

International perspectives on and the implications of US decisions regarding the back- end of the nuclear fuel cycle

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Why we are today especially concerned about implications of US nuclear decisions

- ◆ 61 nations have requested support from IAEA on what they need to introduce to have nuclear power
 - Africa 20
 - Latin America 12
 - Asia Pacific 20
 - Europe and FSU 9

Back-end Topics

Reprocessing

Geological Disposal

- ◆ Global status
- ◆ Impact of US policies
- ◆ A way forward?

Reprocessing – Commercial Scale



BNFL Sellafield

COGEMA La Hague



Countries that reprocess(ed):

- Weapons States
- Netherlands
- Belgium
- Argentina
- (South Africa)
- (Italy)

Reprocessing – a short history

■ 1960/70s

Pilot and semi-commercial reprocessing plants developed (Belgium, France, Germany, Japan, Russia, UK, US).

Change of US policy 1977 to no reprocessing

■ 1980/90s

Large commercial plants in operation (France, UK)

Large commercial plant decided (Japan)

Large commercial plants cancelled or deferred (Germany, Russia)

■ Early 2000s

Slow-down in use of reprocessing

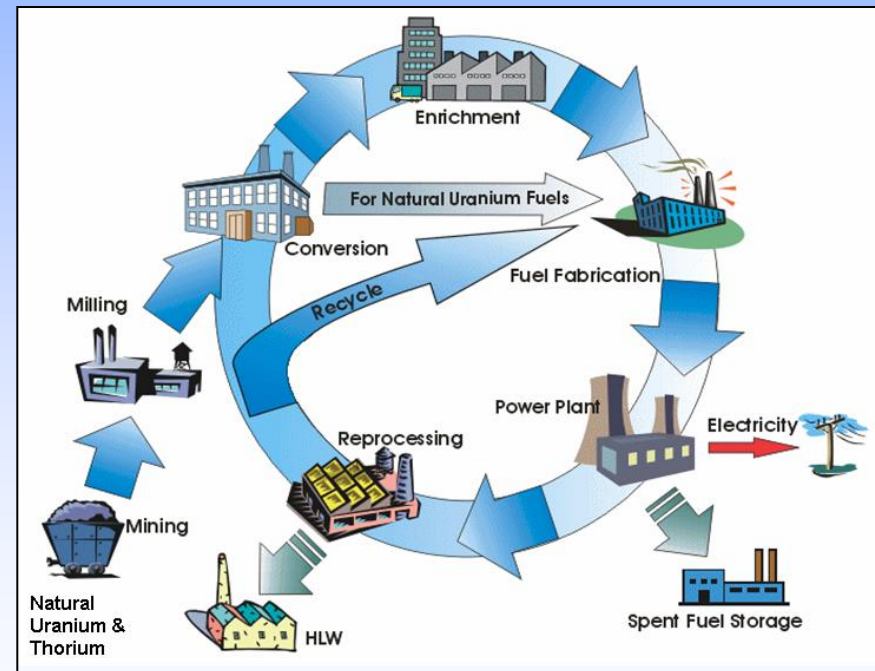
Increasing interest in future reprocessing

Change in US policy

■ Future:??

Increasing interest in recycling

- ◆ International Project on Innovative Nuclear Reactors and Fuel Cycles (INPRO)
- ◆ Generation IV International Forum (GIF)
- ◆ Russian proposal for International Fuel Cycle Centres
- ◆ US Global Nuclear Energy Partnership (GNEP)
- ◆ Multilateral Approaches to the Nuclear Fuel Cycle (MNA)
- ◆ New reprocessing plants started in Japan and China



Reprocessing: Technology Issues

- ◆ 1st generation can function well (in France)
- ◆ Could improve separation efficiency
- ◆ Could reduce emissions
- ◆ Needs new methods to avoid Pu segregation
- ◆ Economics currently unfavourable

Reprocessing: Policy Issues

- ◆ Resource conservation
- ◆ Environmental impacts
- ◆ Proliferation concerns
- ◆ Transport concerns
- ◆ Economics

Nuclear expansion without increased global security risks 1/2

- ◆ Concentrate reprocessing in the few countries that have full fuel cycle facilities
- ◆ Build new reprocessing facilities only when the need has been established
 - .. which means when the advent of fast reactors appears certain

Nuclear expansion without increased global security risks 2/2

- ◆ Develop advanced, more proliferation resistant technologies
- ◆ Enhance incentives for other countries to desist from reprocessing
 - Security of fuel supply is important
 - Help with the challenging task of geological disposal may be a bigger carrot

...and the USA is NOT showing a good example here

The USA and Geological Disposal

International Status and Prospects of Nuclear Power

Report by the Director General 2 September 2010

Some countries like France, India, Japan and the Russian Federation have ongoing programmes to recycle spent fuel. However, because final disposal is necessary in all options for the back end of the fuel cycle, every country needs access to disposal. There is a need to support final disposal options, initiatives and projects. Special support to newcomer countries to develop strategies for spent fuel management is needed.



Can we introduce or expand nuclear without “solving the waste problem”?

◆ *“The definition of insanity is doing the same thing over and over and expecting different results”*

(e.g. ignoring disposal issues; “waste confidence” declarations by experts)

- ✓ Reach wide consensus that geological disposal is feasible and safe ... if properly sited an engineered
- ✓ Change our approach to siting repositories

THE DISPOSAL OF RADIOACTIVE WASTE ON LAND

Report of the
Committee on Waste Disposal
of the
Division of Earth Sciences

Committee Members

Harry H. Hess, Chairman
John N. Adkins William B. Heroy
William E. Benson M. King Hubbert
John C. Frye Richard J. Russell
Charles V. Theis

Publication 519
Price \$1.00

National Academy of Sciences - National Research Council
Washington, D. C.
September 1957

**Geologic disposal
began in the
USA
US National Academy of
Sciences, 1957**

and much of the leading edge
science since then has originated
in the USA
- BUT.....

Negative signals from the USA

- ◆ Complex and inflexible overall governance system in waste management program
- ◆ Siting process driven - in its final stages - by political rather than scientific or societal criteria (The DOE sponsored NAS staging report had more impact outside the USA)
- ◆ Overly expansive - and expensive - siting program at YM set a dangerous signal
- ◆ Engineered barriers: new concepts kept “popping up” as a reaction to problems
- ◆ Dropping the Yucca Mountain project without awaiting an NRC judgement on the safety.

The way forward?

- ◆ Make clear that the Yucca Mountain decision is a policy choice and NOT a generic judgement on the feasibility, safety or ethical justifiability of geological repositories
- ◆ Acknowledge that, although safe surface storage of spent fuel can be carried out for many decades, it is NOT a final solution to the disposal of long-lived radioactive wastes.
- ◆ Start up a modern, adaptively staged siting program taking full account of societal issues
- ◆ Support multinational/regional geological disposal and fuel leasing

Extras

The evolution of nuclear facility siting

- ◆ Remote siting
- ◆ Co-location with existing facilities
- ◆ Expert opinion ("Decide, Announce, Defend" - DAD or DADA)
- ◆ Technocratic; traceable, defensible?
- ◆ Pragmatic (multi-attribute analyses)
- ◆ Volunteering (or at least assent)

What makes nuclear waste management special?

◆ The technical challenge

- Performance over geological time
- “Proof” by demonstration not possible
- Multi-disciplinary
- Central role of “-ologists”

◆ The institutional challenge

- The extraordinary time frame
- Siting - LULU
- Linkage to other agendas
- Values and ethics in conflict
- Political implications
- Nuclear stigma and fears

The public worries when they receive mixed messages from the scientific community

