Reporting at the round table "Eco-efficient technologies of the nuclear industry: today and tomorrow" in the international forum ATOMEXPO'2016

ROSATOM

STATE ATOMIC ENERGY CORPORATION ROSATOM

FUEL COMPANY OF ROSATOM TVEL

20 YEARS

Promising solutions to reduce the negative environmental impact at the TVEL Fuel Company enterprises

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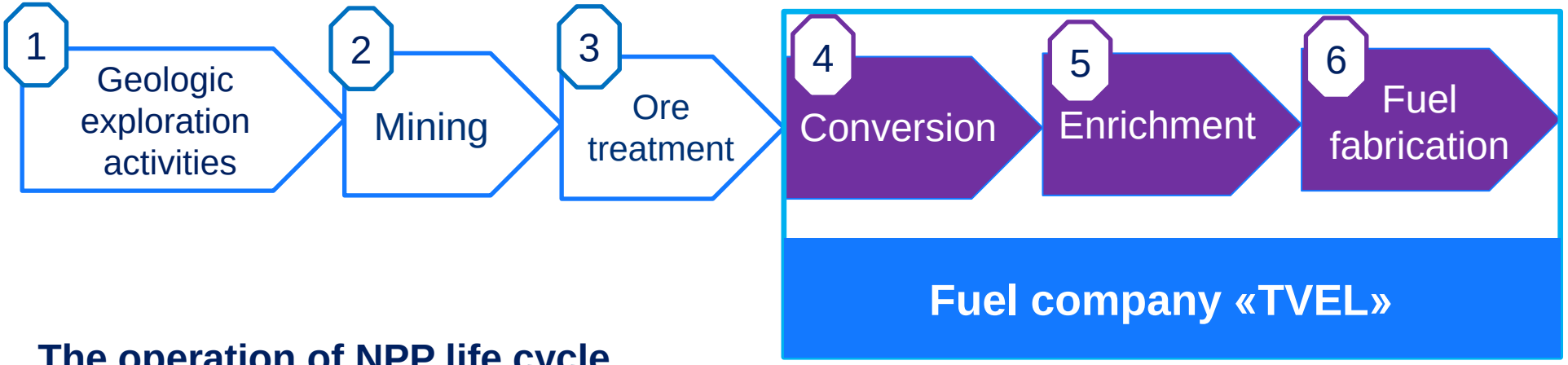
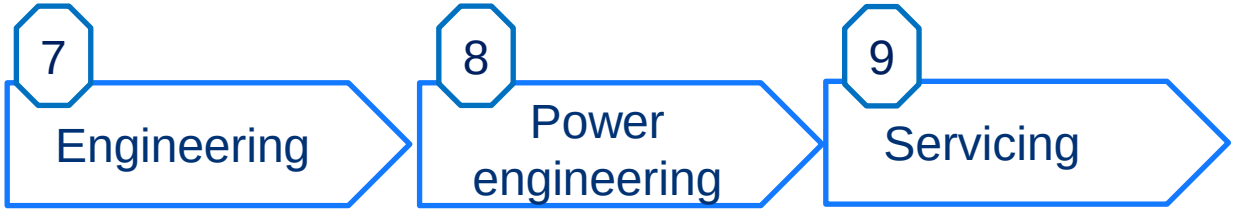
Cities and regions of presence of the TVEL Fuel Company

TVEL Fuel Company in the structure of the nuclear fuel cycle

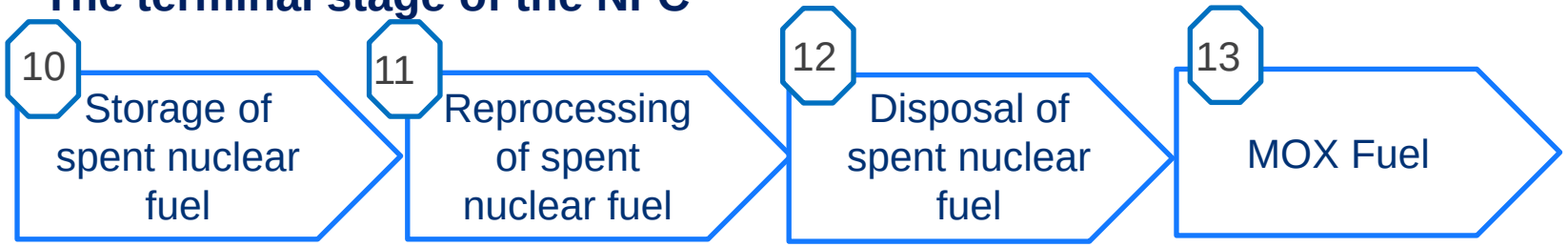
Initial stage of the nuclear fuel cycle (NFC)



The operation of NPP life cycle



The terminal stage of the NFC



Holding a corporate competition in the Fuel Company

The JSC TVEL order no. 93 dated 31.05.2010 enacted the Regulations of the competition on the "best solution/development".

In 2013, within the framework of the Year of environmental protection at JSC TVEL, an additional nomination was introduced in the corporate competition on the "best solution/development“, titled "The best solution to ensure the environmental safety."

The nomination "The best solution to ensure the environmental safety" has become a tradition and now it is included in the nominations of the Corporate competition every year.

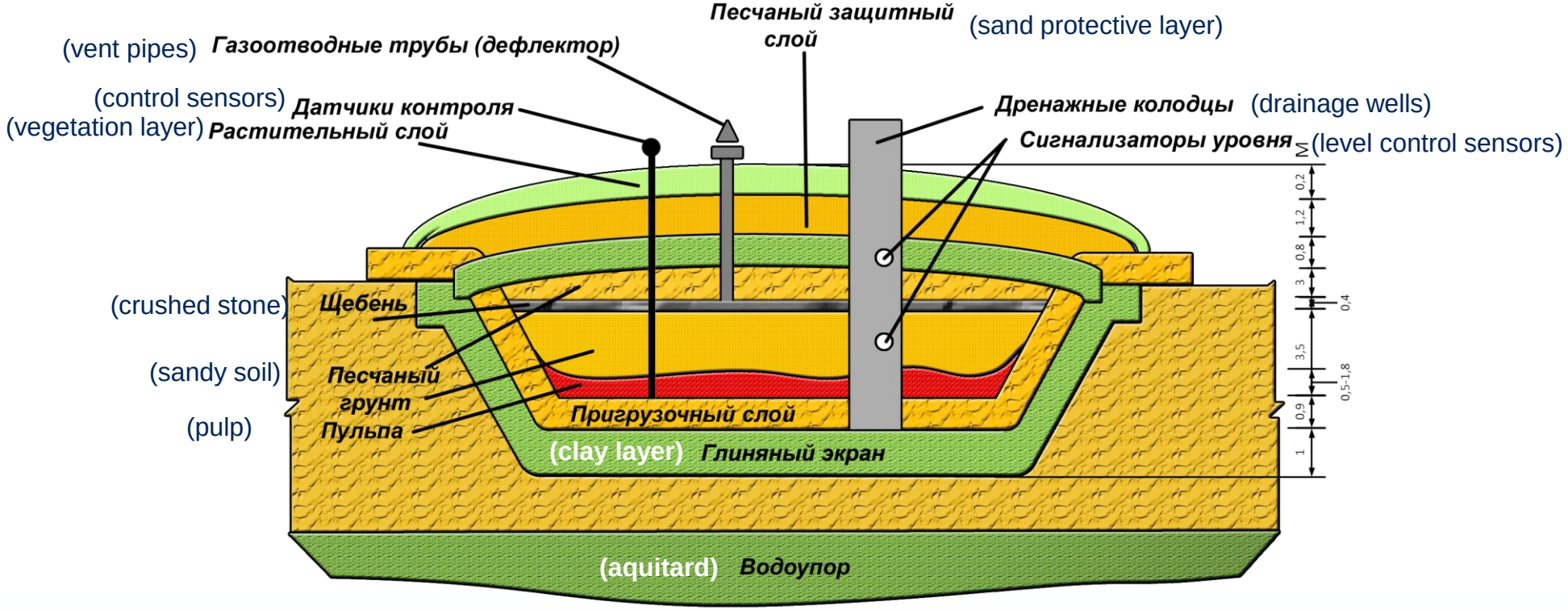
The corporate prizes of the 1, 2 and 3 levels, as well as the honorable mentions, incentive prizes and credits of the President of JSC TVEL are awarded according to the results of the competition.

In 2013, 7 applicants participated in the nomination, in 2014 their number was 6, in 2015 there were 9 of them.

Solutions on the reduction of negative environmental impact at the TVEL Fuel Company enterprises awarded with prizes in the Corporate Competition

The First Prize (2013). JSC Siberian Chemical Plant, «Preservation of the B-2 pool»:
The developed technology of pulp conservation and preservation of contaminated protective layer of soil made it possible to perform the preservation of the open storages of liquid radioactive waste at their locations.

As a result of the preservation works, the reduction of gamma-ray background radiation from 360 mSv/h to 0.0004 mSv/h was achieved. The access of wild animals to the storage was blocked, complete prevention of airborne activity advection due to the natural phenomena was ensured.



Solutions on the reduction of negative environmental impact at the TVEL Fuel Company enterprises awarded with prizes in the Corporate Competition

The Second Prize (2013). JSC Ural Electrochemical Integrated Plant (UEIP), "Reducing the volumes of radioactive waste at the UEIP":

1. Based on the scientific research and development works, a technical solution was elaborated on the adjustment of the process-operational diagram of the waste water purification, contaminated with radionuclides at the Pulp Filtration Plant (PFP). According to the solution, the PFP wastewater is now circulated into special tanks for the aging and decay of short-lived radionuclides, therefore significantly reducing their activity, the content of radionuclides and pollutants. The process of reduction is explained by additional cleaning processes at work for a long time, such as radioactive decay, coagulation, sedimentation, microbiological processes, etc.

Applying the developed technology of treatment of the uranium-bearing solutions and drain water, the Ural Electrochemical Integrated Plant has terminated the generation of liquid radioactive waste and discharge of radionuclides into the surface-water bodies

2. A zone of solid-waste recycling is incorporated at the plant. It comprises two nuclear material processing units: a solid waste press (baler), and a waste incineration plant equipped with a multi-stage gas cleaning system.

   Reduction of solid uranium-bearing waste is done baling it into the seamed steel drums with the capacity of 200 liters or into the TPS- 44/6. This technology allowed for a 2-3-fold reduction of the volume of solid waste produced, depending on its composition, while not changing the waste grade.

   As for the waste incineration plant, the ratio of waste received for recycling to the amount of waste (ash) after the processing ranges from 40 to 50 times (by weight), and from 180 to 200 times by volume.

Solutions on the reduction of negative environmental impact at the TVEL Fuel Company enterprises awarded with prizes in the Corporate Competition

Burning stove of solid radioactive waste

Equipment for pressing of solid radioactive waste

The result of works on the reduction of radioactive waste after the commissioning of the zone of solid-waste recycling was an 85% decrease of the annual generation of solid radioactive waste by JSC Ural Electrochemical Integrated Plant (UEIP) to 0.66 thousand tons a year, and a reduction of radioactive releases by more than 50 times.

Solutions on the reduction of negative environmental impact at the TVEL Fuel Company enterprises awarded with prizes in the Corporate Competition

The Third Prize (2013). JSC Siberian Chemical Plant, "The method of HRW reprocessing and separation of americium-241 from the radioactive waste":

Solving the problems of **highly radioactive waste** (HRW) a method of extraction of americium-241 from HRW was implemented, which allowed to convert the HRW into the intermediate and low-level waste, as well as to master a new kind of product – the dioxide of the americium-241 isotope, which, after its further reprocessing is exported, and, owing to its nuclear and physical properties, is used in the nuclear industry as a source of ɣ-radiation, and, if mixed with beryllium and bromine, as a source of fast neutrons. Moreover, americium-241 can be used as a material for the separation of other isotopes

The implementation of the method of highly radioactive waste reprocessing at the Siberian Chemical Plant has by 6,23 times reduced the amount of generated technologically solid HRW.

The work is protected by the RF patents for invention No. 2335554 and 2477758.

The First Prize (2014). JSC Siberian Chemical Plant (SCC), "Removal of nuclear materials from the SCC radiochemical plant process flow diagram":

The research was conducted by the plant's specialists looking for suitable technologies for processing the radioactive slurries (pulps), the operational research aimed at increasing the efficiency of cleaning the pulps, and shortening the technological operations. After implementing the solutions found, the equipment of the **SCC** radiochemical plant, processing the irradiated uranium lumps, containing highly active fission products has been freed from the nuclear materials in the form of solutions, slurries, and lumpy sludge.

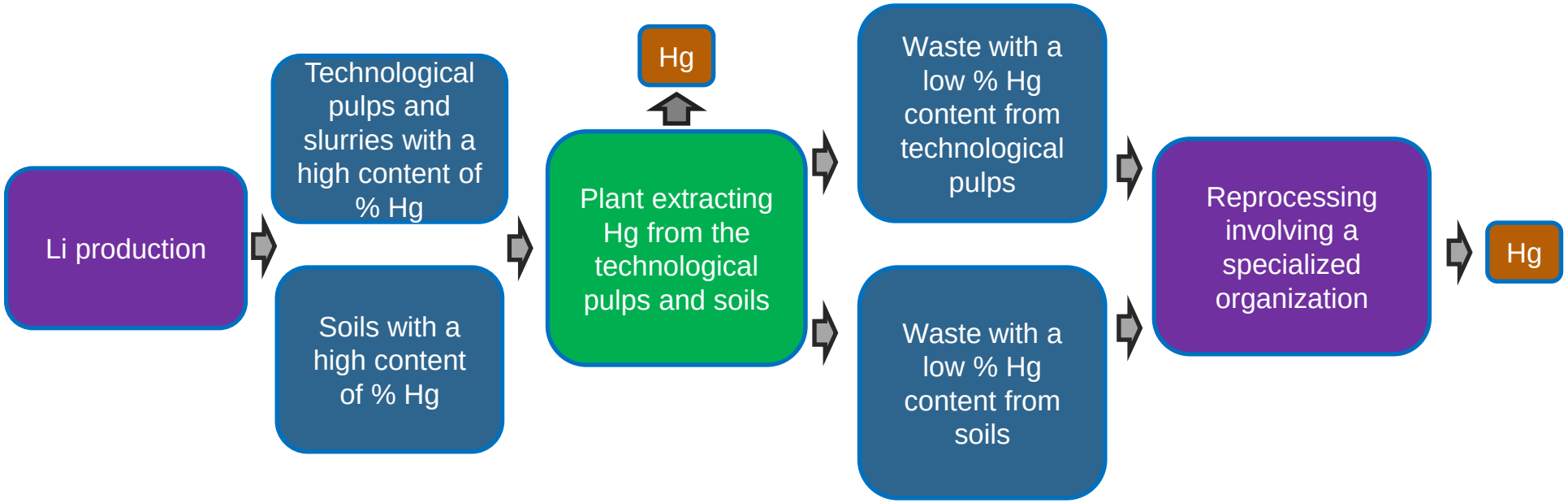
The technology of cleaning the "acid" pulps and the technology of dissolution of mixed plutonium and uranium oxides are protected by the RF patents № 2472711 and № 2451639.

Solutions on the reduction of negative environmental impact at the TVEL Fuel Company enterprises awarded with prizes in the Corporate Competition

The Second Prize (2014). PJSC Novosibirsk Chemical Concentrates Plant (NCCP) "Complex processing of mercury waste with subsequent involvement of the extracted mercury in the fabrication of lithium products":

To address the problem of the 1st class of hazard mercury waste generated at the enterprise since 1958 in the fabrication of lithium products, a plant for complex reprocessing of mercury-containing waste, extracting metallic mercury was developed and successfully implemented in the experimental pilot production .

The results of research and development are focused on the annual decrease of accumulated toxic waste (90 tons per year over 7 years) with the extraction of a valuable component – mercury, and its return to the technological cycle of the enterprise.



The Third Prize (2014). PJSC Machine Engineering Plant (MSZ), "Development and creation of local systems of air purification from the radioactive dust":

A new automated system for the technological gas treatment of air from the radioactive dust using the filters, based on the modern membrane filtration materials (a substitute of Petryanov's filter fabric), designed by a third party has been created.

The system implementation resulted in:

- **The reduction from three to two stages of gas treatment of air from radioactive dust;**
- **an increase of the filter cartridge lifetime and, consequently, reduced incineration of the worn-out cartridges at the 'litter farms', and reduction of emissions into the air;**
- **The automation of the gas air treatment process at the stage of maintenance of filter working conditions (pressure drops or air flow rate) and their regeneration, with an inbuilt alarm alerting of the deviation from the normal course of the gas air treatment process or the need to clean the dust collector;**
- **reduction of losses of the expensive "product" and its return to the production cycle after removing it from the filter dust collector, bypassing the filter combustion stage and chemical processing of the ash.**

Solutions on the reduction of negative environmental impact at the TVEL Fuel Company enterprises awarded with prizes in the Corporate Competition

The First Prize (2015). JSC Chepetsk Mechanical Plant, "Reduction of nitrogen oxide emissions in the process of leaching the uranium raw materials":

The research and development work was done with the aim of improving the modes of conducting the technological processes to be able to reduce the amount of nitrogen oxides emitted while leaching the uranium ore.

The following results were achieved:

- a reduction of nitrogen oxide emissions into the atmosphere from the cascade used for leaching the feedstock by up to 30 times;

-the need for the purchase of expensive equipment for cleaning the exhaust nitrogen oxide gases was eliminated

- a 20% decrease of the volume of processed carbonate mother solution and 30% decrease of the recycled raffinate volume.

- a reduction of volume of waste pulps of uranium production and non-recoverable uranium losses.

The Second Prize (2015). JSC Siberian Chemical Plant, "Eliminating the liquid waste discharges into the surface storage":

The technology of preparation and disposal of liquid radioactive waste in an underground reservoir bed at the radio-chemical plant of JSC SCC,

A series of research works were conducted to determine the composition of liquid radioactive waste and its impact on the underground storage conditions, and to develop the techniques of its preparation for the underground disposal.

As a result, the liquid waste discharges into the surface storage were terminated, with the possibility of its preservation, and a transfer of a potentially dangerous for the environment facility to a safe status.

Solutions on the reduction of negative environmental impact at the TVEL Fuel Company enterprises awarded with prizes in the Corporate Competition

The Third Prize (2015). JSC Siberian Chemical Plant, "Disposal of liquid organic radioactive waste of the JSC SCC chemical metallurgical plant":

A pilot plant for recycling the liquid organic radioactive waste (LORW) was developed at the chemical-metallurgical plant. It uses incineration, designed to reduce the amount of liquid radioactive combustible waste.

The results are aimed at reducing the volume of the LORW, improvement of the environment and fire safety on-site of the interim storage facility.

A prize for meritable work (2015). LLC Ural Plant of Gas Centrifuges, "The use of BM-615 units for the purification and re-use of cleaning solutions":

In order to save water and reduce wastewater discharges, the technology of cleaning solution purification was refined at the plant, selecting the optimum solution in terms of the environmental and economic effects.

As a result of the activity, BM-615 units were placed into service at the plant, purifying the cleaning solutions from the suspended and colloidal impurities using the membrane treatment technology, free and emulsified oil products, allowing to reuse the purified solutions and to avoid their transfer to specialized companies for the disposal.

Thank you for listening!