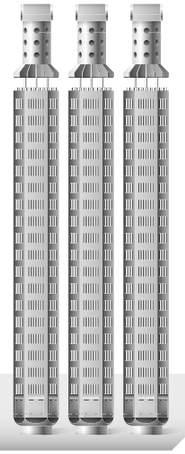
# Chapter 2

# DEVELOPMENT STRATEGY AND EXTERNAL ENVIRONMENT

## Place of TVEL FC in the World Market of FE NFC

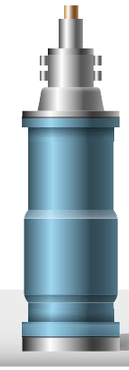
GRI G3.1: 2.7 2.5

TVEL FC is the world leader in nuclear fuel production and uranium enrichment services.



Fabrication market share

17%*



Enrichment market share (together with JSC Techsnabexport)

48%**

### Key Competitors and their Market Share, %

**Fabrication**

| competitor | Value in the year of report |
|---|---|
| AREVA | 30% |
| Westinghouse Electric Company | 31% |
| GNF | 17% |
| Other | 5% |

**Enrichment**

| competitor | Value in the year of report |
|---|---|
| URENCO | 30% |
| AREVA | 10% |
| China | 5% |
| Other | 7% |

* 17% on the market of fabrication in 2012; 16% in 2011.

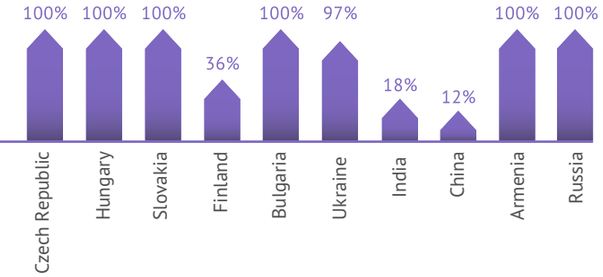
** 45% on the market of enrichment in 2012 and 2011 (together with JSC Techsnabexport).





Number of reactors provided with Russian fuel, ea: 76

Nuclear power plants running on fuel made in Russia, %




NPP units in operation, worldwide/Russian Federation, as of December 31, 2013: 437/33

Countries where NPPs are under construction as of December 31, 2013: 15

Export orders by products and services of FE NFC over a period of 10 years: 10,9 USD bln.

NPP units under construction, worldwide/Russian Federation, as of December 31, 2013*: 72/10

TVEL FC — proceeds from exports in 2013: 1,5 USD bln.

* According to IAEA, including floating nuclear power plants (FNPP).

# FE NFC Global Market Seen by TVEL FC

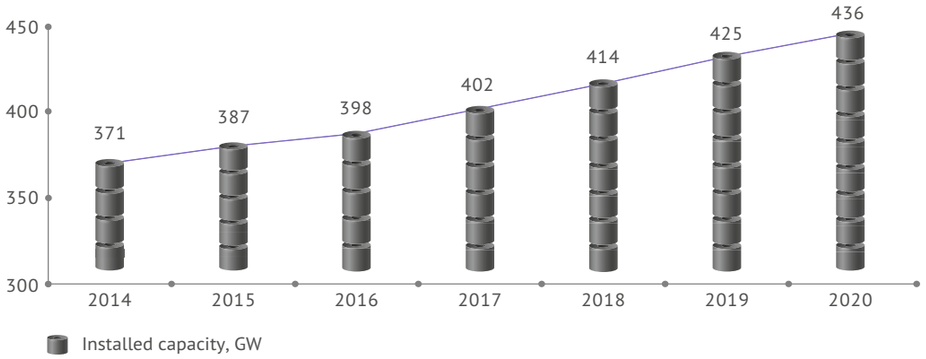
GRI G3.1: 1.2

Conditions and tendencies in development of the global fleet of nuclear reactors represent basic factors that affect the international market of products and services with respect to the front end nuclear fuel cycle. Despite the Fukushima meltdown in 2011 that had quite an impact on the plans of a number of countries with respect to commissioning of new nuclear power-generating facilities, nuclear industry is still an integral part of the global power sector.

The international market of nuclear power generation is expected to grow due to China, India, Southeast Asia (Vietnam), Middle East (Saudi Arabia, UAE) and Africa (SAR). The European market will remain stable by replacing the outdated facilities with the new ones. The U.S. market is now being flooded by shale gas at affordable prices, causing the active expansion of the share of gas burning power plants. According to optimistic scenario, the nuclear power sector of the U.S. will retain its share, or will start shrinking under the opposite scenario.

According to the forecasts, the installed capacity of nuclear power sector worldwide will approach 400 GW by 2015.

**Nuclear Power Market Outlook — Ux Consulting version (installed capacity, GW)**
*© Ux Consulting Uranium Market Outlook Q4 2013*




> "The decrease in the use of nuclear power or replacement thereof by the alternative sources in many countries will continue no longer than five to ten years".
>
> Y.A. Olenin, President of TVEL FC

**Uranium Conversion and Enrichment Markets**
Main events on the international uranium conversion and enrichment markets in 2013:

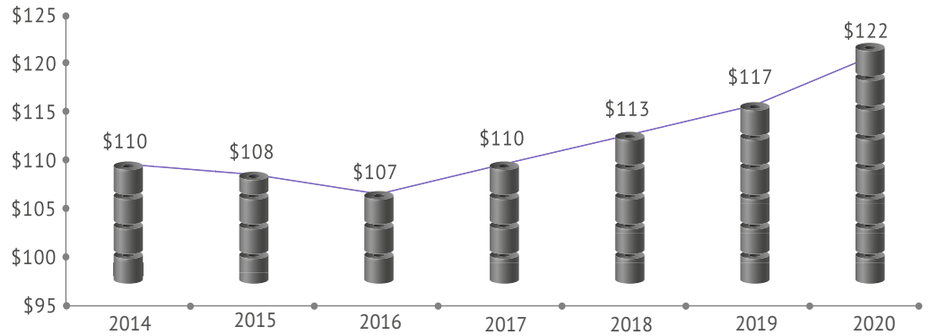
- **ConverDyn (Metropolis, IL) plant resumes operation.**
  Based in the state of Illinois (U.S.), this is the only conversion plant in the United States that makes uranium hexafluoride for further enrichment and use as a fuel in nuclear reactors. The plant was shut down in May 2012 for upgrade of its safety systems in response to the Fukushima meltdown. The plant restarted in the summer of 2013, enabling it to supply up to 15,000 tons of uranium hexafluoride a year. This may boost the competitive edge of the U.S. market of conversion;





- **USEC shuts down its gaseous diffusion plant in Paducah (KY), problems with funding of the American Centrifuge project and the threat of bankruptcy for the company.**
  Shutdown of gaseous diffusion plant (which was economically less efficient in comparison to the gas centrifuge technology that dominates the market) caused the average price on enrichment services drop around the world. According to TradeTech, spot price on enrichment dropped from USD 110 to USD 99 per SWU from late May to December 2013;
- **CNNC (China) successfully makes the first batch of enriched uranium using its own gas centrifuge technology in Lanzhou.**
  Ability to satisfy the growing demand for uranium enrichment nationwide may be the first step of the Chinese manufacturers to active advance on the global market of enrichment;
- **AREVA (France) and URENCO (U.S.) increase the output at Georges Besse II and URENCO USA enrichment plats accordingly.**
  In 2013, AREVA and URENCO continued the expansion of their uranium enrichment facilities using the gas centrifuge technology of ETC company. Commissioning of new facilities will boost competition on the global market of uranium enrichment;
- **Completion of HEU-LEU program.**

**UxConsulting Composite Forecast of SWU Price**
*© Ux Consulting Uranium Market Outlook Q4 2013*




> The price of SWU commenced its decline in 2012 and continued in 2013. By the end of the period of report, it dropped to USD 114 per SWU under the long-term contracts. Based on the adjusted forecasts, the analysts expect the decline to stop by the end of 2015 at USD 108 per SWU and the price will start growing slowly again.

**NF Fabrication Market**
In 2013, the global market of NF saw major events, such as:

- **AREVA (France) resumed deliveries of MOX-fuel to Japan after a pause caused by the Fukushima meltdown.**
  The resumed deliveries of nuclear fuel to Japan indicate that Japanese NPP operators intend to resume generation of electric power. This delivery signals to the global market of FE NFC about revival prospects of Japanese market;
- **CNNC and CGNPC went back on building nuclear fuel plant in Guangdong province (China).**
  The original intention was for the plant to consolidate three FE NFC stages (conversion, enrichment and fabrication) on the same site. By tabling the construction plans, CNNC retain its monopoly on the domestic market of China.

# International Economic Activities of TVEL FC

TVEL FC interacts with its international partners in the sphere of business, science and engineering in accordance with applicable international contractual framework.

To promote its interests in international cooperation, in 2013 TVEL JSC, acting in conjunction with ROSATOM State Corporation, delegated officers of its sector-specific divisions to participate in drafting of a number intergovernmental and interdepartmental agreements, inclusive of Republic of Korea, Japan, France, Hungary and Finland. In 2013, the Company also coordinated intergovernmental (Russia-Hungary and Russia-Finland) agreements on cooperation in the sphere of peaceful use of nuclear power (intergovernmental agreement were signed in early 2014).

Intergovernmental agreement with Finland outlines framework for participation of the Russian Federation in the Finnish nuclear sector development program and makes provisions for a number of separate agreements for implementation of individual joint projects, such as drafting the Hanhikivi NPP project.

Russia-Hungary intergovernmental agreement makes provisions for new power units at Paksi NPP and delivery of Russian fuel to them.

TVEL FC thoroughly performs all international obligations of the Russian Federation and requirements of the national export control regulations.

The Fuel Company boasts a number of properties indicative of its long-term sustainability in conditions of increasing competition on international market of FE NFC products and services.

TVEL FC has enterprises engaged in separation-sublimation and fabrication cycle enabling the Company to offer FE NFC products and services in the form of package deliveries. Ultimately, it contributes to flexible contract pricing and optimized transport logistics. With a number of enterprises in each FE NFC cycle, the Company is able to make highly reliable deliveries.

The Fuel Company is sufficiently competent to supply fuel for reactors designed in Russia, light-water reactors designed in the West (PWR and BWR), and components for PHWR abroad. The Company is successfully manufacturing nuclear fuel from reprocessed uranium in compliance with requirements of European regulators to manufacture technology and to the products.

**Key events for TVEL FC in 2013 with respect to its international business:**

- renewal of contract for the delivery of fuel to Dukovany NPP (Czech Republic) in 2014–2028;
- contract for delivery of fuel and components for Unit 3 and Unit 4 of Tianwan NPP (China);
- fuel delivery contract for the commissioning and further operation of Hanhikivi NPP (Finland);
- successful qualification of TVEL JSC (JSC CMP) by CANDU Energy Inc. (Canada) with the assistance of Atomic Energy of Canada Ltd. as the supplier of zirconium pressure tubes for CANDU reactors.

In addition, the Company continued implementation of the following international projects in the sphere of FE NFC, seeking to retain and to expand its presence on the markets and to promote the development of the Company on the emerging markets*.

* For more details regarding the international cooperation projects see 2012 TVEL JSC Annual Report, Section 10 — "Place of TVEL FC in the World Market of FE NFC".





**Table 7. Performance in 2013 — International Cooperation in the Sphere of FE NFC**

| Project | Performance in 2013 |
|---|---|
| Cooperation with AREVA | September 2013 — ceremonial delivery of the 3,000th fuel assembly to the Customer for PWR and BWR.<br>During the operation of FA made by MSZ JSC under the contract with AREVA NP, no loss of containment has ever been registered |
| TVS-KVADRAT | Autumn 2013 — TVS-KVADRAT assemblies manufactured for loading in PWR scheduled for 2014 |
| JV ALVEL a.s. — Center for Technology Services | A number of contracts entered into with the leading European operators of Western reactors, increasing the corporate portfolio which is a milestone for the Company's success in the future |
| Uranium Enrichment Center (Project TSOU) | End of September 2013 — the Joint-Venture Uranium Enrichment Center (Russia-Kazakhstan) completed the purchase of 25% + 1 share in the enrichment enterprise of JSC UEIP (Russia). The Joint-Venture will have access to 5 mln SWUs a year. Effective period of the project — 30 years.<br>In November 2013 — first shipment of TSOU CJSC product under the Project TSOU |
| Project "ITER" | 2013 — the Company continued to improve the production technologies with respect to Nb-Ti and Nb-Sn strands for international Project ITER. 20,000 tons of strands supplied in 2013 |
| Project "Fabrication Plant in Ukraine" | 2013 was the year of dynamic development of project for the establishment of nuclear fuel production facilities in Ukraine under Russian technologies. Project design was completed by the end of the year; state expert review yielded positive conclusion; preparatory operations on site commenced<br><br>In 2013, the Fuel Company continued manufacture of substandard equipment for Stage 1 of Fabrication Plant in Ukraine that is scheduled for delivery in September 2014.<br>The equipment is 90% ready<br><br>November 2013 — TVEL JSC performs its financial obligations — in a timely and proper manner – USD 42 mln transferred to the JV for the additional issue of the shares. No money due from the Ukrainian shareholder in JV — State Concern Nuclear Fuel — was received as of December 31, 2013 |