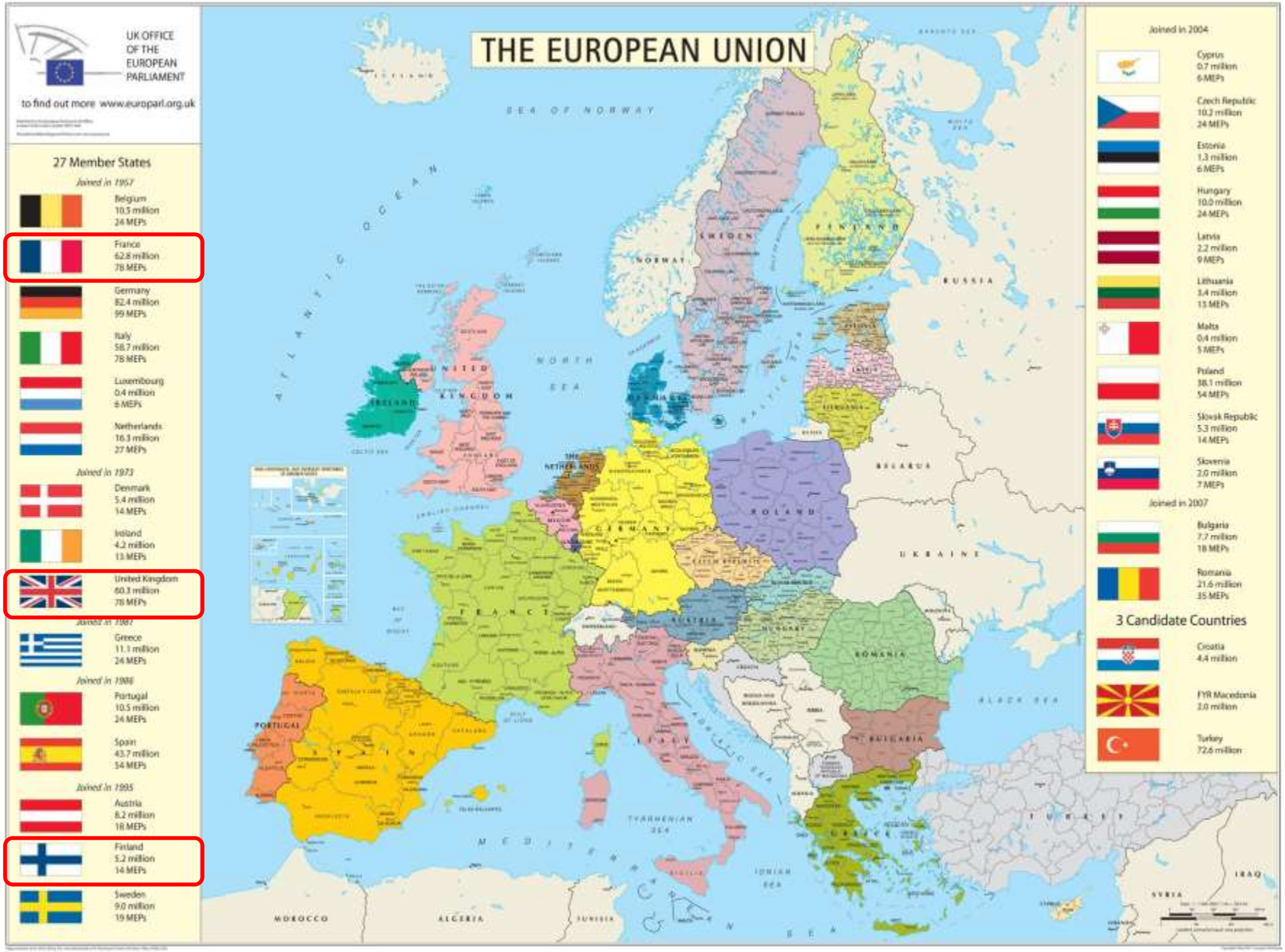
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Estonia 1.3 million 6 MEPs
Hungary 10.0 million 24 MEPs
Latvia 2.2 million 9 MEPs
Lithuania 3.4 million 13 MEPs
Malta 0.4 million 5 MEPs
Poland 38.1 million 54 MEPs
Slovak Republic 5.3 million 14 MEPs
Slovenia 2.0 million 7 MEPs
Joined in 2007
Bulgaria 7.7 million 18 MEPs
Romania 21.6 million 35 MEPs
3 Candidate Countries
Croatia 4.4 million
FYR Macedonia 2.0 million
Turkey 72.6 million
SEA OF NORWAY
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SWEDEN
FINLAND
RUSSIA
NORTH SEA
IRELAND
UNITED KINGDOM
THE NETHERLANDS
GERMANY
POLAND
BELARUS
UKRAINE
FRANCE
AUSTRIA
HUNGARY
ROMANIA
BULGARIA
PORTUGAL
SPAIN
ITALY
GREECE
TURKEY
IRAQ
SYRIA
MOROCCO
ALGERIA
TUNISIA
MEDITERRANEAN SEA
BLACK SEA

Recommendations - Part Seven

12. The International Atomic Energy Agency (IAEA) either via its Human Resource Department or Knowledge Management (KM) Department can take the initiative and lead to prepare a softcopy and hardcopy Directory of Nuclear Education and Training offered by IAEA Member States covering all stakeholders including:

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ii) Policy and Decision Makers
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x) Media Representatives

And I would be happy to offer my support and ideas to the IAEA for this initiative

sheriffahnai@gmail.com

Mobile: 00 6017 6853075