Successful strategy development in Used Fuel Management: an industry perspective

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Global nuclear capacity is expected to increase by ~+50% by 2030.

Optimizing the fuel cycle will become even more crucial to ensure the sustainable growth of nuclear energy.

Main drivers of used fuel management:

- **Risk Reduction**
  - Non-proliferation & security
  - Nuclear safety
  - Environmental impact & footprint
  - Public acceptance

- **Nuclear System Performance**
  - Increase energy independence
  - Optimize cost of nuclear electricity
  - Preserve natural resources
  - Minimize waste generated

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Successful strategy development in Used Fuel Management
Henri Zaccai, Vice President, International Development, AREVA and Chairman of the Sustainable Used Fuel Management Working Group, World Nuclear Association
### Setting up a deep geological disposal repository is a long term project

<table>
<thead>
<tr>
<th>Start of Research</th>
<th>License to build application</th>
<th>Foreseen Start of operations</th>
<th>Corresponding Electricity output TWh</th>
<th>Status/ comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Closed cycle</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1982</td>
<td>2032</td>
<td>&gt;2050</td>
<td>1860</td>
<td>Under discussion</td>
</tr>
<tr>
<td>1991</td>
<td>2017</td>
<td>2025</td>
<td>18 000</td>
<td>Siting in progress, Research to operation cycle &gt; 35 years</td>
</tr>
<tr>
<td>2002</td>
<td>2020</td>
<td>2036</td>
<td>16 400</td>
<td>Under discussion</td>
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<tr>
<td><strong>Open &amp; Closed cycle</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>2026</td>
<td>&gt;2050</td>
<td>1 300</td>
<td>Siting under discussion</td>
</tr>
<tr>
<td><strong>Open cycle</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>1982</td>
<td>2008</td>
<td>2048</td>
<td>Project stopped by the Obama administration in 2010</td>
<td></td>
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<tr>
<td>1995</td>
<td>2012</td>
<td>2021</td>
<td>2 900</td>
<td>Research to operation cycle &gt;50 years</td>
</tr>
<tr>
<td>1980</td>
<td>2010</td>
<td>2025</td>
<td>-</td>
<td>Building authorisation expected in 2015</td>
</tr>
</tbody>
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Deep geological disposal repository remains a scarce resource
How is industry developing a successful strategy?

The industry aims to enhance global used fuel management. Industry strategy is to:

- **Share and promote** sound, safe, sustainable and proliferation-proof used fuel management
- **Gather the views** of the nuclear industry and stakeholders (including newcomers) on the back-end of the fuel cycle and consider how the industry can best respond to these needs
- Explain how used fuel management **could further contribute to the sustainability of nuclear energy**

**Perpetual storage** of Used Fuel and Waste **infringe** one of the nine principles set forth in the Safety Fundamentals approved by the IAEA’s Board of Governors in September 2006.
Industry response: the WNA Working Group on Sustainable Used Fuel Management

A new **Working Group** within the World Nuclear Association:

Providing the nuclear industry with a regular forum to discuss the achievements, best practices and challenges surrounding the sustainable management of used nuclear fuel.

The Working Group is designed to support industrial approaches to

- Create a **sound framework with available industrial solutions** with the view to avoid “Wait & See” strategies which create an unresolved issue in the long term
- Share and promote among members **good practices** on all approaches to the SUFM.
- Encourage national efforts and international collaboration on the R&D of **advanced nuclear reactor and fuel cycle technologies**
Achievements to date

Working Group established April 2013

Comprehensive membership of the Group including Europe, Russia, Asia and North America

As of today, the Working Group has achieved the following:

* **Definition** of a Sustainable Used Fuel management
* Identification of:
  * **Key messages** and best practices
  * **Key success factors**
* **Used Nuclear Fuel report**

* Others:
  - Relationships with **IAEA**
  - First survey launched on **current practises**
  - **Country views** presented (Russia, Japan, US (EPRI), France, Sweden, The Netherlands, Finland, India,...)
A used fuel management is a **Sustainable Option** if it meets the following key criteria:

- **It covers all the steps** of used fuel management from the generation of used fuel up to and including final disposal in accordance with a well-defined practical plan.
- **It proves to be feasible** with a sustainable impact level.
- **It includes a realistic financing plan**.
- **It is able to demonstrate** to a practicable extent that it is **technically and economically viable**.
- **It protects human health and the environment** and has no greater impact on the health of future generations than is allowed today.
- **It answers to a present need but does not impose burdens on future generations**.

Due to the long-term nature of these management plans, a sustainable option could have one or more pre-defined milestones where a decision could be taken on which option to proceed with.
Example of options

Recycling (closed cycle)
- Interim (wet or dry) storage of the used fuel, if any
- Treatment of the used fuel and recycling of reusable materials in outlets
- Storage of the vitrified and compacted waste (flexibility on the storage period)
- Final disposal of the waste

Conditioning or Packaging (open cycle)
- Interim storage (wet or dry) of the used fuel, if any
- Conditioning or packaging of the used fuel
- Aging management to assure sustainability of storage methods
- Final disposal of the conditioned or packaged used fuel
Key messages

Working Group **key messages** will be targeted at various different stakeholders.

Key Messages will include industry views on:

- **Definition** of a Sustainable UFM
  
  See Definition as endorsed by the WG

- The **characteristics** of used fuel
  
  Quantitative data (What are we talking about?)

- **Strategic requirements** on UFM
  
  One possible reference: EU Directive of 07/2011

- **Vision** of used fuel management inside the nuclear fuel cycle

- **Regional repository**

- **The funding**
Key success factors

* Defined roadmap till and including Final Disposal

* Site selection

* Secure funding

* Public acceptance
Established effective relationships with the IAEA through participation:

- In technical meetings
- In technical workshops
- In conferences

The Working Group aims to share industry views with other international bodies to:

- Promote SUFM towards the main players among the nuclear international bodies
- Review any new initiatives in connection with Used Fuel Management
- Maintain or, if needed, develop active participation in the IAEA, OECD/NEA and other International or key Organizations
The WG performed an industry-wide survey in 2013/14 which looked at
• current policy practises
• current discourse
• current regulations
• what industry would like to see in future

The responses will feed into the Used Fuel Management Report and a further survey will be issued to gather further quantitative and qualitative data.
The Action plan
Used Fuel Management Report

* The objective is to have an overview and a shared vision of the **used fuel management perspectives worldwide for the next 20 years** (as per the World Nuclear Fuel Report)

* The perspective will cover
  - Assumptions on the used fuel discharged on a yearly basis
  - Make assumptions on the way the used fuel are managed
  - Assess the sustainability of such management
  - All fuel discharged including LWR, VVER and CANDU

* This will allow WNA be able to contribute to
  - Communication plan
  - The sustainability of the used fuel management
The Report will examine:

- Forecasts for yearly used fuel unloadings across all civilian reactor types
- Storage: wet and dry, and on- and off-site options
- The reprocessing of used fuel
- Other management options, both long and short term solutions. The report will evaluate the sustainability of these options according to our agreed industry definition
- The prospects for final disposal
Thank you for your attention