Experience of Cask Technology for SNF Management

Tatiana Makarchuk
JSC FCNRS

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One of the key tasks of nuclear power development in Russia

SNF and RAW management

- Accumulated problems
- One of the problems of dynamic nuclear power development

**Solution:**

- Federal target program «Nuclear and radiation safety for 2008 and for a period up to 2015»
- Creation of the infrastructure for the safe SNF implementation, including
  - Commissioning of dual-purpose casks for SNF of the different types of the reactors
  - Renewal of Cask Fleet for VVER SFAs Transportation to Centralized Storage Facilities
Dual-purpose metal - concrete casks

UKH-104 (TUK-104)  UKH-109 (TUK-109)  UKH-121  UKH-123 (TUK-123)

TUK-108/1  TUK-120
Structural peculiarities of metal-concrete casks

1-steel shells of the metal-concrete cask (MCC) body; 2-coaming; 3- heavyweight high-strength concrete; 4-inner lid; 5-outer lid; 6-sealing sheet; 7-pack-offs; 8-sockets for storage cask (UKH) lifting and manipulating; 9-spacer grid; 10-canisters for RBMK-1000 reactor SNF; 11-SNF; 12-upper lid of the energy absorption container (EAC); 13-EAC cylindrical sheath; 14-tubular elastoplastic elements; 15-EAC bottom; 16-sockets for TUK lifting and manipulating

1-outer lid; 2- pack-offs; 3-inner lid; 4-coaming; 5-spacer grid; 6-SNF canisters; 7- heavyweight high-strength concrete; 8- sockets for TUK lifting and manipulating; 10-guidance device; 11- steel shells of the metal-concrete cask body; 12-bottom damping assembly
## Technical specifications of dual purpose TUK casks for transport and storage of SNF from various reactor types

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<thead>
<tr>
<th>TUK/UKH</th>
<th>Description</th>
<th>Capacities/Details</th>
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<tr>
<td>TUK-108/1</td>
<td>Storage and transportation of SNF from naval decommissioning submarines on DalRAO, PA Mayak, Zvyozdochka and FAP Zvezda and other</td>
<td>Capacity: 7 canisters  Weight with SNF: 40t. 108 casks are using for SNF storage and transportation</td>
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<tr>
<td>TUK-120</td>
<td>Storage and transportation of SNF from nuclear ice-breaker fleet</td>
<td>Capacity: 7 canisters  Weight with SNF: 40T. 50 casks are using for SNF storage and transportation</td>
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<tr>
<td>TUK-104 (UKH-104)</td>
<td>Storage and transportation of SNF from RBMK-1000 reactors, Leningrad NPP</td>
<td>Capacity: 114 bundles of spent fuel rods  Weight of TUK with SNF: 120T.  Weight of UKH (storage cask) with SNF: 95T. Experimental prototypes have been manufactured by JSC Izhora Plants.</td>
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<td>TUK-109 (UKH-109)</td>
<td>Storage and transportation of SNF from RBMK-1000 reactors, Leningrad and Kursk NPPs</td>
<td>Capacity: 144 bundles of spent fuel rods  Weight of TUK with SNF: 126T.  Weight of UKH with SNF: 101T. Manufacturing works:  1) JSC Energotex  2) JSC Izhora Plants  3) JSC PA Sevmash.  200 casks are using for SNF storage and transportation</td>
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<tr>
<td>TUK-123 (UKH-123)</td>
<td>Transportation and storage of SNF from BN-350 reactor, Aktay, Kazakhstan</td>
<td>Capacity: 8 canisters  TUK weight with SNF: 124.2T.  Weight of UKH (storage cask) with SNF: 98T.  60 casks are using for SNF transportation from NPP and storage in Semipolatinsk, Kazakhstan</td>
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Infrastructure for TUK-108/1 and TUK-120 operation

Ленинградская АЭС (г. Сосновый Бор, Ленинградской области)
Курская АЭС (г. Курчатов, Курской области)
ГХК (г. Железногорск, Красноярский край)
ПО «Маяк» (г. Озерск, Челябинская область)
ФГУП «Атомфлот» (г. Мурманск)
ДВЗ «Звезда» (Приморский край)
«Звездочка» (г. Северодвинск)
Infrastructure for RBMK-1000 SNF cask handling
Cask Storage Facility for SNF of BN-350, Semipalatinsk, Kazakhstan
Program of Renewal of Cask Fleet for Spent Nuclear Fuel

Modernization of existing Fleet Casks

Development of dual-purpose cask

Consideration of storage site

Experience of dry cask storage site

Development and manufacturing of new transport casks for VVER-1000 and VVER-440 SNF

Development and manufacturing of dual-purpose casks for VVER-1000 SNF

Development and building of storage cask site on MCC, Krasnoyarsk

Loading of SFA into dual-purpose cask on NPP, transportation and placing it on storage site on MCC,

TUK-140

TUK-141
TUK-140 and TUK-141 are packages of B(U)F type for transportation of VVER SFA having higher enrichment by U-235 and burn-up
TUK-141 dual-purpose cask for higher burn-up fuel

- **Body** – high-strength cast iron with spheroidal graphite

- **Spacer greed** – stainless and boron steel

- **Solid neutron shielding**

**Specifications**

- SFA capacity, pcs.: 18
- TUK lifetime, years: 60
- SNF storage period, years: 60
- Full weight (with SFA) of TUK including dampers, t: 125
- Weight of empty TUK including dampers, t: 98
- Max height including dampers (without dampers), mm: 7120 (5860)
- Max diameter including dampers (without dampers), mm: 3120 (2770)
Advantages of dry storage using dual-purpose casks

- Reduction of operation costs
- Modular design – possibility to expand the storage facility
- Independence of infrastructure facilities commissioning for reprocessing
- Enhanced storage safety
- Less number of SNF reloading operations (reactor cooling pool - cask)
- Mobility in decision-making on further SNF management strategy
- Technology unification
Objective

Commercial operation of dry cask storage facilities for VVER-1000+ SNF
The technology of dry long-term storage and transport of SNF in metal-concrete casks has become a commercial one.

Both the technology and equipment have been tested in SNF transport and process operations including container-type storage facilities at NPPs and other nuclear facilities and sites.

The dual purpose cask technology ensures reliable and safe SNF containment preventing any release into the environment.

Creating a new of dual-purpose casks for SNF from a new generation of VVER-1200 reactor is a true to life necessity. Commissioning of such dual – purpose TUK is planned by 2020.
THANK YOU FOR YOUR ATTENTION!

JSC Federal Center for Nuclear and Radiation Safety

www.fcnrs.ru
+7 (495) 780 74 83
info@fcnrs.ru