The multinational fuel cycle: a matter of trust

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Multinational fuel cycle: global concept (1)

Fuel supply
- Installations
  - All steps of fuel fabrication
  - Interim storage

Fuel use
- Fresh fuel
  - Installations
  - Electricity production
  - Interim storage

Fuel take-back
- Nuclear material

Fuel use
- Used fuel
  - Interim storage

Waste
- Nuclear material
  - Reprocessing
  - Conditioning
  - Final disposal

Safe
- Secure
- Safeguarded

* Potential transboundary movement
Multinational fuel cycle: global concept (2)

- **Major principles to make the cycle viable:**
  - All partner-States must benefit from a *fair balance of rights and obligations* in all respects.
  - All partner-States must be submitted to the *same rules and standards* in terms of safety, security and safeguards.
  - *National sovereignty* regarding choices of fuel cycle option must be guaranteed.

- **Shareable and/or transferable components of the cycle:**
  - *Nuclear installations* (facility/device, subject to a license, in which radioactive substances are produced, processed, used, handled (transported), stored or disposed of).
  - *Radioactive substances* (materials subject to regulatory control because of their radioactive/fissile content).
  - *Nuclear technologies* (scientific knowledge, from mining to final disposal).
Experience of common undertakings

- **Chooz A and Tihange 1 Nuclear Power Plants** (France-Belgium)
  - Equal electricity share.
  - Used fuels are managed by the nation hosting the power plant.

- **Krško Nuclear Power Plant** (Slovenia-Croatia)
  - Principle of equality in all aspects of the joint project.
  - Have succeeded in overcoming major changes in national policies in the course of the project.

- **Eurochemic reprocessing plant** (13 OECD countries)
  - Multiple owners of used fuel; waste is managed and disposed of by the nation hosting the reprocessing facility (Belgium).
  - The chosen legal structure failed to equitably distribute the burden.

- **Many others...**

  ✓ Learn from existing experiences to build viable scenarios and identify risks for unequity in supported burdens.
The existing regulatory framework

- **International tools**
  - Convention on Nuclear Safety; Convention on Physical Protection of Nuclear Materials;
  - Treaty on the Non-Proliferation of Nuclear Weapons (and Additional Protocol);
  - Vienna Convention on Civil Liability for Nuclear Damage;
  - Code of Practice on the International Transboundary Movement of Radioactive Waste;
  - ...

- **Regional tools**
  - EURATOM Treaty, establishing the European Atomic Energy Community;
  - Paris Convention on Third Party Liability in the Field of Nuclear Energy (and Brussels Supplementary Convention);
  - Commission Recommendation of 4 December 2008 on criteria for the export of radioactive waste and spent fuel to third countries;
  - ...

- **National tools**
Regulatory framework: needed evolution

International tools (implemented in national laws)
Regional tools (often effective upon publication)
National tools (Laws, Decrees, Acts,..)

Multiple regulatory elements, but not all aspects are addressed at international level (safeguards and transports are) Homogeneity is needed

Harmonize the existing framework
Cover all regulatory aspects of a multinational fuel cycle

Unique harmonized framework
The multinational fuel cycle is a new concept (vision of a future world), that must be capable of integrating many countries. It requires instruments allowing to reach a high level of understanding and trust between partners.

Major needs are (not exhaustive):

- Harmonization of the *comprehension and the conception* of a regulatory system (equal safety culture for all parties).
- Mutual recognition agreement for the enforcement of regulations.
- Development of a common legal framework concerning the *physical protection* of nuclear installations.
- Use of a common *nuclear liability* regime.
- ...
Nuclear installations : sharing of service and responsibility

- All services of the cycle can be shared, including final disposal
  - There is no conflict between the fundamental principle of ultimate national responsibility (safe management of spent fuel and radioactive waste) and the sharing of any installation.
  - A multinational installation can be part of a national program.

- The legal responsibility of a nuclear installation rests on the license-holder
  - The allocation of the nuclear liability falls on the operator (license-holder) of a nuclear installation. License could be granted to a supranational entity.
  - The operator bears the non-transferable responsibility to operate the installation in safe, secure and safeguarded conditions, according to defined rules / regulations / standards and under the supervision of a competent, independent regulatory authority.
  - Remark : ownership and operational interests can be separated (i.e. installation property may belong to investors).
Radioactive substances in the cycle

Types of radioactive substances

- **Valuable materials**:
  - Nuclear material upstream from the manufacture of fresh nuclear fuel.
  - Fresh nuclear fuel (un-irradiated material as-loaded in a nuclear reactor for the purpose of generating energy).
  - Used/irradiated/spent nuclear fuel (nuclear fuel removed from a reactor following irradiation, which is no longer usable in its present form).

- **Non-valuable materials**:
  - Radioactive waste: radioactive material for which no further use is foreseen.

Requirements for the management of radioactive substances

- Need for *specifications that comply with the whole cycle* system; failure to meet these specifications leads to materials « on the shelf ».
- Need for *“intended end-use”* for any material generated during the cycle (avoid buildup of unused materials).
Radioactive substances: responsibility aspects

- **Nuances in the property of radioactive substances**
  - **Ownership**: legal responsibility of the material.
  - **Possession**: rights to use and consume the material (type of "economic ownership" right).

- **Legal responsibility for radioactive substances**
  Rests on the material owner, but:
  - possession (use without ownership) of valuable material by a third party in the context of an industrial business (highly regulated in terms of safety, security and safeguard) is an acceptable practice.
  - As regards spent fuels coming from this practice:
    "Where spent fuel is shipped for processing or reprocessing to a Member State or a third country, the ultimate responsibility for the safe and responsible disposal of those materials, including any waste as a by-product, shall remain with the Member State or third country from which the radioactive material was shipped".

=> Who bears the “end” responsibility: the fuel owner or the fuel user?
Nuclear technologies in the multinational fuel cycle

- **Multiple technologies**
  - From the treatment of mined material to the final disposal of radioactive waste.

- **Equal rights to develop them**
  - Technology transfer is a fundament of the NPT:
    
    “all Parties to the Treaty are entitled to participate in the fullest possible exchange of scientific information for, and to contribute alone or in co-operation with other States to, the further development of the applications of atomic energy for peaceful purposes”.

- **But variable interest in acquiring them**
  - Some technologies are challenging to develop at national level: countries with a small number of nuclear reactors would have little incentive to acquire technically challenging technologies, like reprocessing or enrichment (difficulties in developing capabilities that are commercially viable).

⇒ *Service share is an necessary step on the path to multinational fuel cycle.*
Above responsibility : accountability

Accountability is the path to trust

Accountable : Called to account to some authority (or entity) for one’s action (includes political, financial, administrative and legal perspectives).

☐ A « first-level » concept :

Accountability implies continuous scrutiny, monitoring and reporting to allow correcting rules and standards.
A robust accountability mechanism leads to a transparent, highly performing system with limited risks of safety/security/safeguards failure.
Accountability is a “first-level” concept, of which responsibility (liability) is a particular aspect.

☐ A collective concept

Accountability involves all stakeholders (statutory or not) of a (multi)national undertaking, throughout the process.
It is not a matter for transfer.
Multinational fuel cycle: the time element (1)

- **Long term aspects: failure risks**
  - A multinational fuel cycle is a long term (on a human scale) process: time scale is in the order of a century.
  - Even fitted into a unique, robust regulatory framework, it can not be excluded that in the future, part of the process is impaired for a reason currently unidentifiable.
  - In such perspective, States should explore *national solutions* for the management of radioactive substances they will generate, in parallel to contributing to a shared solution. This “dual-track” approach would ensure that a backup solution will be available, should sharing fail.
Multinational fuel cycle: the time element (2)

- **Very long term aspects**
  - Repositories have very long-term time frames (over thousands of years), far beyond what can be reasonably considered in *nuclear liability* provisions.
  - Nuclear liability is beared by the *repository operator* (entity to which the license has been granted) which can be any legal body, under the supervision of a competent, independent regulatory authority.
  - Should the operator of a multinational repository not be a State (or a group of States), a *temporal end-point to its responsibility* should be fixed, allowing a shared transfer of responsibility to the involved State(s).
  - This temporal end point should not overly exceed (few decades seems reasonable; retrievability could be part of the aspect) the *completion of the contractual operational phase* (design capacity is reached).
  - The responsibility transfer to State(s) should take place in a progressive way, with the necessary hold points to guarantee the soundness (in all respects) of the process.
Conclusions (1)

- A multinational fuel cycle must be based on equity, preserve National sovereignty and operate exclusively within a unique, fully addressed regulatory framework (which has still to be built).

- Common undertakings of the past should help identifying the viable paths and scenarios (avoid past errors and failures).

- Accountability is the key for a highly performing system, with limited risks. It is a collective process providing the necessary transparency and the consequent trust into the system.

- Responsibilities have to be identified and assigned at all levels up to the end of the process.

- Because most of the involved States will not develop each of the cycle technologies, service sharing is an unavoidable aspect of the multinational fuel cycle.
Conclusions (2)

- All services of the cycle can be shared, including final disposal, on the same bases as those applied to conventional (though highly regulated in terms of safety, security and safeguard) industrial business.

- The legal responsibility for a nuclear installation definitely rests on its license-holder. A supranational entity can be granted a license for the operation of a nuclear installation.

- In multinational scenarios, fuel users (radioactivity producer) might not be fuel owners (legally responsible entity). In case of further reprocessing of the spent fuel, the responsibility for waste is an issue that must be addressed (particularly from an ethical point of view).

- Failure during the course of the multinational cycle must be considered, particularly in terms of responsibility for waste management (national back-up solution?).

*It is clear from the above considerations that the multinational fuel cycle calls for a dedicated multinational instrument.*
Thank you for your attention