



ROSATOM

ENTERPRISE OF ROSATOM STATE CORPORATION

Mo-99 production.

Update on Russian project status

Alexey Vakulenko

First Deputy CEO, JSC Isotope

Russian Federation

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JSC ISOTOPE - authorized distributor of isotope products produced by ROSATOM state corporation



SSC RIAR (Dimitrovgrad)

Reactors: RBT-6 and RBT-10a (pool type)

Reactor, processing

Max. production capacity:

Mo-99 – 1000 six-day Ci per week

Karpov IPC (Obninsk)

Reactor: VVR-c

Reactor, processing

Max. production capacity:

- Mo-99 – 350 six-day Ci per week,
- Mo-99/Tc-99m (for domestic market).

V.G. Khlopin Radium Institute

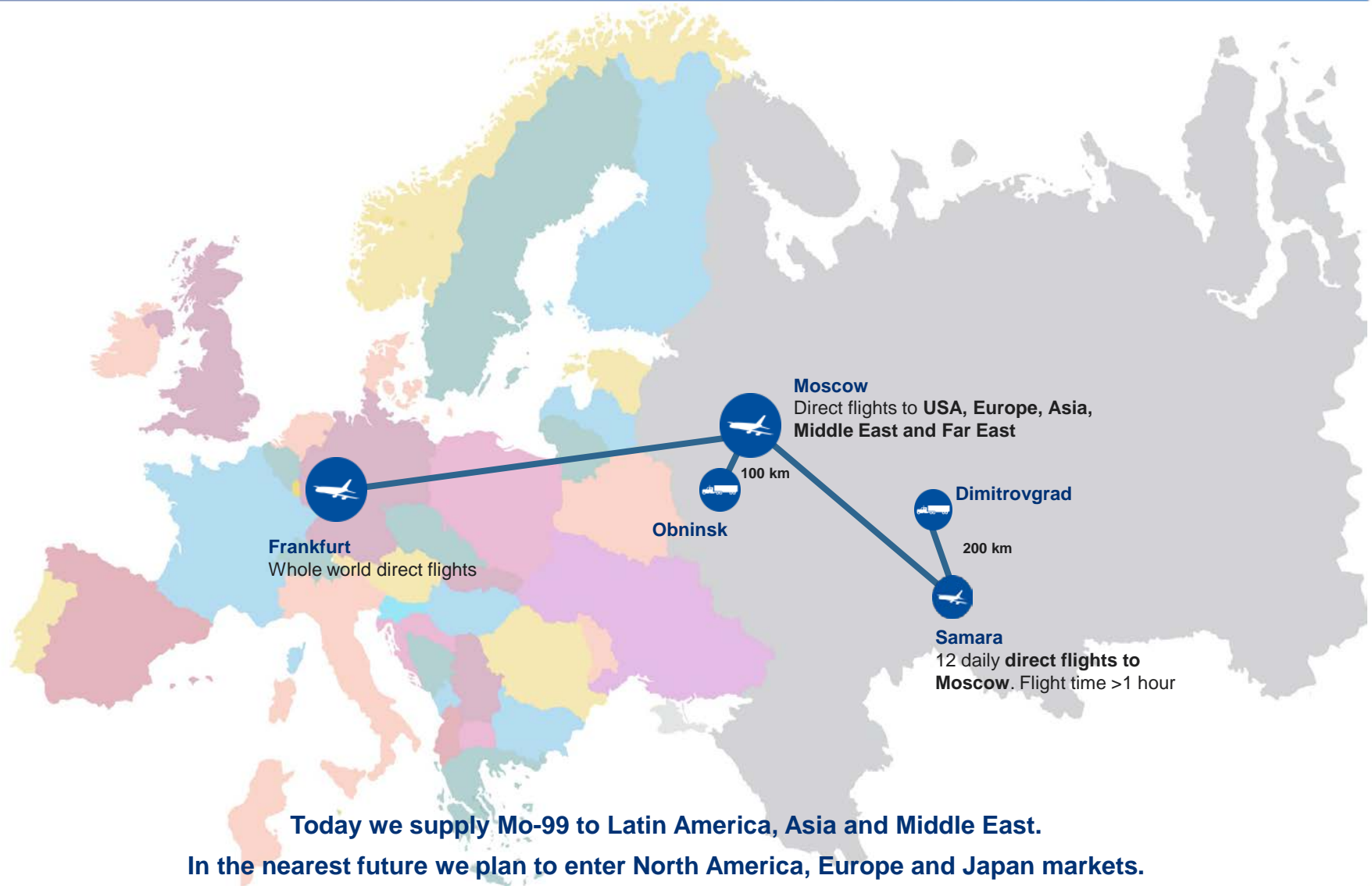
(St.Petersburg, North-West region)

Irradiators: LNPP (RBMK), PNPI (VVR-M)

Local producer; not involved in export activity

- Coordinated production and supplies
- Secured backup supply by 2 independent producers

Logistics diagram



Current status of Mo-99 production

«RIAR»

- In 2015 second stage of Mo-99 production that has been launched in 2013 was put into operation.
- By the end of 2016 it is planned to start 3rd processing per week. It will allow RIAR to reach full capacity of Mo-99 production.

GMP-certification

- The project GMP-certification of Mo-99 production has been initiated.
- In June 2016 international experts have held pre-audit of RIAR and Karpov IPC in order to determine GMP-certification potential.
- Both enterprises have received recommendations, according to which they will have to remove the existing deviation from the GMP standards.
- Mo-99 production in accordance to GMP-standards is planned to start in the 2nd quarter of 2017.

HEU-LEU conversion

- Both producers continue their preparation to HEU-LEU conversion.
- It is expected to start production of Mo-99 (LEU) in 2017-2018.



RIAR Mo-99 production capacities

Mo-99 supply development (2013-2017)

As a result of intensive Mo-99 supply growth in 2015, we have faced a number of difficulties:

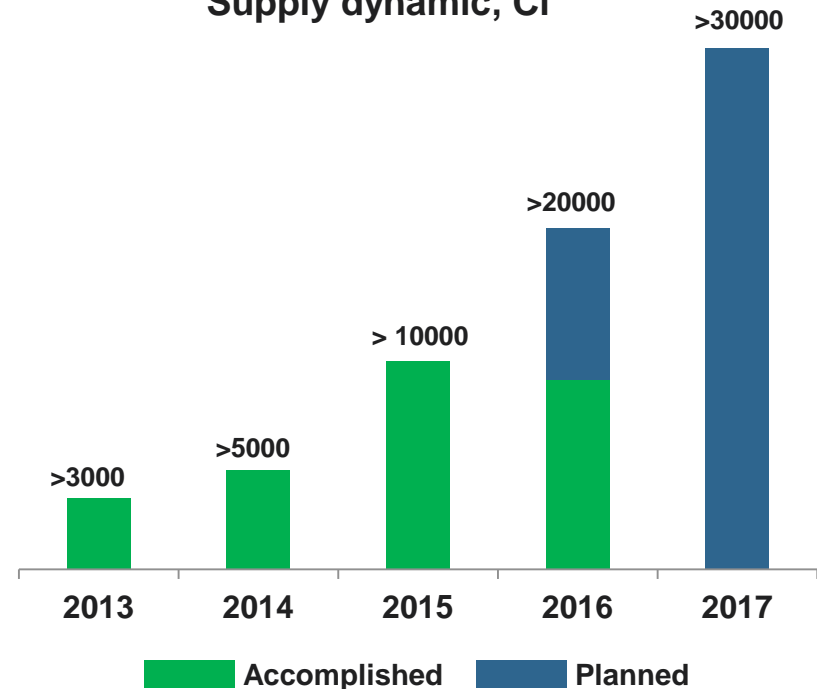
Due to the supply of products in a large volumes over long distances the radiolysis problem occurred. It was caused by the formation of gaseous products in the primary capsule, leading to problems while opening the vials by the customer.

- Problem was solved by changing the primary structure of the ampoule (volume has been increased 1.6x), and at the same time limiting maximum activity and solution volume in the ampoule. In addition, stabilizer (NaOCl) has been added to the product.

Increase in processing volumes has also led to failures of pieces of equipment.

- As a result, we had to significantly modify the initial installed production line and make changes to existing technology.

Supply dynamic, Ci



Since 2013, the volume of shipments increased by 100% YoY.

Current status of new projects

Mo-99 (LEU) production on the RBMK-type reactors

- Smolensk NPP has been selected as the site of the project due to its young age (Decommissioning in 2034).
- Work on the suitable type of target and the finalization of the project parameters is in progress.
- NPP territory or Karpov IPC are considered as potential site locations for the organization of radiochemical complex.



Smolensk Nuclear Power Plant

Current status of new projects

Mo-99 (LEU) production on the solution reactors

- A decision has been made to construct a pilot project based on solution reactor and radiochemical complex.
- In 2015, the construction in Sarov (500 km from Moscow) has been initiated.
- Construction completion and production start is scheduled for 2018.
- The production capacity of one solution reactor is about 250 Ci per week.



Dimensions:	1500 x 1500 x 2700 (cm)
Capacity:	50 kW
Personnel:	4 people
Mode of operation:	(24/7)
Service life:	10 years
Fuel:	LEU
Replacement of fuel:	Once every 10 years

Thank you for attention!