



**ROSATOM**

# **Use case of AI application in Rosatom: NPP Turbogenerator Anomaly Detection**

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# Rosatom at a glance



**138.3** Bn USD  
10-YEAR PORTFOLIO OF OVERSEAS ORDERS

**16.7** Bn USD  
REVENUE\*

RUSSIAN DESIGNED NPPs AVOIDED  
**213** M tonnes of CO<sub>2</sub>eq

**35** UNITS  
OVERSEAS NPP PORTFOLIO

R&D INVESTMENT  
**4.5%** of revenue

**0** INES  
LEVEL-2 INCIDENTS

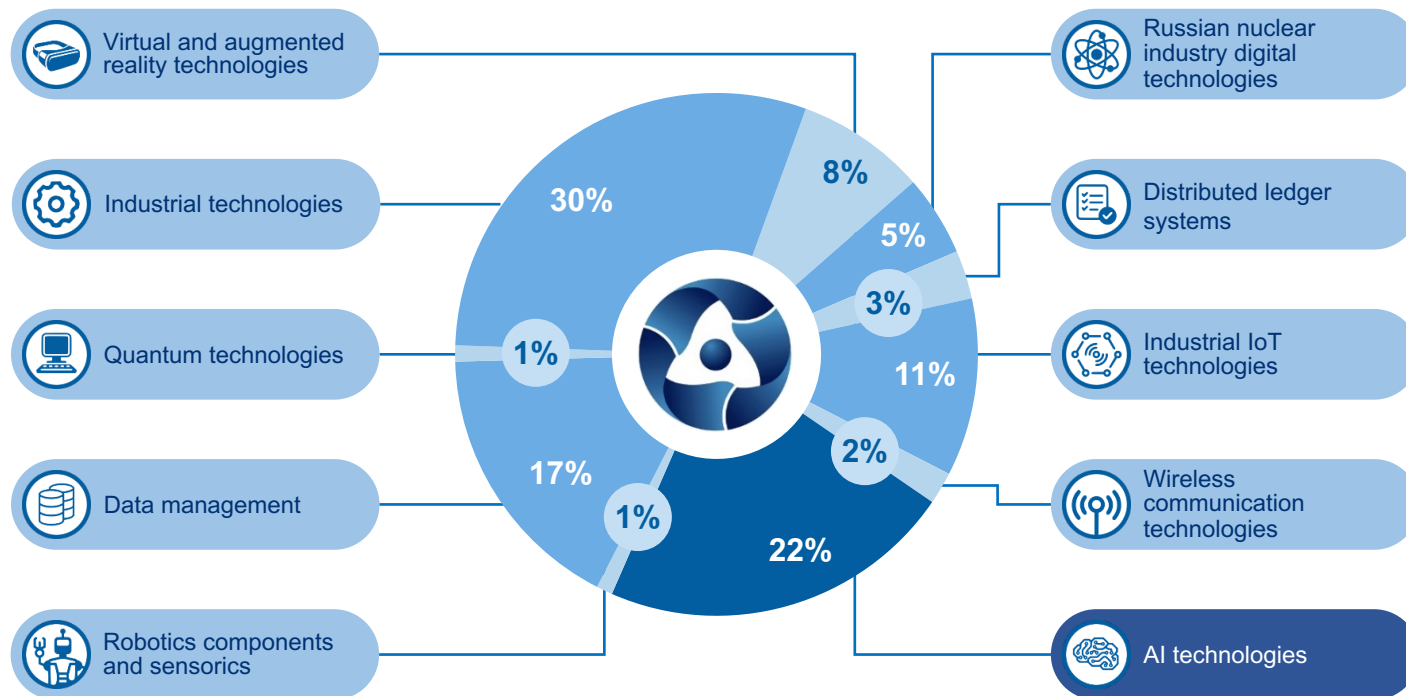
**>250 000**  
EMPLOYEES

GLOBAL FOOTPRINT -  
**> 50** countries



\* Source: Rosatom IFRS, annual report

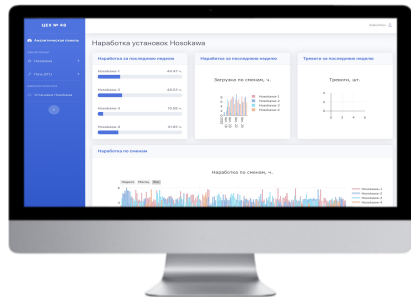
# Digital portfolio structure based on industrial demand



# Most popular / common groups of AI projects in our portfolio



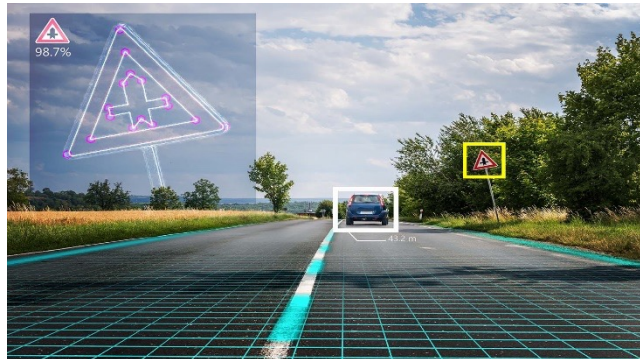
## Industrial Predictive Analytics



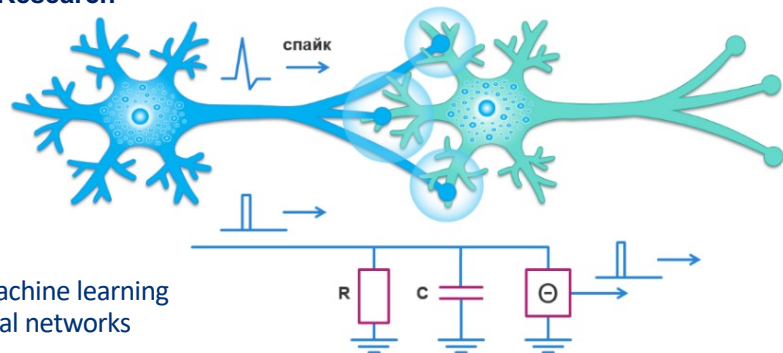
## Natural language processing, speech recognition and synthesis



## Computer Vision

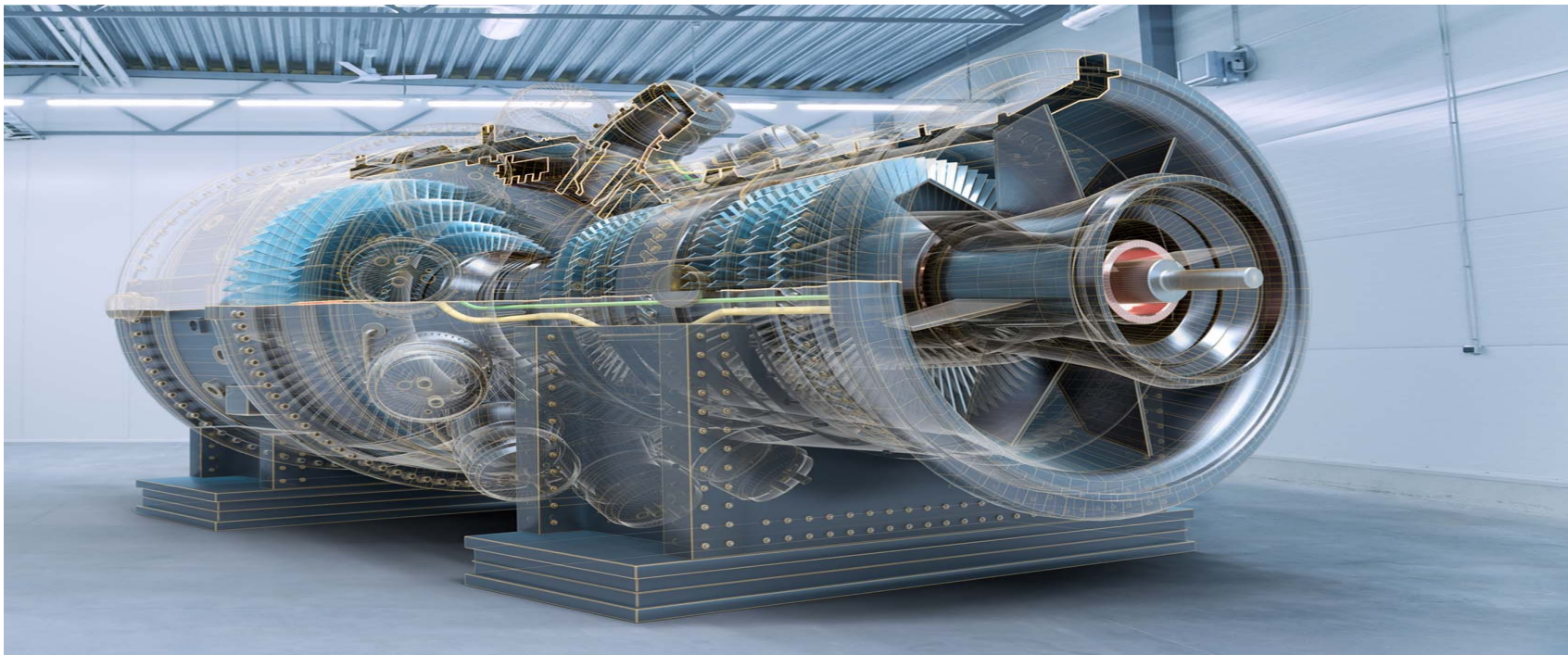


## Promising Research



# NPP Turbine Generator Sets

A turbine generator set is the most expensive and critical NPP electrical equipment





# Size of a prize – why do we care?



## Avoiding losses:

Each emergency stop of Turbogenerator\* - about 1 million euro lost profit per day  
More than 45 total number of turbogenerators located at nuclear power plants in Russia

## Lowering operational / repair costs:

Planned stop is less expensive than emergency stop

(\*) [https://elektrovesti.net/51781\\_odin-den-prostoya-aes-vo-frantsii-stoit-bolshe-1-mln-evro](https://elektrovesti.net/51781_odin-den-prostoya-aes-vo-frantsii-stoit-bolshe-1-mln-evro)

## **A predictive analytics system for turbogenerator has to solve following tasks:**

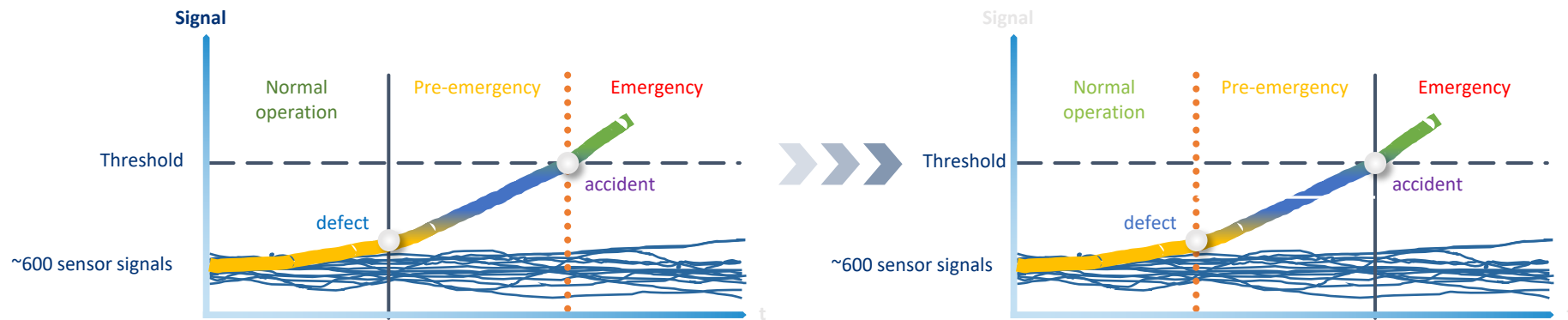
- Early defect detection
- Defect isolation
- Defect root cause identification
- Defect development prediction

**Existing diagnostics systems do not solve the problems in its entirety**

**Successfully developed ML-based anomaly detection algorithms to improve the diagnostic quality**

**The most valuable part of a predictive analytics system is mathematical models, particularly a ML models**

# Operationalizing results: AS IS vs. TO BE



Early defects detection can reduce repair costs



# Conclusions / Learnings

- Development of machine learning models allows to improve existing approaches to the monitoring of strategically important industrial facilities
- Use of predictive monitoring system allows switching to condition-based maintenance of equipment
- Transition to maintenance of nuclear power plants in accordance with the research of the International Atomic Energy Agency and independent reports can reduce the maintenance costs of equipment