



The Abdus Salam
**International Centre
for Theoretical Physics**



2473-1

Joint ICTP-IAEA School on Nuclear Energy Management

15 July - 3 August, 2013

The IAEA Programme on Nuclear Power, Fuel Cycle and Nuclear Science

A. Bychkov
IAEA, Vienna, Austria

The IAEA Programme on Nuclear Power, Fuel Cycle and Nuclear Science

Alexander Bychkov
Deputy Director General
Head of the Department of Nuclear Energy
International Atomic Energy Agency

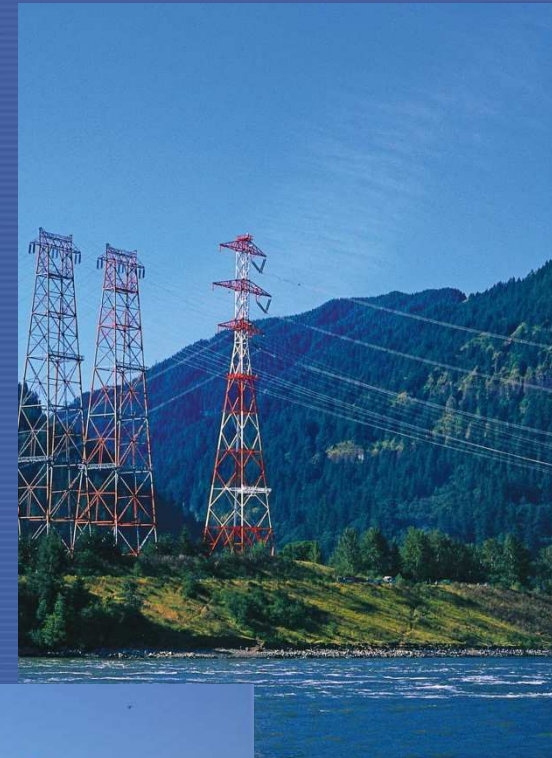


IAEA

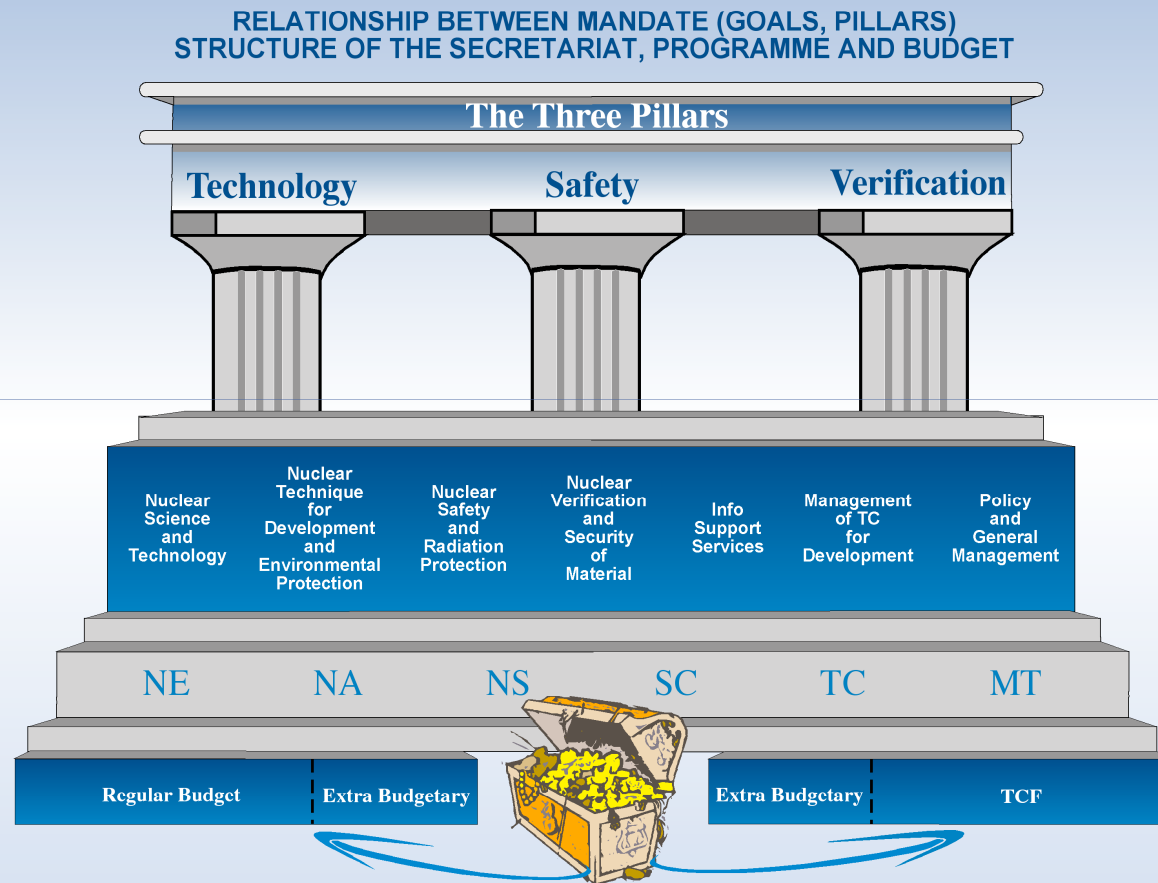
International Atomic Energy Agency

IAEA Statutory objective

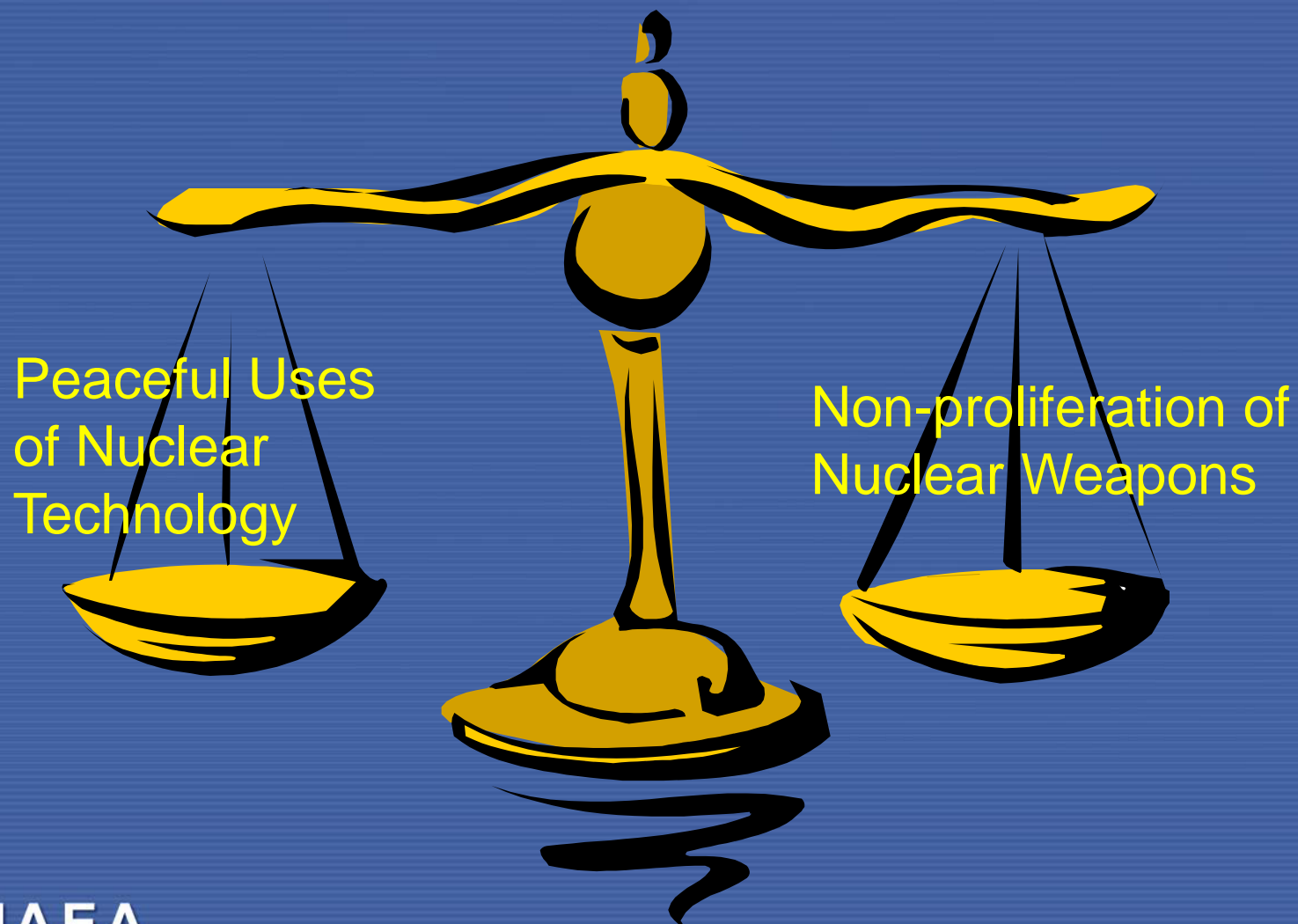
- “The Agency shall seek to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world...”



Three “Pillars” of the IAEA



A Fundamental Balance



ATOMS FOR PEACE



IAEA's role in supporting the peaceful use of nuclear power

- *Developing Standards and Guidance*
- *Providing Reviews and Services*
- *Supporting Capacity Building*
- *Promoting Knowledge Networks*
- *Providing a forum for communicating, increasing transparency, sharing lessons learned via workshops, meetings, and various media*

The Technical Departments



Department of
Nuclear Sciences
and Applications

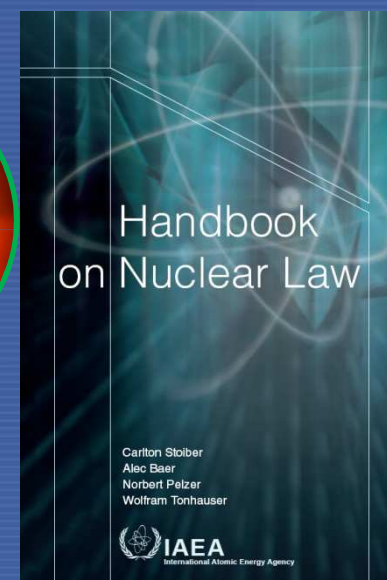


Department of
Nuclear Energy



Department
of Safeguards

Department of
Nuclear Safety
and Security



Office of Legal
Affairs



Safeguards & Verification



- The IAEA is the world's nuclear inspectorate, with more than four decades of verification experience. Inspectors work to verify that safeguarded nuclear material and activities are not used for military purposes.
- The IAEA inspects nuclear and related facilities under safeguards agreements with more than 145 States around the world. Most agreements are with States that have internationally committed themselves not to possess nuclear weapons. These agreements are concluded pursuant to the global *Treaty on the Non-Proliferation of Nuclear Weapons (NPT)*, for which the IAEA is the verification authority.



Nuclear Applications

Diagnosis and
Treatment of Disease



Changing Environment



Water
Resources

Food Safety

Human Health

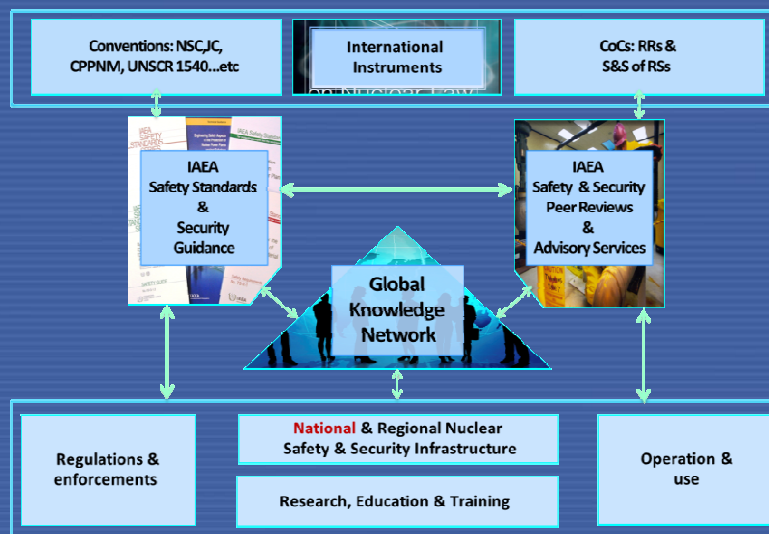
Sustainable
Agriculture

Nuclear Safety and Security

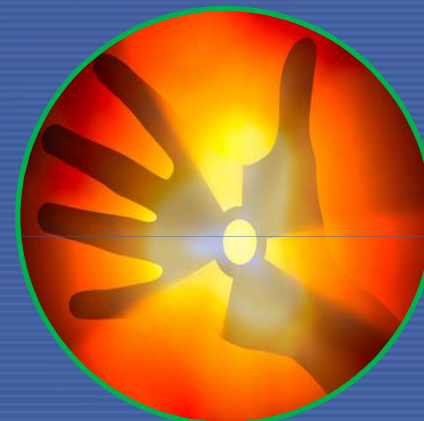
Nuclear Installation Safety



Global Nuclear Safety and Security Framework



Global Nuclear Security



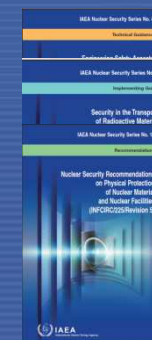
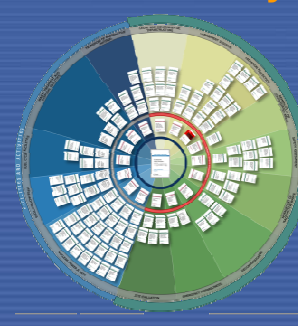
Emergency Preparedness and Response



Radiation, Transportation and Waste Safety



Nuclear Safety Standards and Security Guidelines



Technical Cooperation

- The Technical Cooperation Department of the International Atomic Energy Agency, a specialized organization within the United Nations system, helps to transfer nuclear and related technologies for peaceful uses to countries throughout the world.
- **The Technical Cooperation Strategy** aims at a clear objective: *“to increasingly promote tangible socio-economic impact by contributing directly in a cost-effective manner to the achievement of the major sustainable development priorities of each country.”*

Nuclear Energy

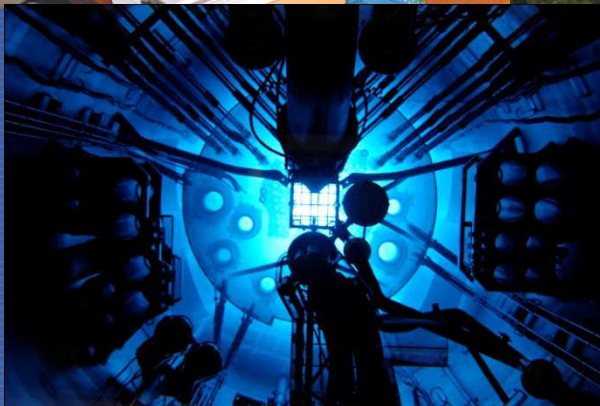
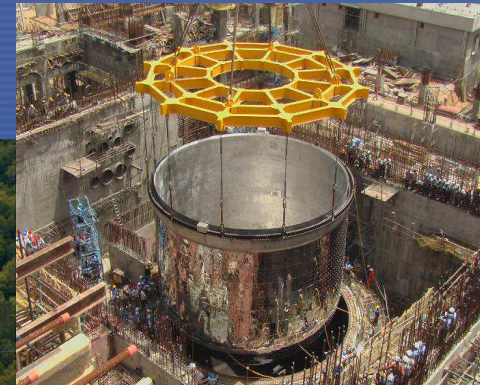
Planning and training



Uranium exploration and production



Power production



Research reactors



Spent fuel and waste

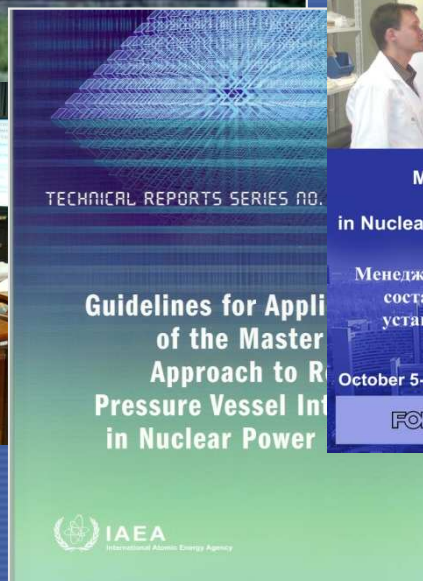


Decommissioning

Nuclear Energy Department Activities

Mission

1. Support to existing Nuclear Power for excellence
2. Catalysing of innovation for sustainable development
3. Capacity building, support knowledge management,



INTERNATIONAL ATOMIC ENERGY
and
FORATOM Business Excellence Workshop
6th Joint Workshop

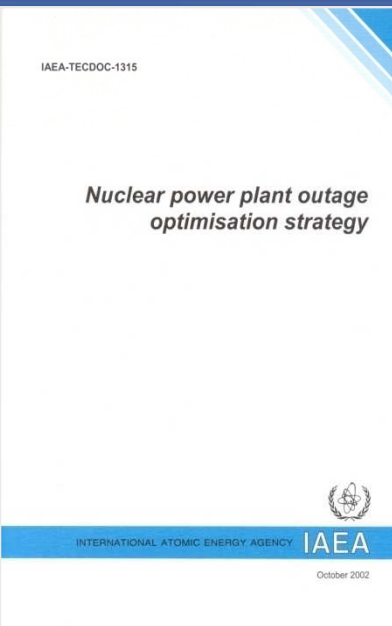


Managing an Aging Workforce
and Transfer of Knowledge
in Nuclear Installations and Regulatory Bodies

Менеджмент в условиях старения
состава и передача знаний на
установках и в регулирующих
органах

October 5-7, 2004

FORATOM



Department of Nuclear Energy

The NE Department provides services and advice to Member States on nuclear power and the nuclear fuel cycle for:

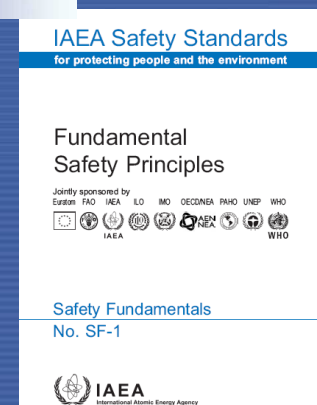
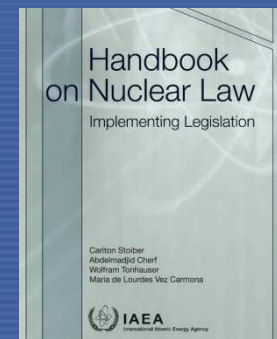
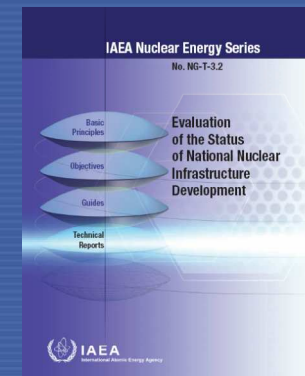
- **Continued reliable and safe lifetime operation of present reactor systems and fuel cycle facilities**
- Expanded use of nuclear power, particularly for countries currently without nuclear power, or with only small nuclear power programmes
- **Development of advanced reactor systems and their fuel cycles for the long term**
- Capacity building for energy analysis and planning
- **Objective consideration of the role of nuclear power for sustainable development**
- Development of nuclear knowledge management, information and communication

IAEA services & products

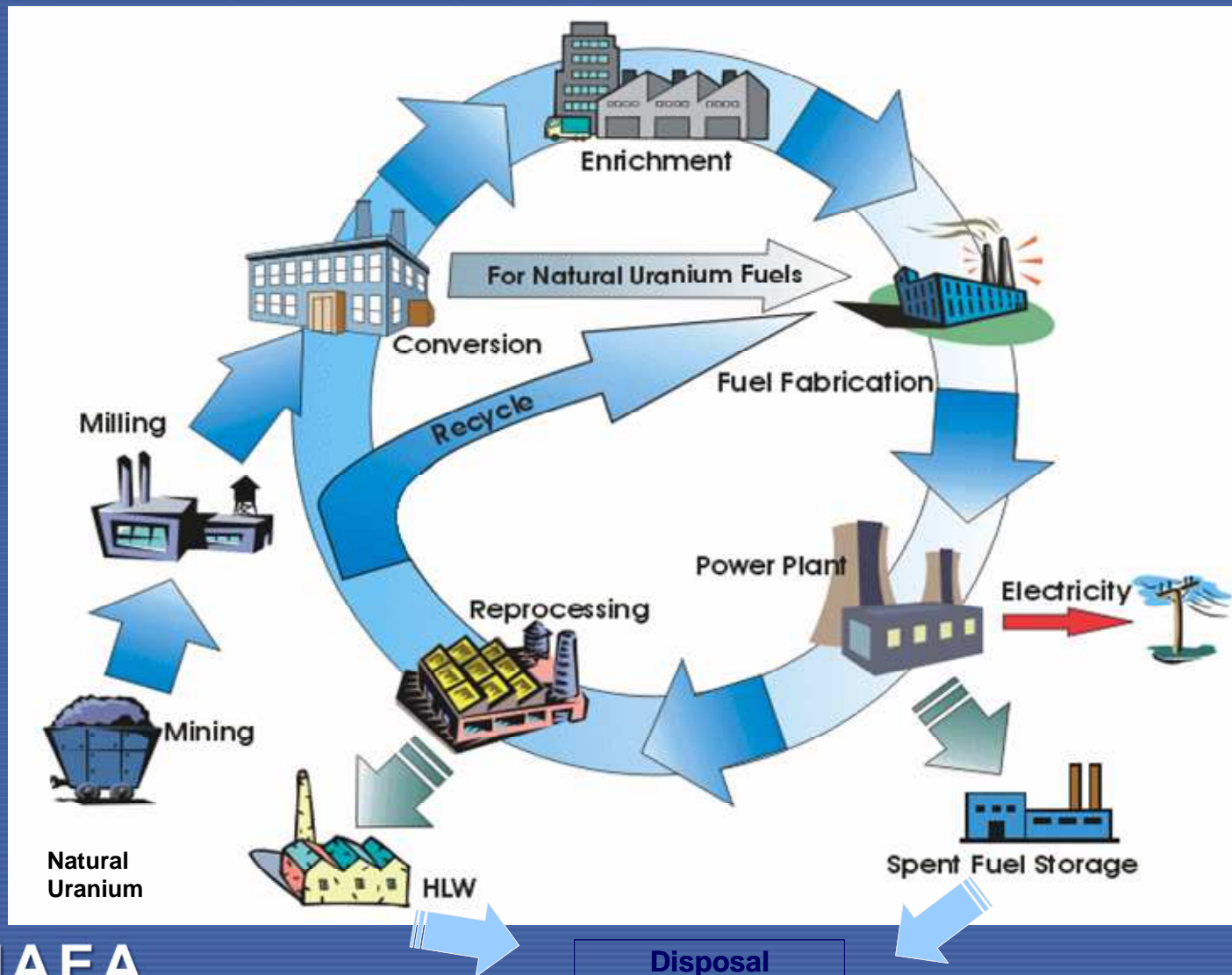
- Peer reviews
- Databanks
- Summaries of experience, new knowledge, best practices
- Training, distance learning
- Standards, guidelines
- Technical ref. documents
- Research coordination



Considerations to Launch a
Nuclear Power Programme



Nuclear fuel cycle



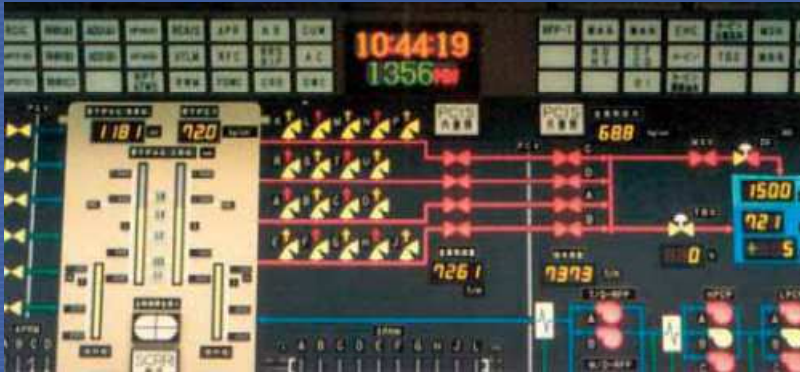
NE - Nuclear Power

- Nuclear Power Engineering
- Nuclear Power Technology Development
- International Project on Innovative Nuclear Reactors and Fuel Cycles - INPRO
- Integrated Nuclear Infrastructure



Support for operators

Instrumentation & control



Advanced
construction

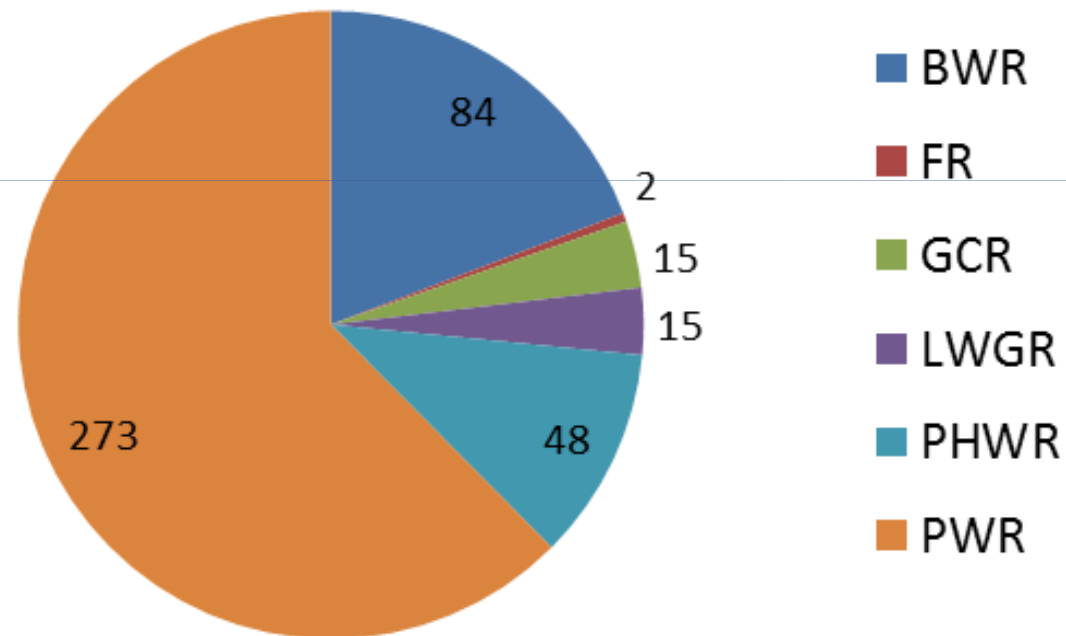


Plant life extension



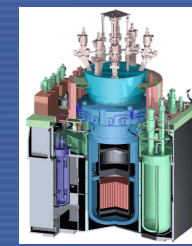
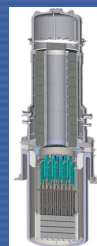
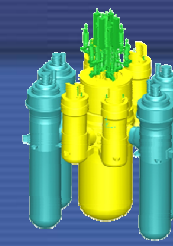
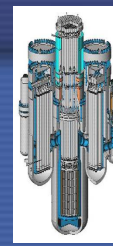
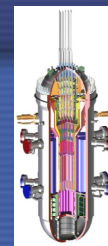
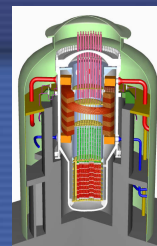
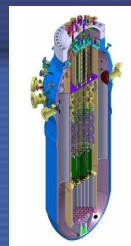
World Reactors Fleet - 2012

Number of reactors



Catalyze innovations

Lessons learned from
the Fukushima
Daiichi accident,
SMRs

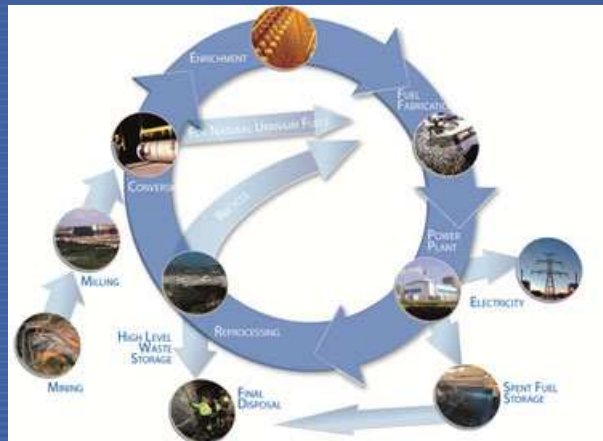


International
Project on
Innovative
Nuclear
Reactors and
Fuel Cycles



NE - Nuclear Fuel Cycle & Waste Technology

- Nuclear Fuel Cycle & Materials
- Waste Technology
- Research Reactors



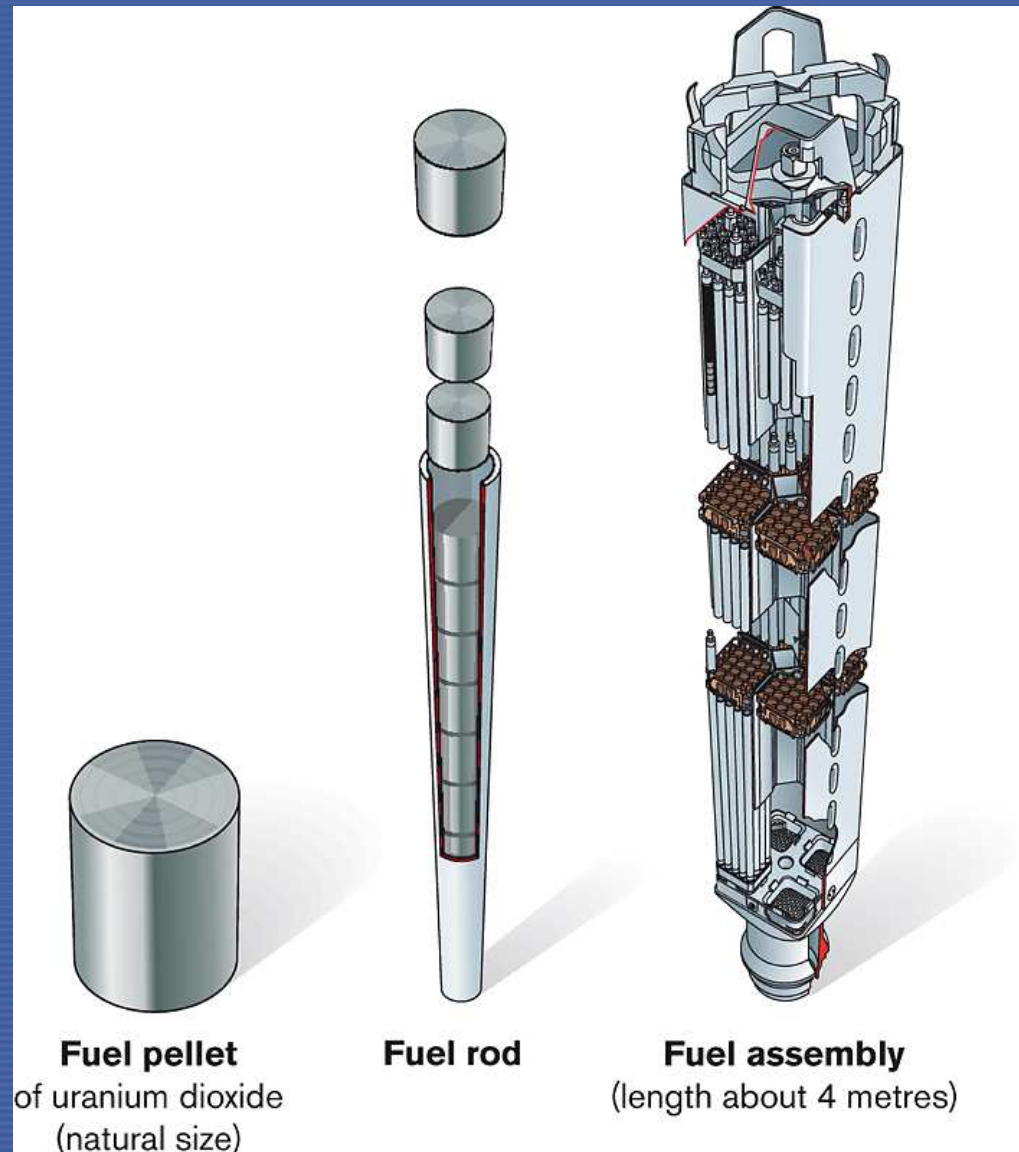
Uranium exploration & mining



MEGATEM, Dash 7

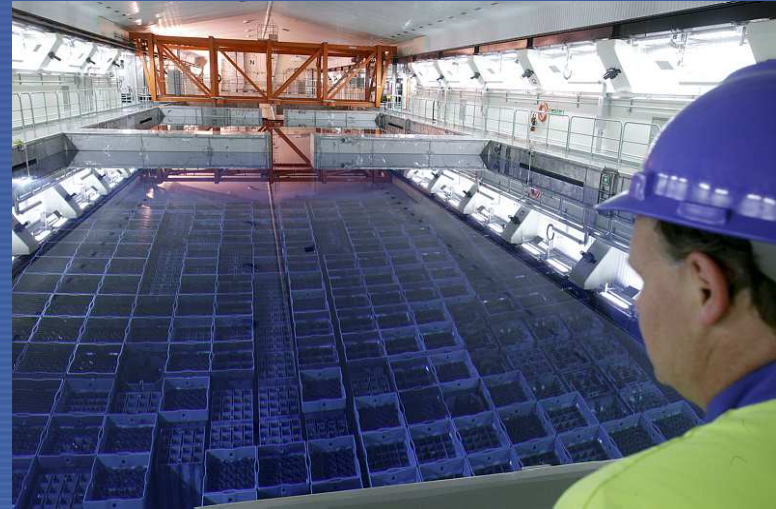


Fuel fabrication and engineering



Spent fuel management

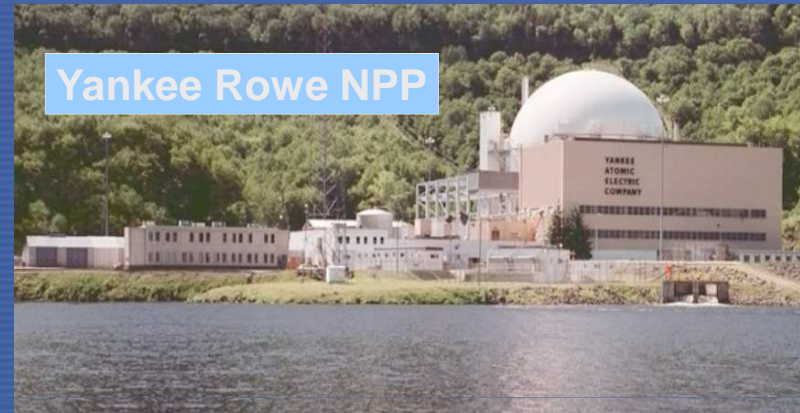
Spent fuel storage



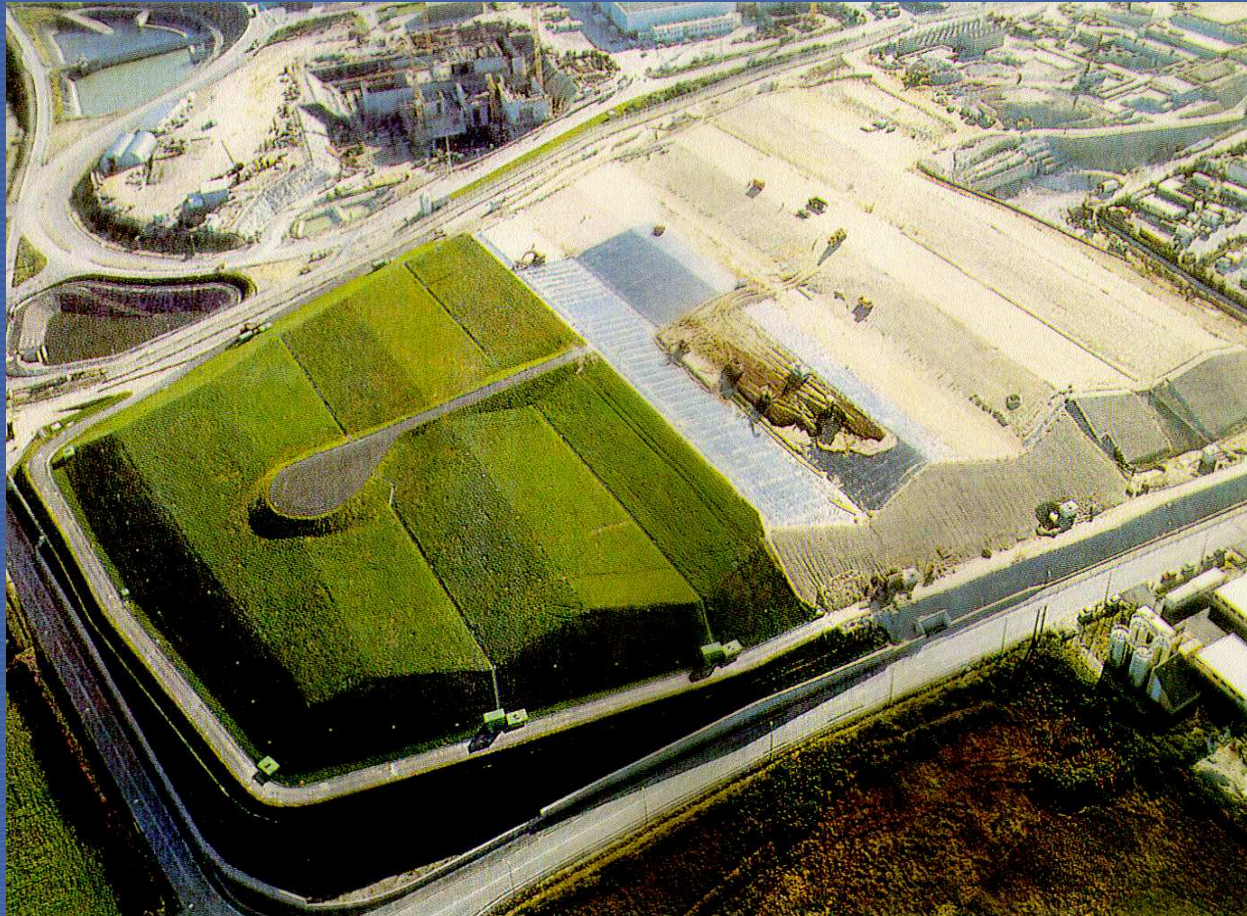
Decommissioning



Maine Yankee being dismantled, USA



Disposal of low level waste



Final Covering of the Low Level Waste
Disposal Facility at Centre de la Manche (France)

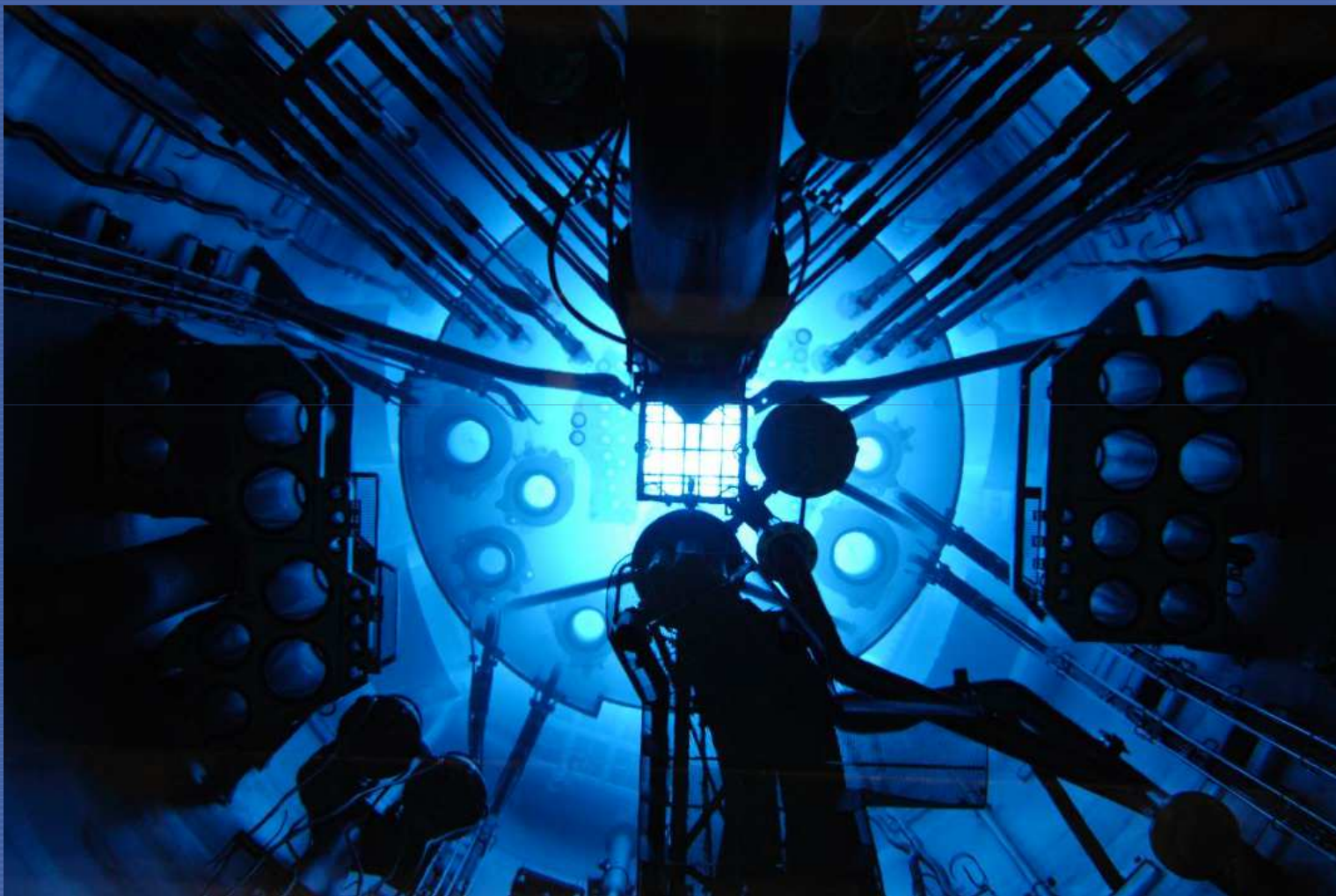
Äspö Hard Rock Laboratory



Disused sources mangement



Research reactors



Vinča HEU Repatriation to Russia

by trucks to
Subotica

by train to
the port of
Koper

by ship to
the port of
Murmansk

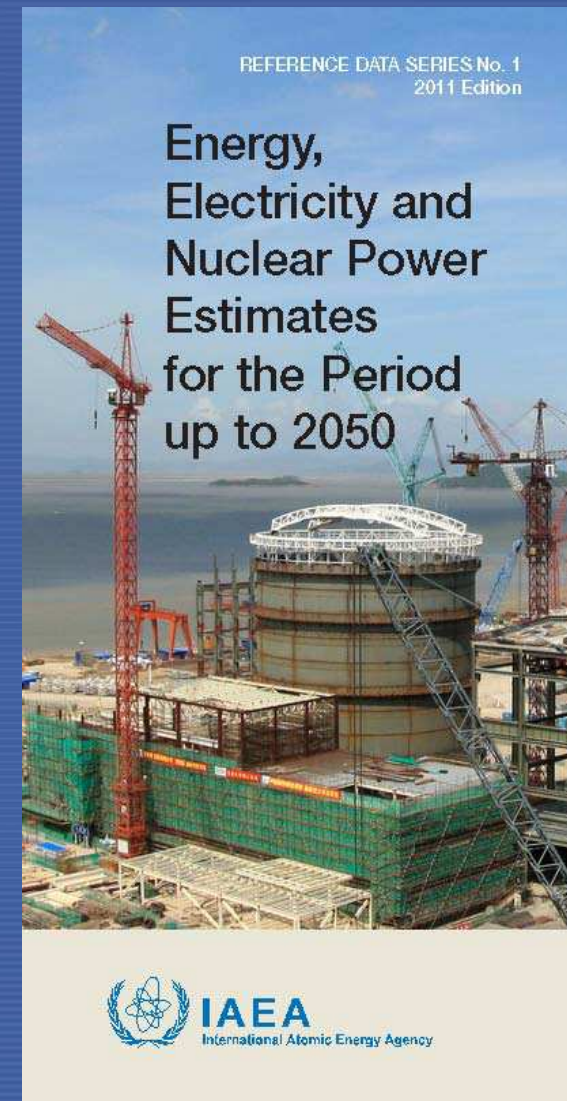
by train to
the Mayak
facility



IAEA

Planning & Economic Studies: Analysis for Sustainable Energy Development

Through training, technical assistance and information exchange, IAEA helps Member States build capacity in energy systems analysis and planning for identifying the role of different technologies, including nuclear, in meeting their future energy needs.

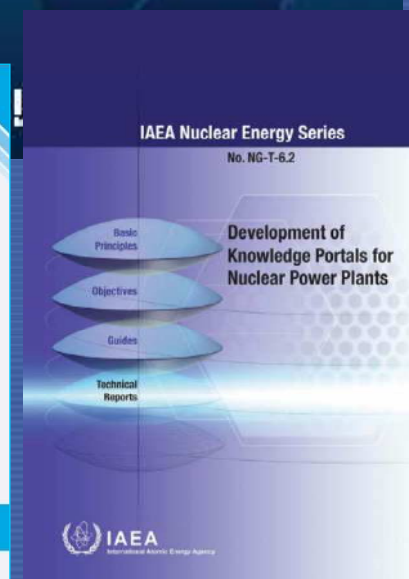
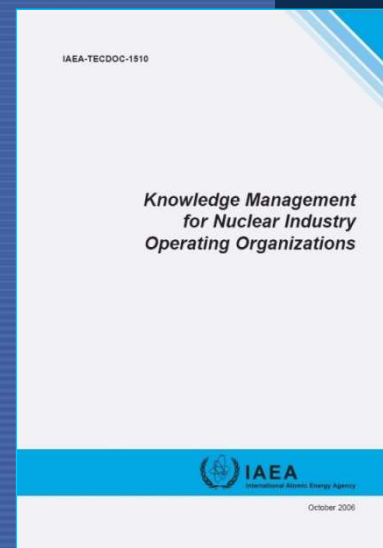
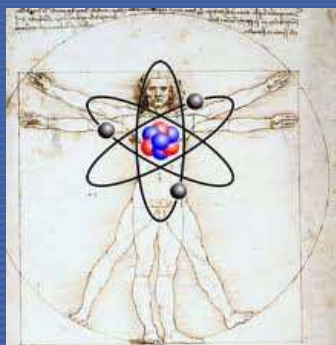
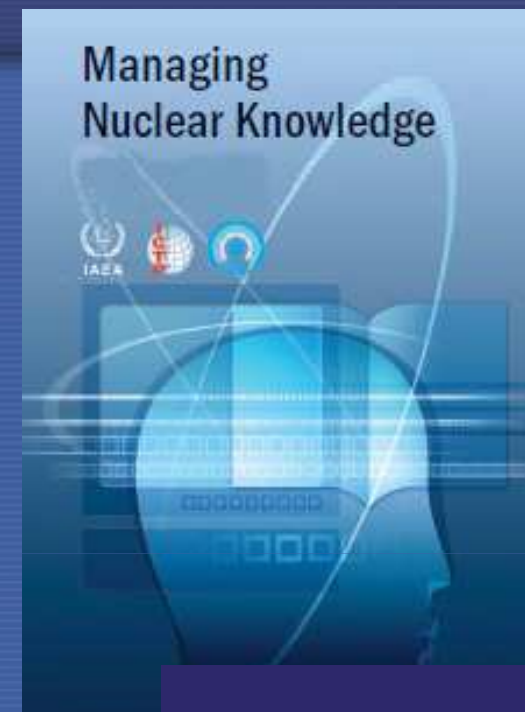


International Nuclear Information System (INIS) and Library

- The INIS hosts one of the world's largest collections of published information on the peaceful uses of nuclear science and technology. It offers online access to a unique collection of non-conventional literature. INIS is operated by the IAEA in collaboration with over 150 members.
- Since 1958, the library has been at the heart of nuclear information management.

Nuclear Knowledge Management

- **Developing and implementing methodologies and guidance documents for NKM,**
- **Facilitating sustainable nuclear education, training and information exchange,**
- **Providing NKM related products and services.**



Energy 2013

2.6 Billion
rely on biomass

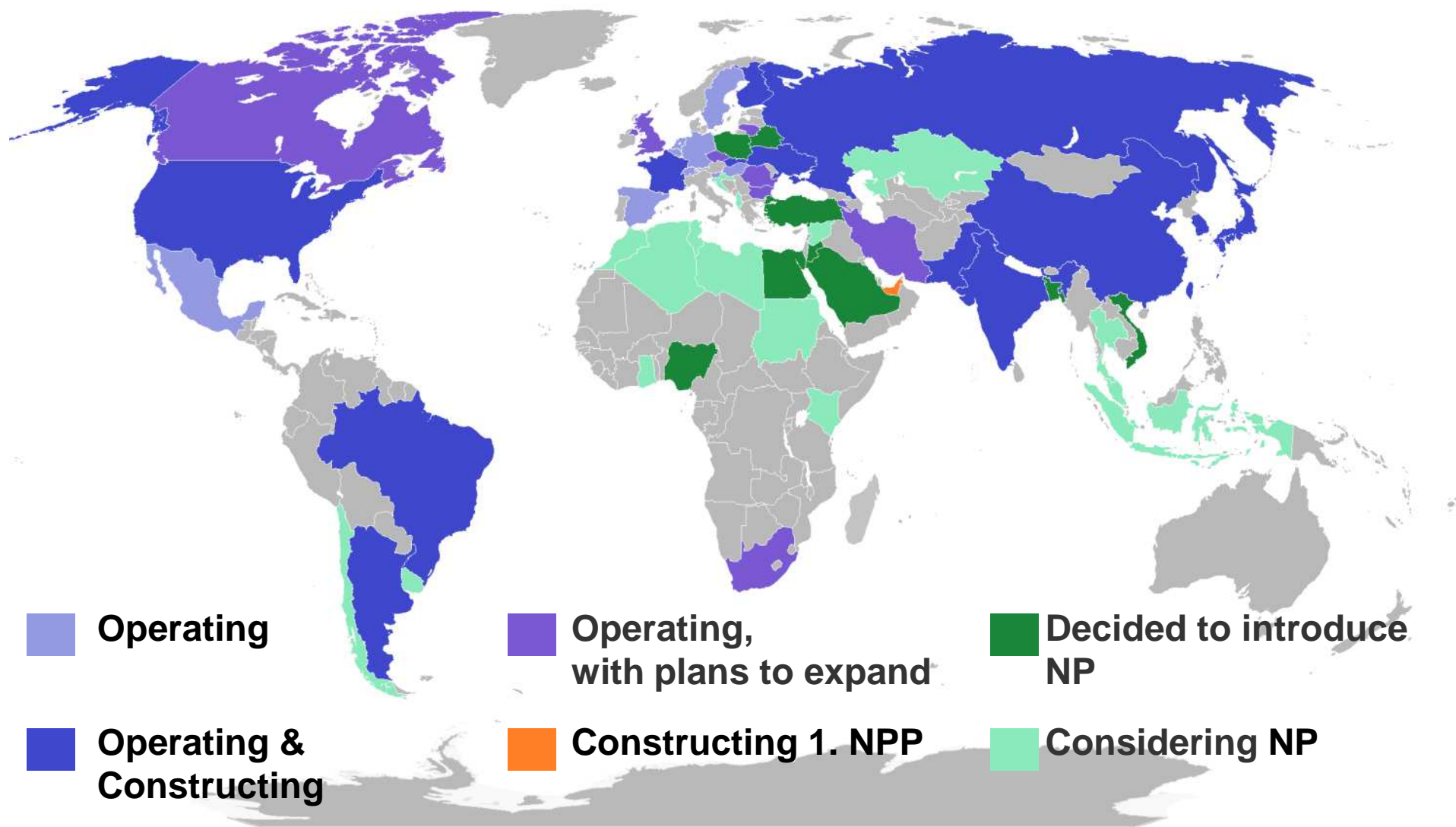
1.3 Billion
no access to energy

1 Billion
no health care
due to energy poverty

Earth at Night
More information available at:
<http://antwrp.gsfc.nasa.gov/apod/ap001127.html>

Astronomy Picture of the Day
2000 November 27
<http://antwrp.gsfc.nasa.gov/apod/astropix.html>

Nuclear Energy 2013



IAEA

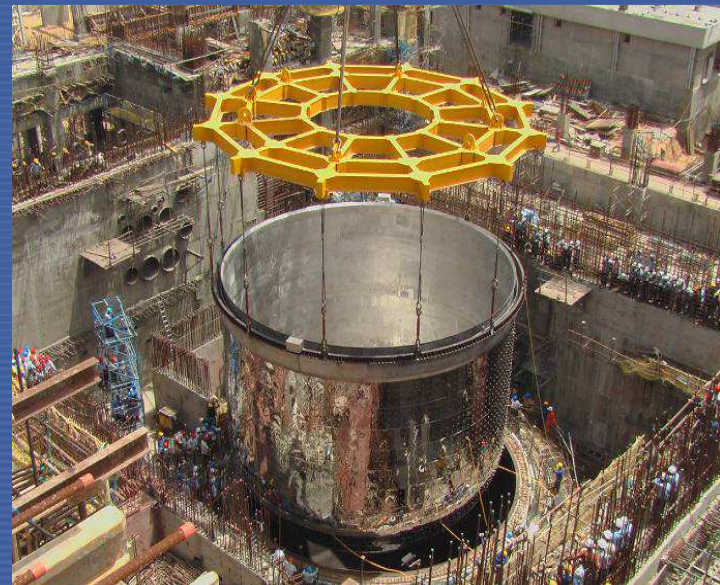
Sustainable Energy for “All”



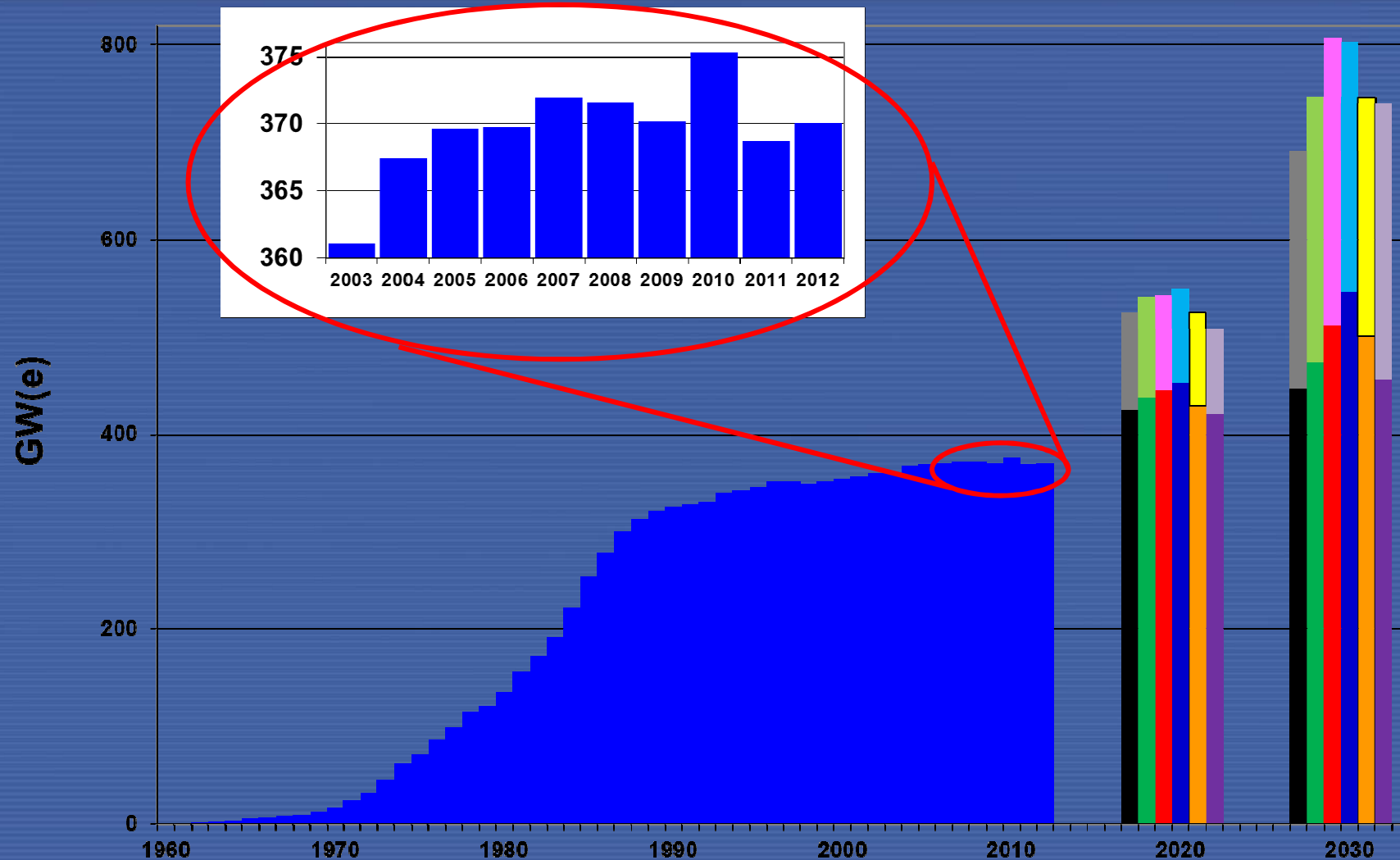
Nuclear Power Current Status

10 July 2013

- **434** nuclear power reactors in operation
- **370 543** MW(e)
- **69 (+1)** under construction



Global installed nuclear power capacity



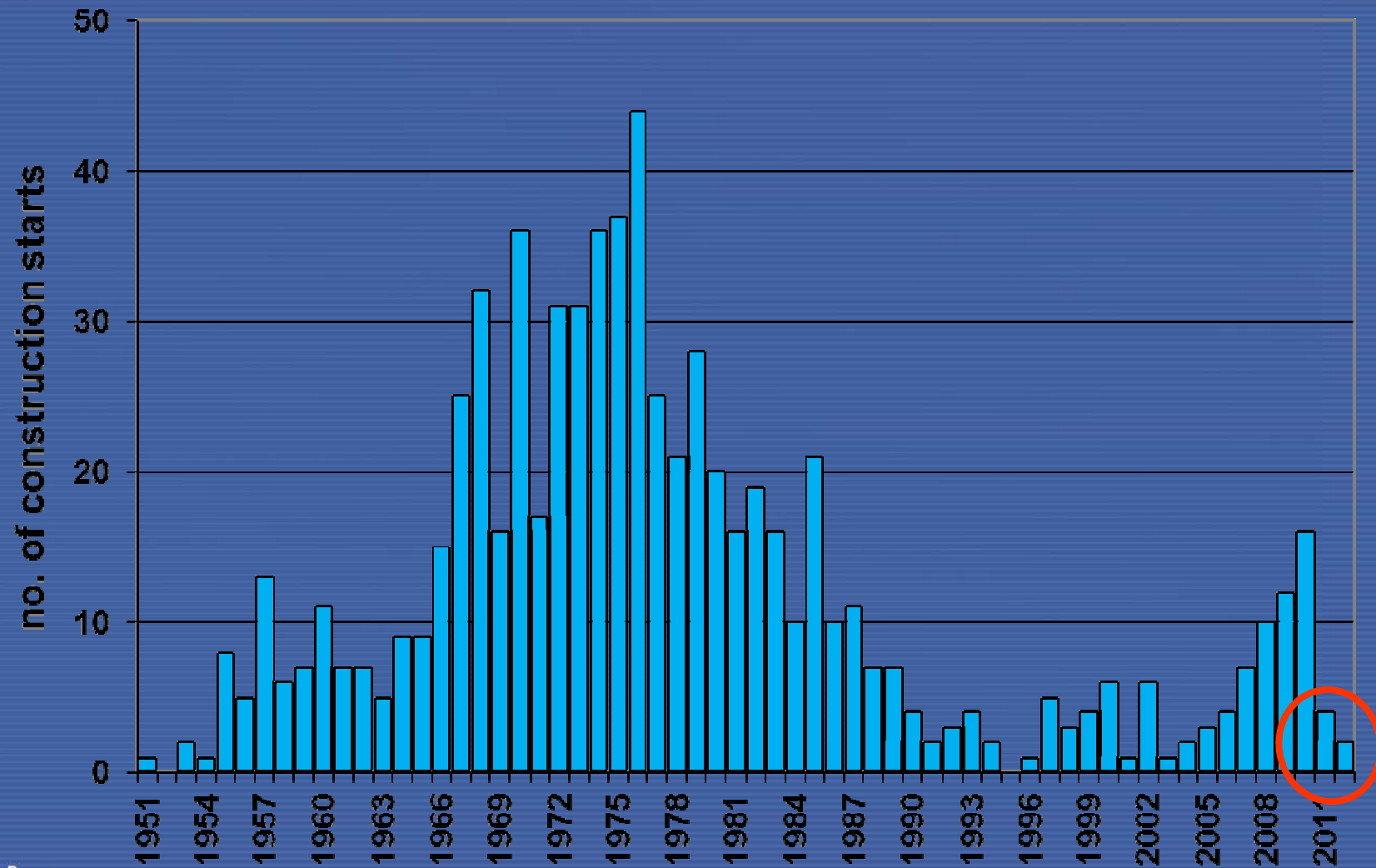
Key assumptions

- LOW reflects a continuation current trends and changes in policies affecting nuclear power other than those already in the pipeline
- HIGH is much more optimistic, but still plausible and technically feasible and assumes that
 - the Fukushima Daiichi accident does not lead to a long-term retraction of nuclear power programmes globally
 - the current financial and economic crises will be overcome in the not so distant future
 - past rates of economic growth and electricity demand, especially in the Far East, would essentially resume
 - the implementation of stringent policies globally targeted at mitigating climate change



IAEA

New construction starts



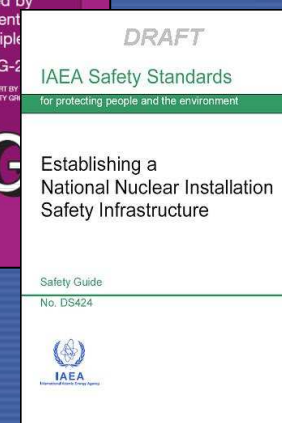
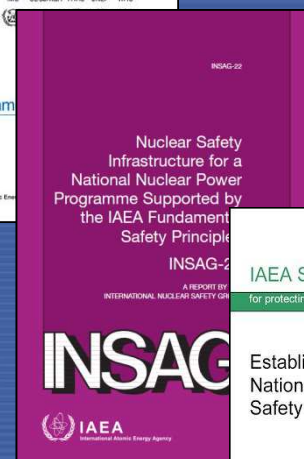
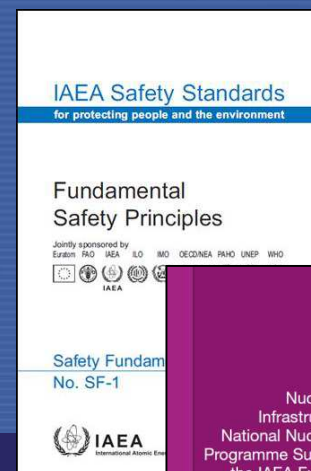
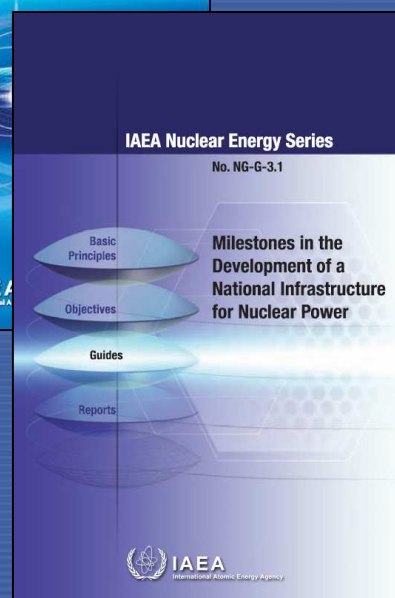
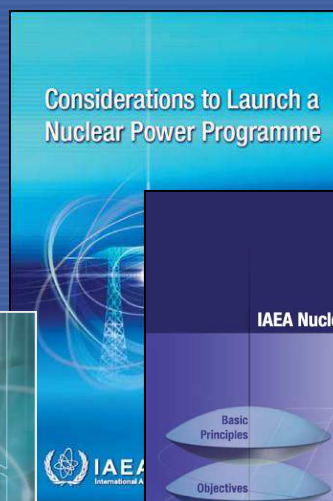
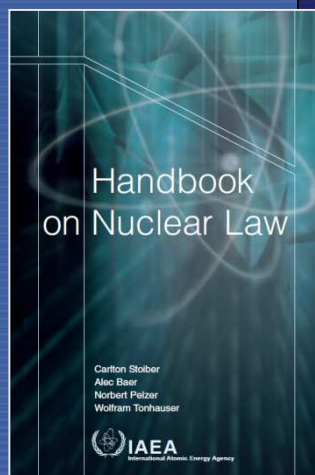
Post Fukushima: Unchanged drivers behind the interest in nuclear power

- Global energy demand is set to grow :
Nuclear power expands supply options
- Environmental pressures are rising
Nuclear power has low life-cycle GHG emissions
- Energy supply security back on the political agenda
Nuclear power contributes to energy security
- Reliable base load electricity at predictable and affordable costs for meeting MDGs
Nuclear power offers stable and predictable generation costs based on low resource costs

Newcomers Post-Fukushima

- Nuclear power continues to be an option, but public confidence has been shaken
- Many countries are continuing with their plans for their first NPPs, and have said they will incorporate the lessons learned from Fukushima accident
- Some countries have decided to delay decisions regarding nuclear power in order to take the lessons into account

Phased Approach to Nuclear Power



The IAEA NE “holistic package”

For expanding and new nuclear power national programmes:

- Energy planning and capacity building for energy system analysis
- Integrated Nuclear Infrastructure Review (INIR)
- Nuclear Energy System Assessment (NESA)
- Nuclear Knowledge Management (NKM)