Italian – Russian Cooperation Agreement for Global Partnership

Liquidating the Nuclear Heritage

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Project Management Unit
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Background

• The nuclear arsenal built during the Cold war period and subsequent decades was drastically reduced after the collapse of the Soviet Union.

• Financial difficulties experienced by the Russian Federation during the 90’ slowed down the effort to dismantle de-commissioned nuclear submarines and nuclear installations.

• The international community agreed to share the burden to liquidate the heritage of the Cold war, through the subscription of several international agreements.

• The most significant, from a financial point of view, is the “Global partnership” launched in Kananaskis, Canada, by the G8 countries in 2003.
The Italian-Russian **Cooperation Agreement** for the **Global Partnership** envisages the allocation of **360 Meuro in 10 years** granted by the Italian Government.

The competent Organizations for the implementation of the Agreement are the **Ministry of Economic Development** (MiSE) for Italy and **Rosatom** for the Russian Federation.

A **Steering Committee** (2 Italian members + 2 Russian members) provides directives, approves the projects and controls the overall development of the activities.

An integrated **Project Management Unit** (called **UGP/ГУП**), based in Moscow and formed of 10 engineers (**5 Italian + 5 Russian**), carries out contractual activities, prepares the technical specifications and monitors the implementation of the projects.
Several lines of activities have been approved by the Steering Committee. The most significant ones are:

1. DISMANTLING OF NPSs AND TRANSPORTATION OF REACTOR COMPARTMENTS
2. IMPROVEMENT OF THE PHYSICAL PROTECTION
3. MANAGEMENT OF THE RADIOACTIVE WASTE
4. MANUFACTURING OF CONTAINERS FOR RW AND SNF
5. MANUFACTURING OF A INF-3 CLASS SHIP FOR SNF AND RW TRANSPORTATION

In 6 years of activities, **34 contracts** have been signed for a total value of more than **147 Meuro**. About **150 invoices** have been paid to the amount of **135 Meuro**; **180 internal reports and technical specifications** have been issued.
### Line of activities – Funds (Meuro)

<table>
<thead>
<tr>
<th>Activities</th>
<th>COMMITTED</th>
<th>SPENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – Submarine dismantling and unit transfer (including equipment delivery)</td>
<td>31</td>
<td>30</td>
</tr>
<tr>
<td>2 - Phisical protection improvements (design, equipment delivery, installation)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>3 - Retrieval, conditioning and storage of radwaste (design, equipment, construction)</td>
<td>22</td>
<td>15</td>
</tr>
<tr>
<td>4 – Containers for alpha fuel (design, mock-up, tests, fabrication)</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>5 - Design and construction of a transport ship</td>
<td>76</td>
<td>76</td>
</tr>
<tr>
<td>Other projects and management</td>
<td>15</td>
<td>12</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>147</strong></td>
<td><strong>135</strong></td>
</tr>
</tbody>
</table>
A 76 Meuro contract for the detailed design and construction of a ship for SNF and RW transportation has been signed in July 2008. The ship has been designed and manufactured by FINCANTIERI (Italy). She has been launched on December 16, 2010, delivered to Atomflot in July, 2011, and transferred to Murmansk in August, 2011.

<table>
<thead>
<tr>
<th>DISPLACEMENT</th>
<th>3.000 tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOUBLE HULL</td>
<td>YES</td>
</tr>
<tr>
<td>LENGTH</td>
<td>77 m</td>
</tr>
<tr>
<td>WIDTH</td>
<td>14 m</td>
</tr>
<tr>
<td>HEIGHT</td>
<td>17 m</td>
</tr>
<tr>
<td>SPEED</td>
<td>12 knots</td>
</tr>
<tr>
<td>RANGE</td>
<td>3000 km</td>
</tr>
<tr>
<td>PROPULSION</td>
<td>2 X 1300 KW SEGREGATED DIESEL MOTORS EACH DRIVING ONE SHAFT LINE AND ONE PITCH PROPELLER</td>
</tr>
<tr>
<td>PAYLOAD</td>
<td>640 tons</td>
</tr>
</tbody>
</table>
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INF-3 class ship for SNF and RW transportation

Construction, September 2010
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INF-3 class ship for SNF and RW transportation

Launching, December 16, 2010
The ship will be used to transport casks with irradiated fuel from various locations of Kola peninsula (Andreeva Bay for VVER fuel and Gremikha for alpha/VVER fuel) to the port of Atomflot, near Murmansk, for further transfer to Mayak.

Moreover it is expected that the ship will transport containers with conditioned radioactive waste from different sites of North-West Russia to the site of Sayda Bay for their final storage.
INF-3 class ship for SNF and RW transportation

Arrival in Murmansk on 15th August, 2011
Five NPSs have been dismantled - one Yankee Notch, two Victor, two Echo II.

The Contracts have been signed with Nerpa shipyard in July 2006, March 2007, April 2008, June 2009, December 2010, respectively.

The Spent Nuclear Fuel (SNF) has been sent to Mayak and the Reactor Compartments have been transferred to Sayda Bay (NPS 542 in progress).

All activities have been carried out without significant problems or delays.

<table>
<thead>
<tr>
<th>NPS</th>
<th>DISPLACEMENT (t)</th>
<th>YEAR OF DISMANTLEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>YANKEE NOTCH No. 415</td>
<td>8.800</td>
<td>2006 - 2007</td>
</tr>
<tr>
<td>PROJECT 667AT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VICTOR No. 601</td>
<td>3.650</td>
<td>2007 - 2008</td>
</tr>
<tr>
<td>PROJECT 671</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VICTOR No. 604</td>
<td>3.650</td>
<td>2008 - 2009</td>
</tr>
<tr>
<td>PROJECT 671</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ECHO No. 535</td>
<td>4.700</td>
<td>2009 - 2010</td>
</tr>
<tr>
<td>PROJECT 675</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ECHO No. 542</td>
<td>4.700</td>
<td>2011</td>
</tr>
<tr>
<td>PROJECT 675</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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Dismantling of NPS Yankee Notch No. 415

Preparation to defueling, September 2006

Dismantling, December 2006

3RC in Sayda Bay, July 2007
Dismantling of NPSs Victor No. 601 and 604

NPSs 601 and 604 waiting for dismantling, March 2007

Dry docking of NPS 601, October 2007

Dry docking of NPS 604, August 2008

1RC of NPS 601 in Nerpa shipyard, March 2008
Dismantling of NPSs Echo II No. 535 and 542

535 waiting for dismantling, May 2008

Dry docking of 535, October 2009

1RC of NPS 535 in Sayda Bay, July 2010
Transportation of NPSs Spent Nuclear Fuel

From PM-12 to Imandra

Loading the cask (Lotta)

Loading the special train

The train ready to leave, December 2009
Delivery of the equipment for the improvement of Nerpa and Zvyozdochka Shipyards industrial safety.

Contracts (3.5 Meuro) provide for the supply of special equipment coming from different European countries. In particular:

- welding, cutting, cleaning and painting equipment,
- forklifts, trailer trucks, compressors, special scaffoldings, individual protection means (400 masks)

All the equipment has been delivered and are being used.

Even if significant problems have been encountered during the custom clearance process, nevertheless the project targets have been fully implemented.
40 NPSs out of 118 NPSs - initially in the North-West Region of Russia - have been reduced to one compartment units. They are located at Sayda Bay storage site. The remaining NPSs (78) have been reduced to three compartments units, now floating at Zvyozdochka, Poliarny, Nerpa, and Sayda.

The Pontoon will be used to transport to Sayda Bay the Reactor Compartment units presently located elsewhere and to allow the dry docking of the floating units. The design of the Pontoon is presently underway. Completion of the design activities: summer 2012.
Main Characteristics:

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max length</td>
<td>m</td>
<td>82.0</td>
</tr>
<tr>
<td>Width</td>
<td>m</td>
<td>27.6</td>
</tr>
<tr>
<td>Payload capacity</td>
<td>t</td>
<td>3100</td>
</tr>
</tbody>
</table>
Maximal limits for loads to be transported on board (NPS units or compartments of ATO ships):

- Max length: 43,0 м;
- Max width: 19,0 м;
- Max height: 15,0 м;
- Mass: 2955 t;
- Max draft (for floating units):
The projects are related to physical protection modernization at Nerpa and Zvyozdochka shipyards, aiming at:

- The replacement of obsolete physical protection systems,
- The installation of control systems for personnel and vehicle access;
- The supply of new systems for the physical protection of the water area.

Following the completion of the detailed designs of the physical protection systems, the tendering procedure is underway (Zvyozdochka) for the supply of the equipment. Contracts to be awarded in summer 2012.
IVECO Patrol trucks
The **Strategic Master Plan** provided the guidelines for RW management in North-West Russia:

- Radioactive waste will be transferred to the Regional Center in Sayda Bay for long-term storage.
- LRW and SRW are to be conditioned and placed into containers, according to the requirements for long-term storage and final disposal, using existing or new infrastructures.
- Liquid and solid LLW and ILW will be processed on site.

When applied to **Andreeva Bay**, these criteria determine the need to build two treatment and conditioning facilities, for SRW and LRW, respectively, plus a temporary storage pad for conditioned waste before transferring to Sayda Bay.
The management of radioactive waste at Andreeva Bay site is the most important project underway in terms of complexity and use of resources.
Following additional radiological surveys (2007 – 2009), the design of the **buildings 201 and 202** of the RW management complex in Andreeva Bay has been completed by VNIPIET at the end of 2009. Dimensions (m) are 48 x 66 (60) x 12.

Licensing of the design of the buildings has been released by GlavGosExpertiza in May, 2010.

The construction has been awarded to the Russian company RosSpezMontazh. The contract has been signed in August, 2010.

The construction of the buildings to be completed by July 2012.
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Radioactive Waste Management – Buildings 201 and 202

September, 2011
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March 2012
Overview of the site May 2012
After the completion of a conceptual study (2007 - 2008), and following additional radiological surveys of the areas (2010), the construction of three facilities (solid and liquid treatment ones and the storage pad for conditioned waste) has been decided. The contract for the Design of the facilities (2010-2012) has been assigned to Ansaldo Nucleare / AtomStroyExport. Activities are in progress.
Simplification and Acceleration Strategy (1/2)

Simplification

At the beginning of 2011, ROSATOM has decided to anticipate the definitive closure of Andreeva Bay site to 2025 – 2030 (initially 2050). This decision has significantly affected the project of the LRW and SRW facilities and the storage pad. The simplified project will comply with the new requirements:

- replacement of reinforced concrete structures of the facilities with metal structures and pre-fabricated panels;

- modular approach for process systems;

- replacement the temporary storage facility (initial choice) with an accumulation pad protected by a simple and light structure.
Simplification and Acceleration Strategy (2/2)

Acceleration

At the same time, an acceleration of the project will be put into effects: as soon as the design of the civil structures and the main technical characteristics of the components are finalized, the realization phase will start soon after. It will be probably subdivided into two separate contracts:

- construction of the buildings and purchase of the main components (e.g. super compactor, diesel generators, main tanks, pumps, motors, breakers, etc) and
- purchase of all other components and materials, assembling, training, tests and operation.

Contract for the preliminary construction activities to be signed in June 2012.

Facility operation to start in 2015, two years before the previous schedule.
CONTAINERS FOR TRANSPORTATION OF ALFA FUEL OF LIQUID-METAL COOLANT REACTORS PRESENTLY AT GREMIKHA

The detailed design of these containers has been already completed by the Russian Institute VNIITF and negotiations are under way to assign the fabrication contract (10 containers).

In order to meet the Safety Authorities requirements,
• tests on a full scale mock up of the upper flange (Leak Tightness Test Stand) and
• tests for material and welding qualifications
Are being carried out.
DONE
INF-3 Ship “ROSSITA”
5 NPS Dismantled
Buildings 201 and 202
Equipment Supply
Design of Physical Protection Systems (Equipment), Casks

IN PROGRESS
Design of Andreeva Bay RW Facilities
Design of the Pontoon
Tests on the Cask Mock-up and Material
Supply of Equipment for Physical Protection Systems

FUTURE COMMITMENTS
Construction of the Andreeva Bay Facilities and Storage Pad
Manufacturing of 10 Casks
Construction of the Pontoon