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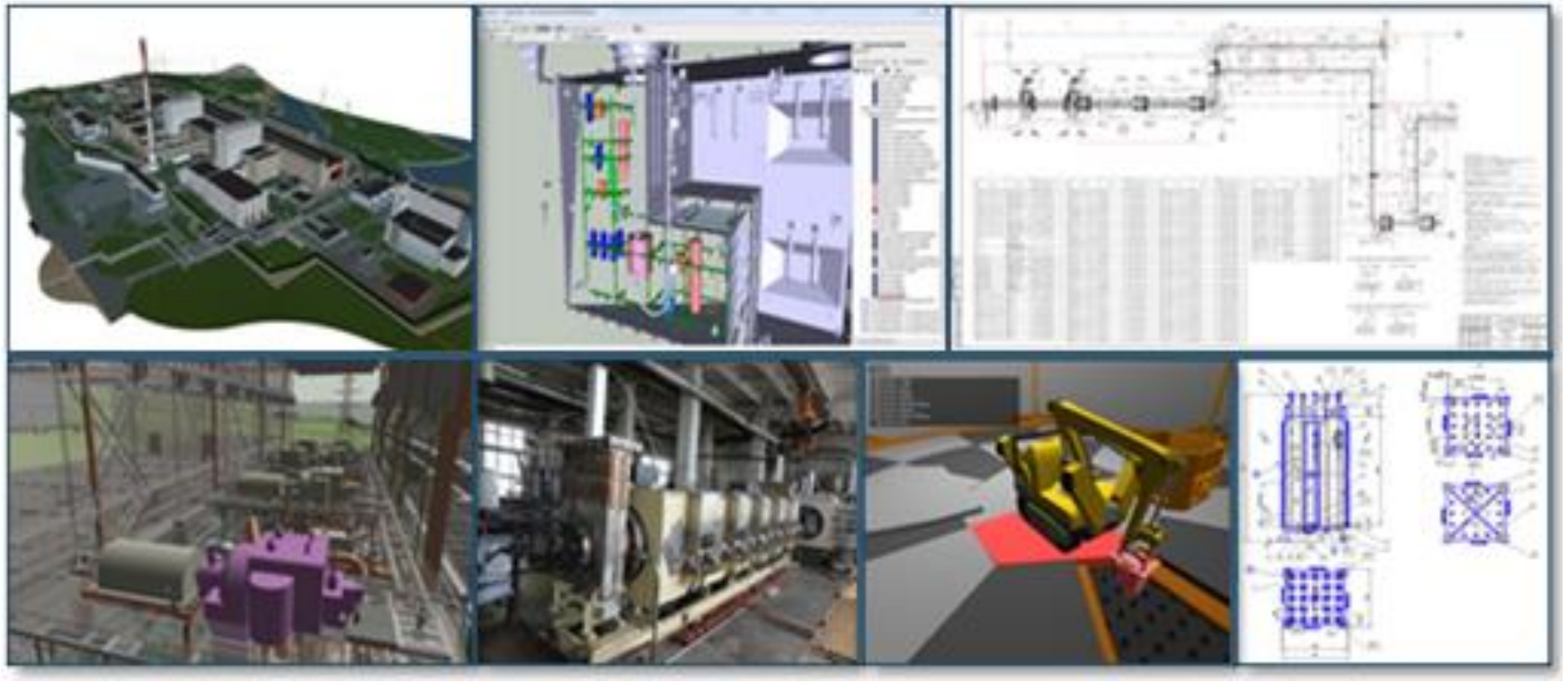
Life Cycle Management and Information Transfer



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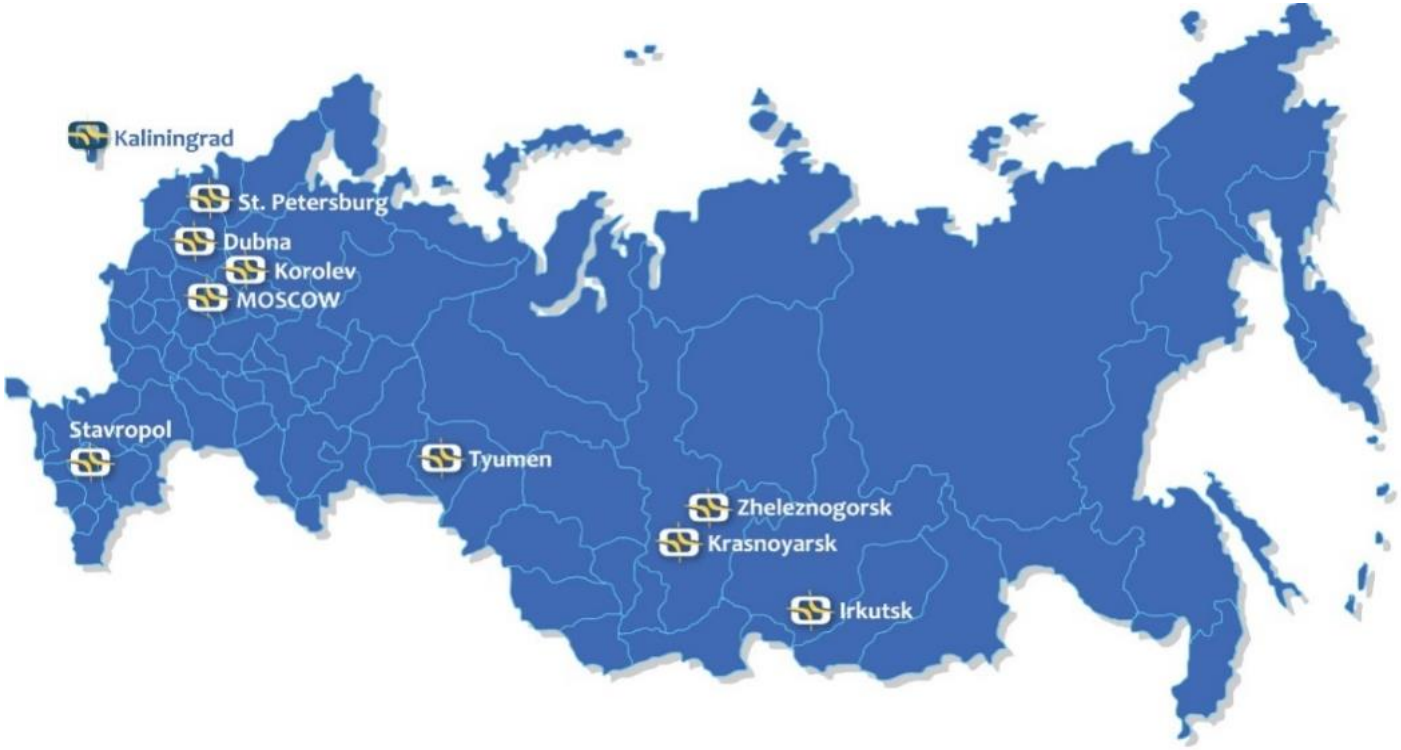
JSC NEOLANT

- Established: 2004
- The number of engineers (2017): ~500
- Main office: Moscow,
- Offices: St. Petersburg, Kaliningrad, Stavropol, Krasnoyarsk, Irkutsk, Tyumen, Zheleznogorsk, Dubna

Specialization:

- IT – PLM, PDM, CAD, GIS, DMS, MES, etc.
- Engineering, include:
  - Decommissioning engineering and radioactive waste management
  - Specialized decommissioning equipment manufacturing
  - Prime design contractor for civil objects



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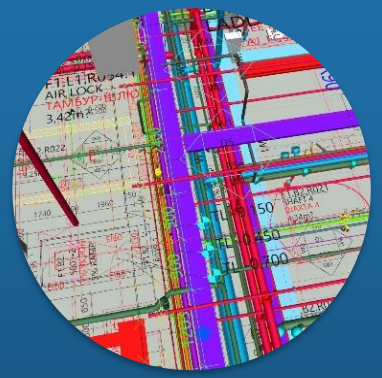
The Life Cycle of a Process Facility and Accumulation of Information about the Assets



Design

~ 3 years

Construction

~ 5 years

Operation, Reconstruction

more than 60 years

Decommissioning, Recycling

more than 20 years

- *Life-cycle* - consecutive and interlinked stages in the life of a structure consisting of planning, design, construction, operation and decommissioning
- *Life-cycle management* - systematic and coordinated activities and practices through which a structure is appropriately managed over its life cycle
- *Infrastructure asset management* - combination of management, financial, economic, engineering, and other practices applied to physical assets with the objective of providing the required level of service in the most cost-effective manner

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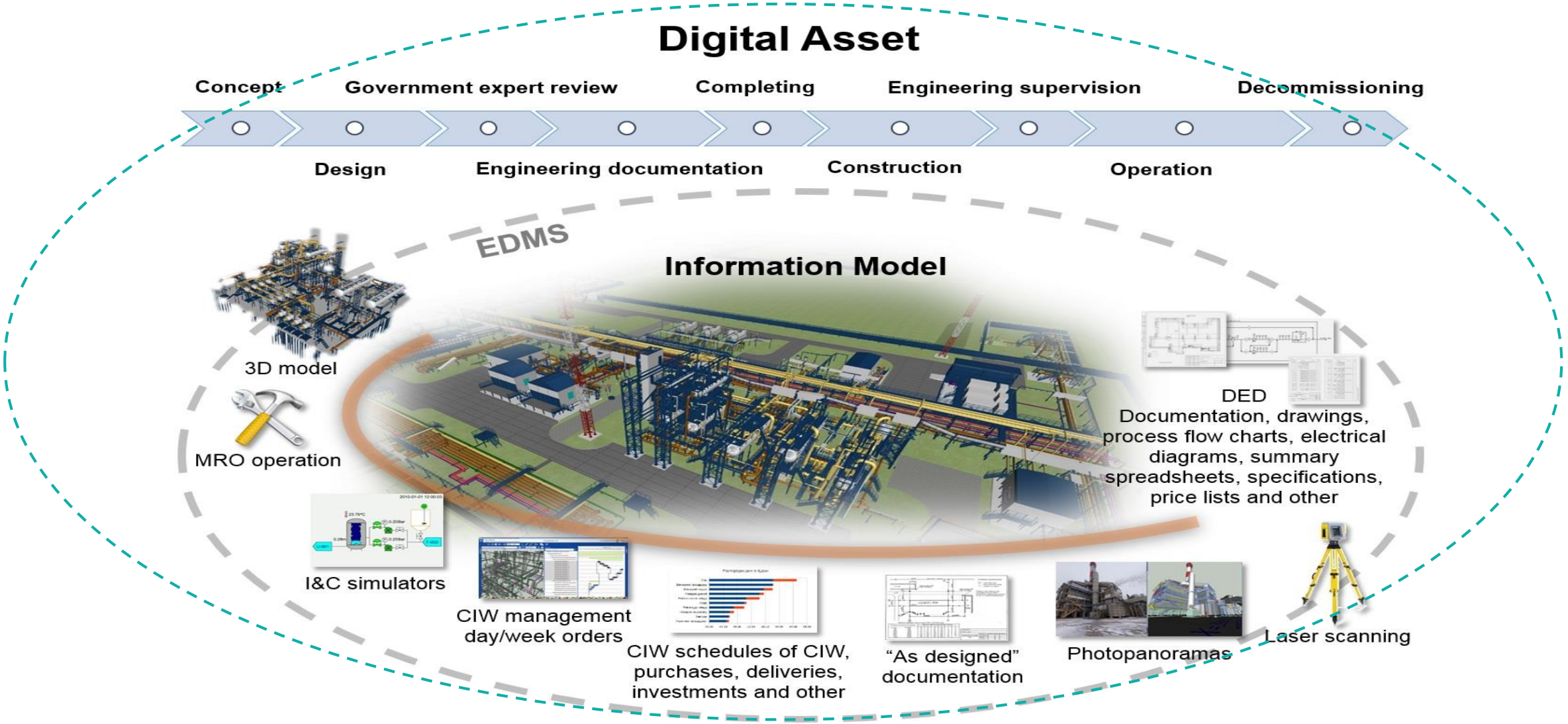
Life Cycle of a Process Facility and Its Data-focused Information Model



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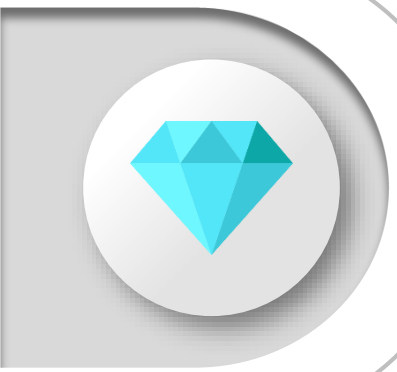
Effects of Information Modeling Technologies Using



- Increasing the manageability, transparency and predictability
- Improvement of the decision’s quality
- Data integrity
- Optimization of time and resources.

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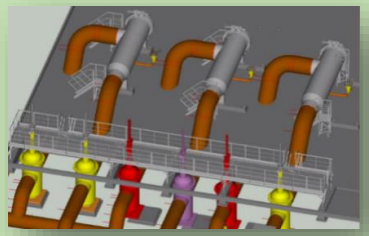
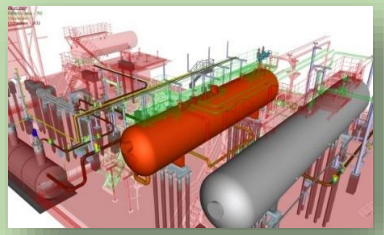
Russian Technologies Support All Stages of The Life Cycle

Design → **Construction** → **Operation, Reconstruction** → **Decommissioning**

Digital Asset

NEOSYNTEZ

Горизонт, ЦМОЭМ, InterBridge, InterStorage, Polynom, SOMOX and etc.

- Creation of a integrated information model «as-design»
- A digital model for the construction and operation of the field

- 4D/5D/6D information modeling
- Construction management
- Creation information model «as-build»

- Accessing the information portal supporting operations
- Considering all types of operating data
- Analyzing accumulated data with flexibility
- Planning and accounting of repairs

- Planning of shutdowns and dismantling
- Supporting the information needs of complex process through engineering surveys
- Visualizing dismantling activities

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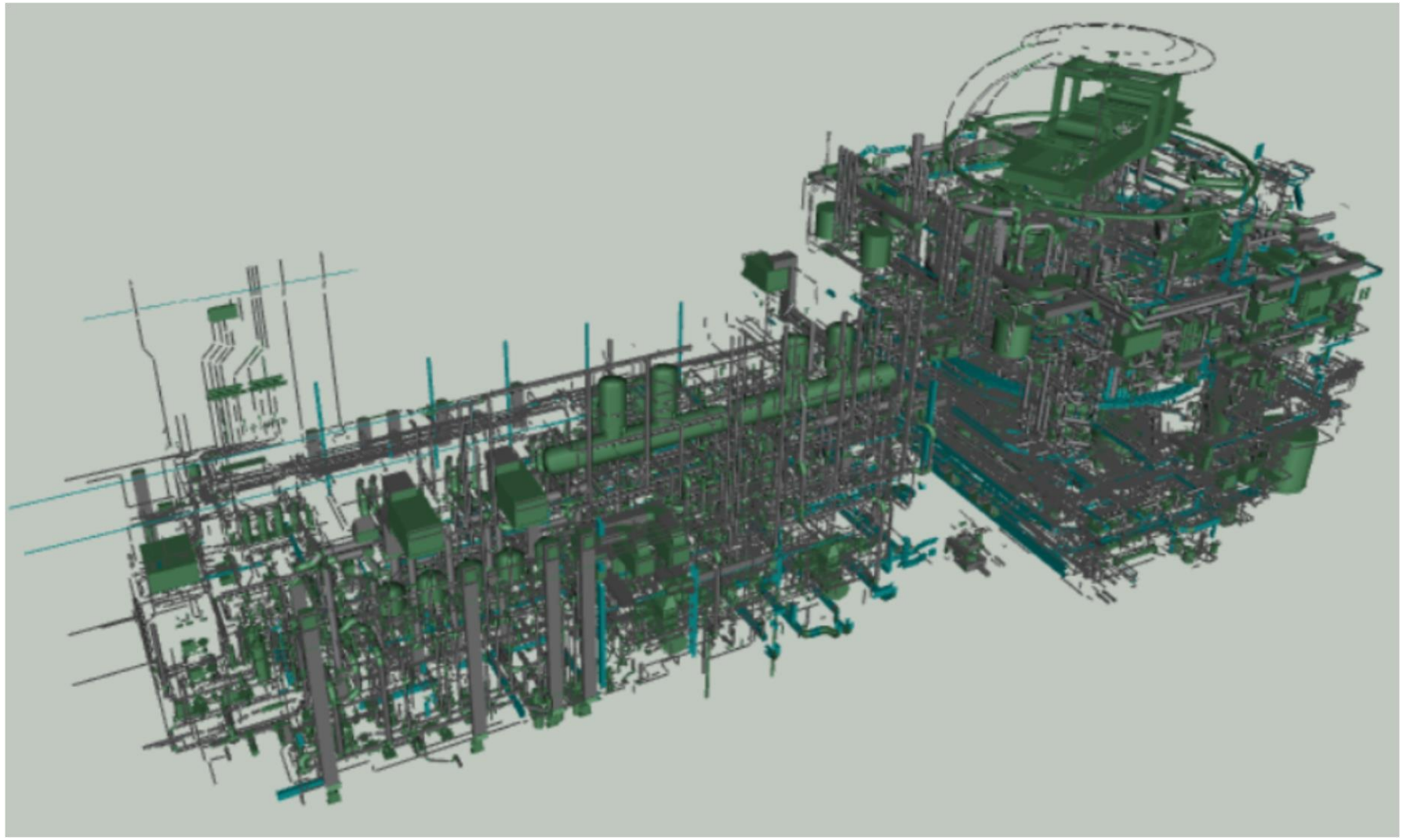
Examples of Projects to Create and Maintain IM for Construction and Operation Tasks



Industry : Nuclear Industry

Customer : Rosatom group (JSC NIAEP-JSC Atomstroyexport»

Project : Creating software solutions for use in the construction of NPP

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Examples of Projects to Create and Maintain IM for Construction and Operation Tasks

Industry : Oil and Gas Extraction

Customer : : Gazprom Neft PJSC

Project : Creation of an IM and implementation of engineering data management system for the facilities of the Novoportovskoye field

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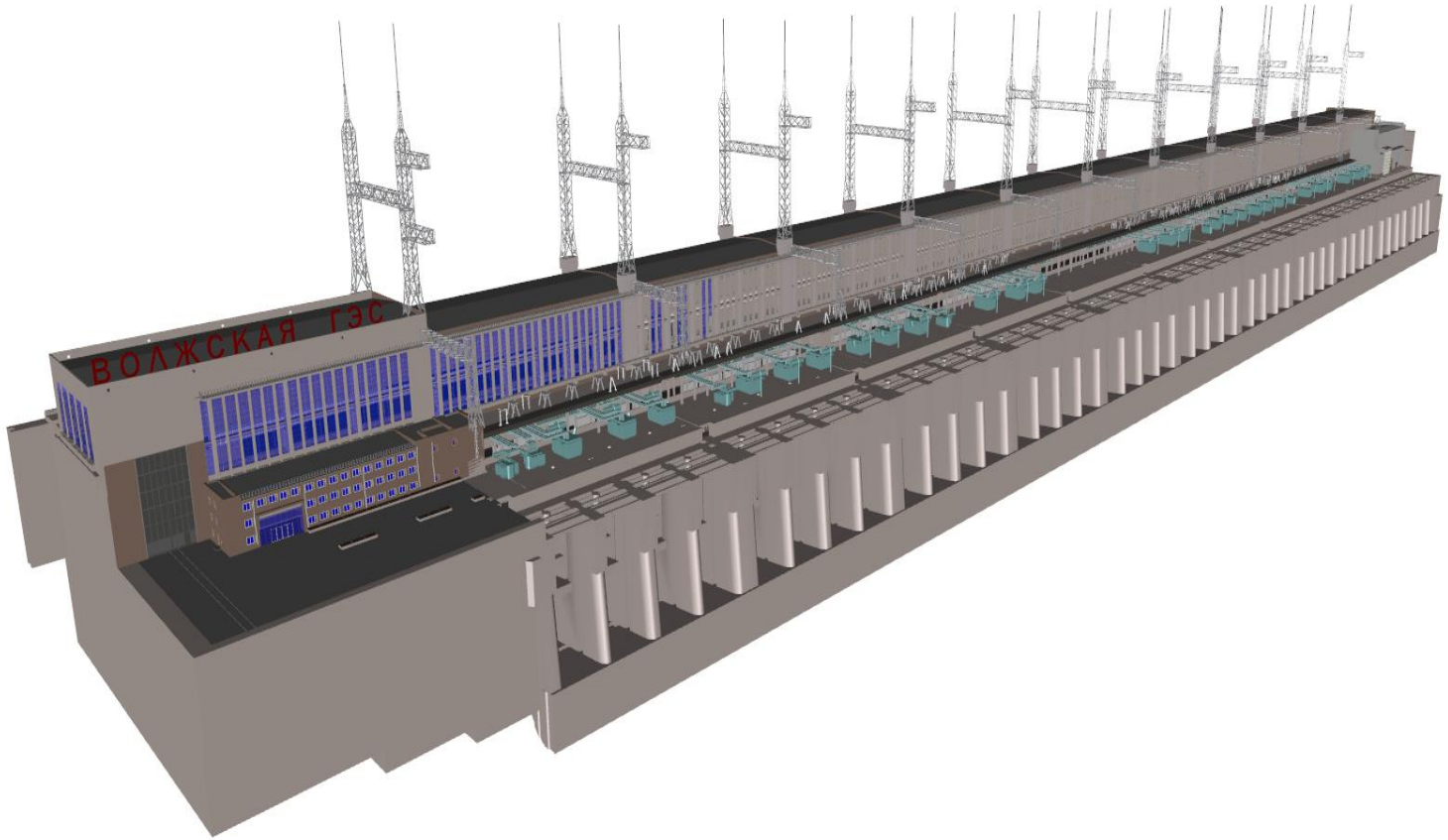
Examples of Projects to Create and Maintain IM for Construction and Operation Tasks



Industry : Hydropower Complex

Customer : : RusHydro PJSC

Project : Creation of the information model of the Volga HPP and implementation of engineering data management system

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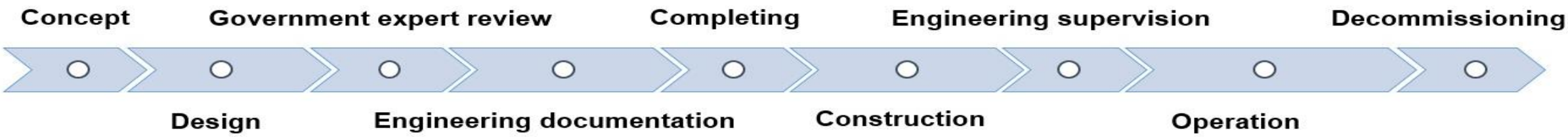
ISO development 22040



Life cycle management of concrete structures

NP stage

Warning for WDs and CDs

This document is not an ISO International Standard. It is distributed for review and comment. It is subject to change without notice and may not be referred to as an International Standard.

Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

ISO/PWI 22040: #### (E)

8. Information transfer among management stages

Information accumulated at each stage of planning, design, execution, use, and end of life in the life cycle of a structure shall be transferred within and across the stages. Necessary information on decision-making shall also be transferred.

The information accumulated should be recorded in a proper way for the improvement of LCM. The accurate information collected at each stage shall be retained in a form readily understandable at subsequent stages.

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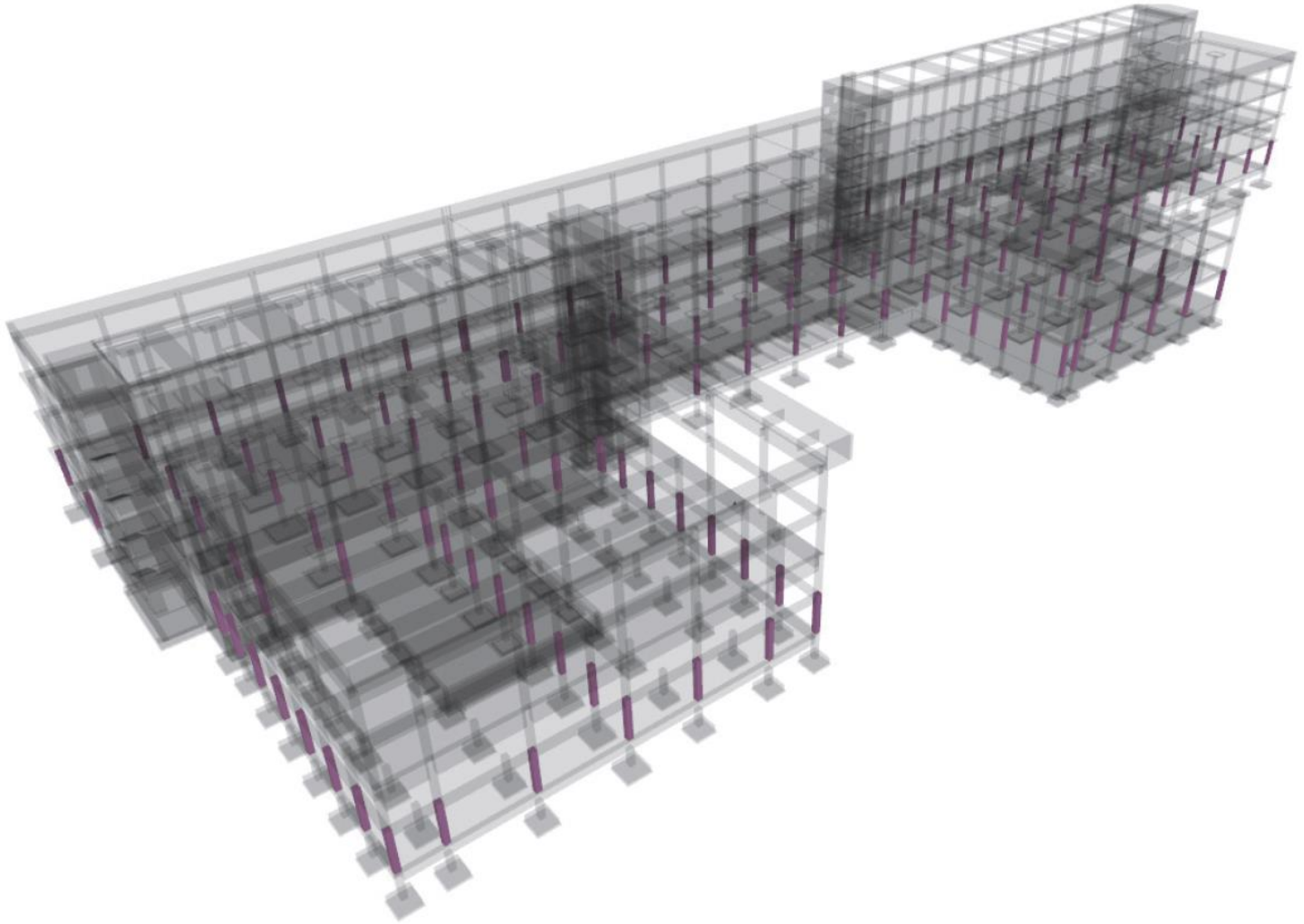
Management in Planning and Design Stages

- DATA:
  - Concrete Type
  - Concrete Class
  - Technology information
  - Dimensions
  - Tolerances
  - Surface type
  - Cover
  - Environmental action
  - Fire resistance



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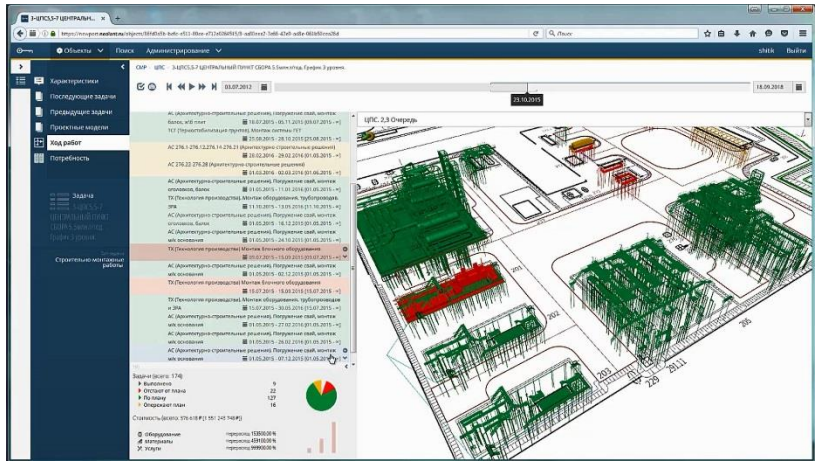
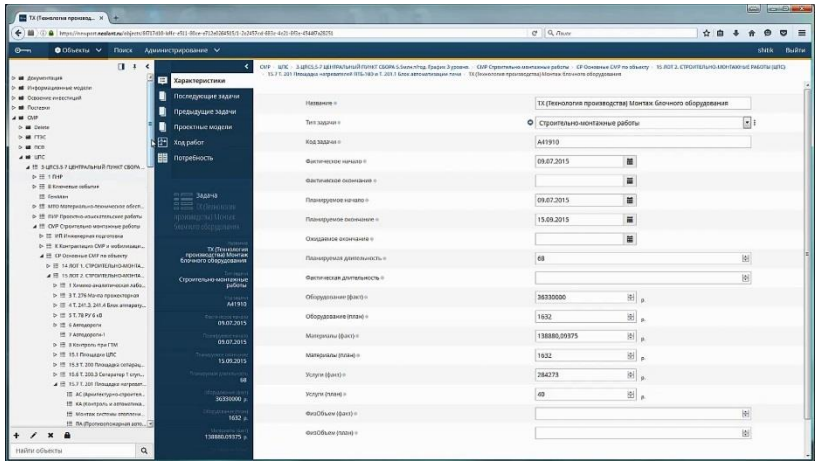
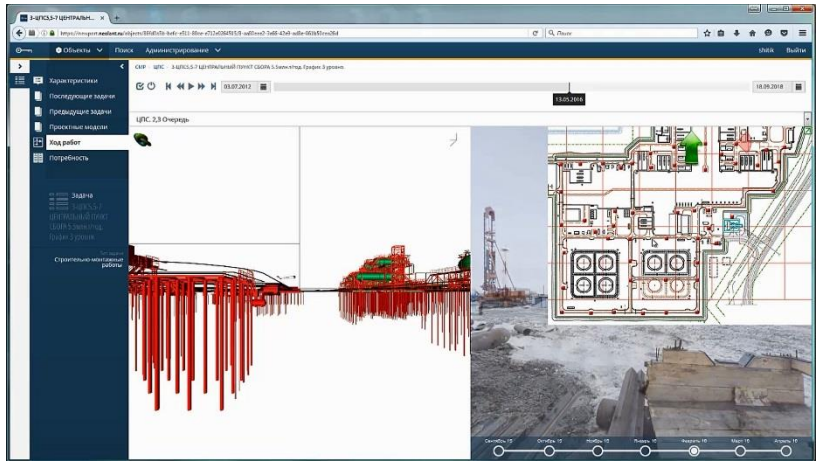
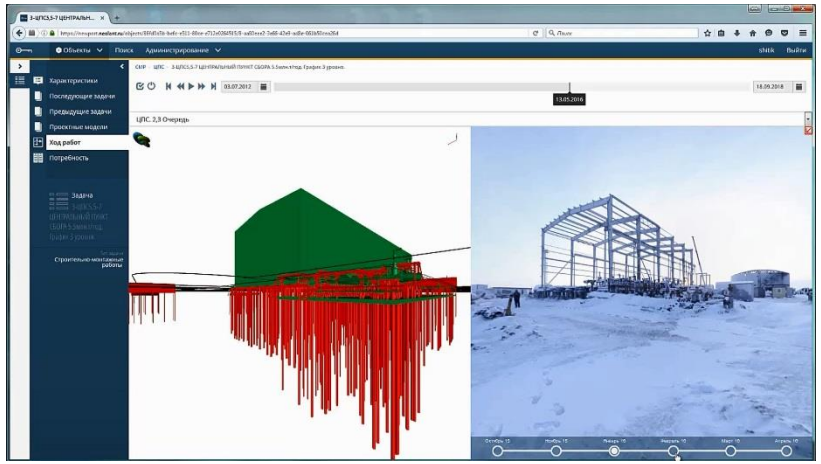
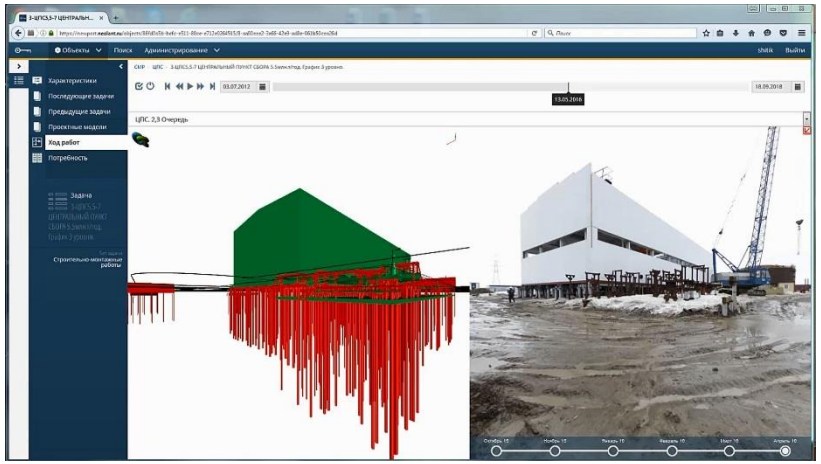
Management in Construction Stage
Support of Installation and Construction Work

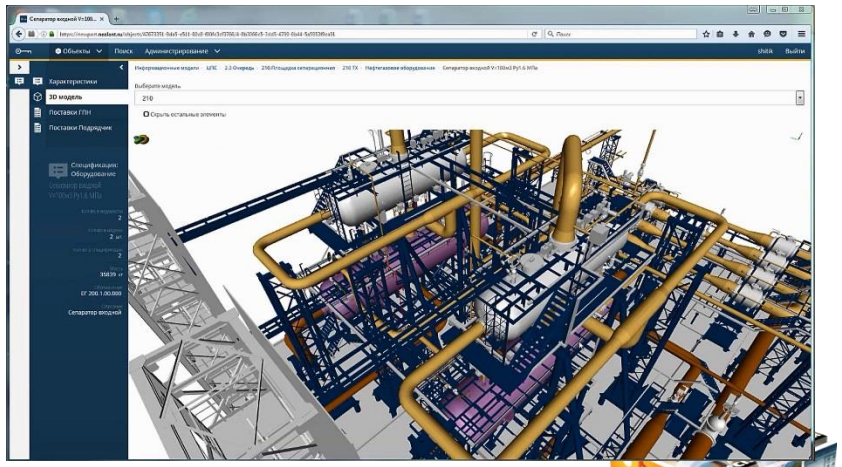












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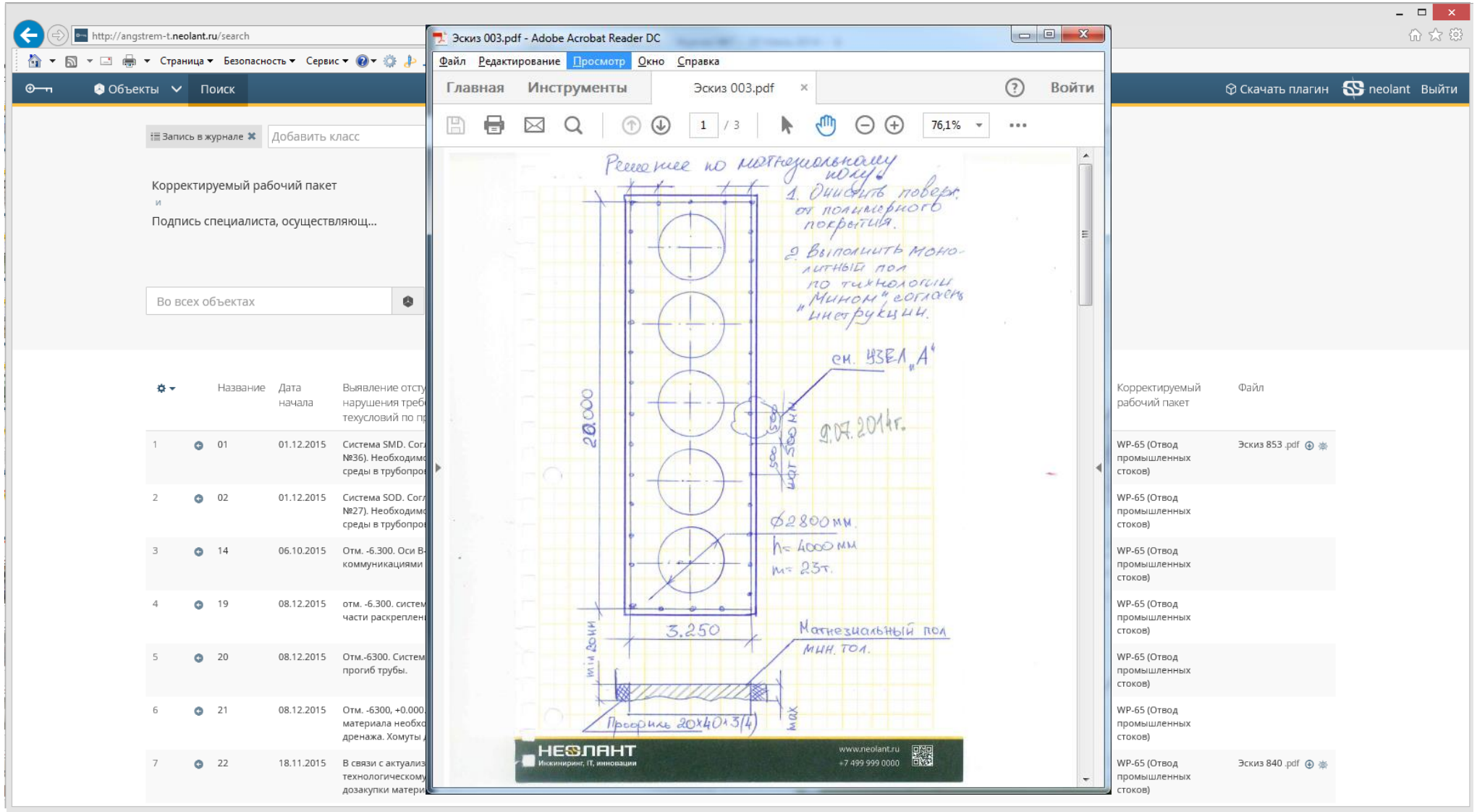
Management Construction Stages
Creation and Implementation of Electronic Supervisor's Log



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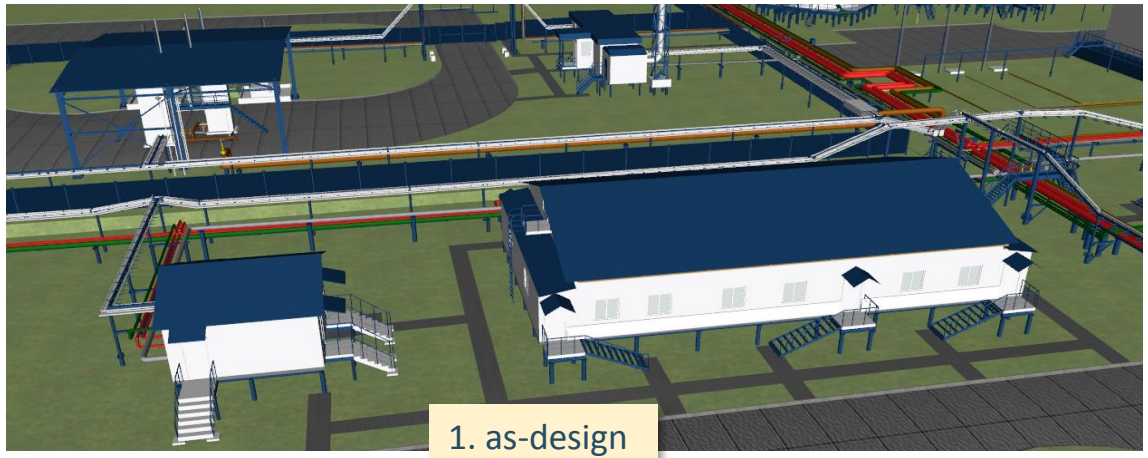
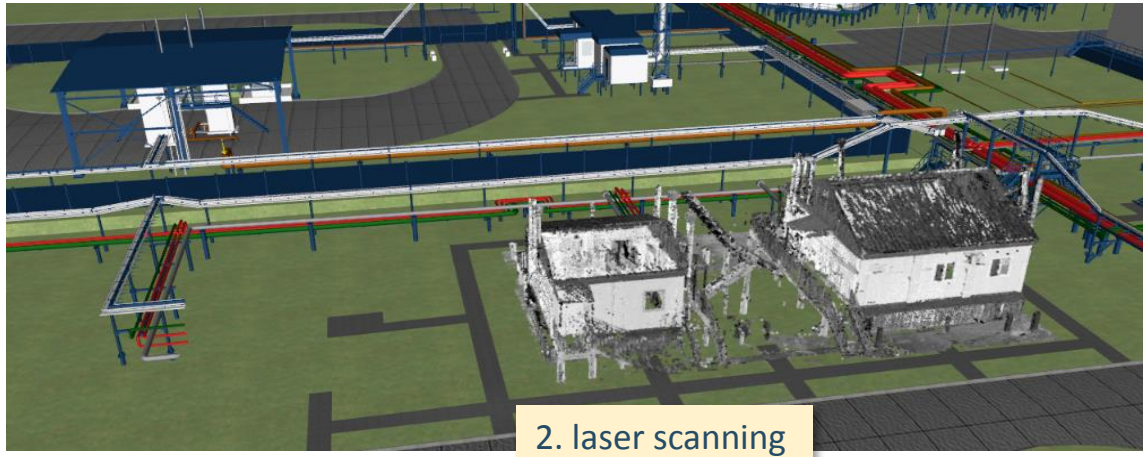
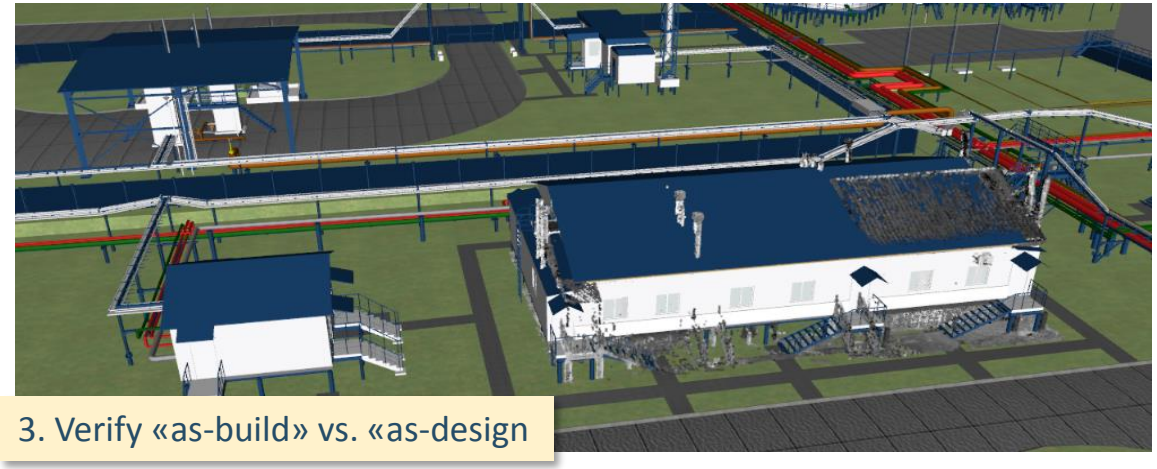
Management in construction stage
Formation of As-Built Information Model



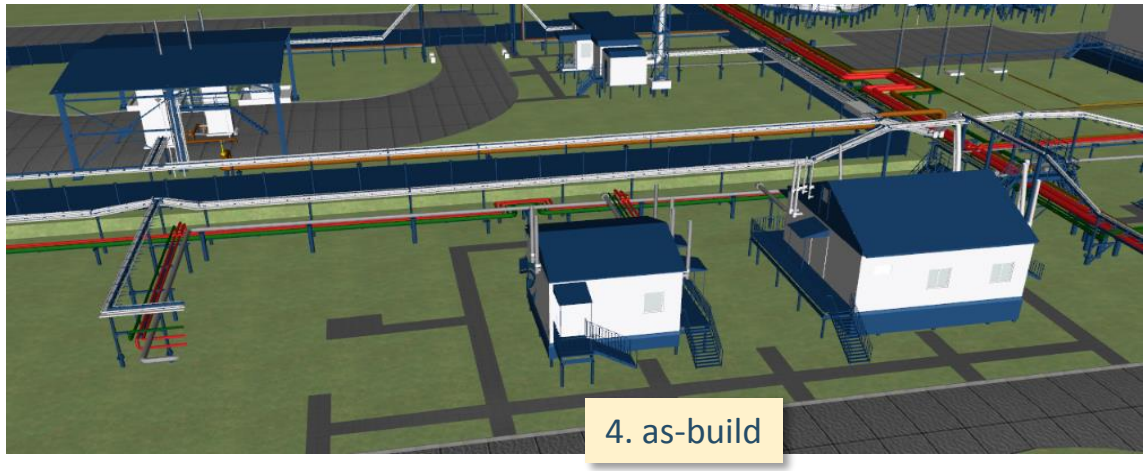
1. as-design



2. laser scanning



3. Verify «as-build» vs. «as-design



4. as-build

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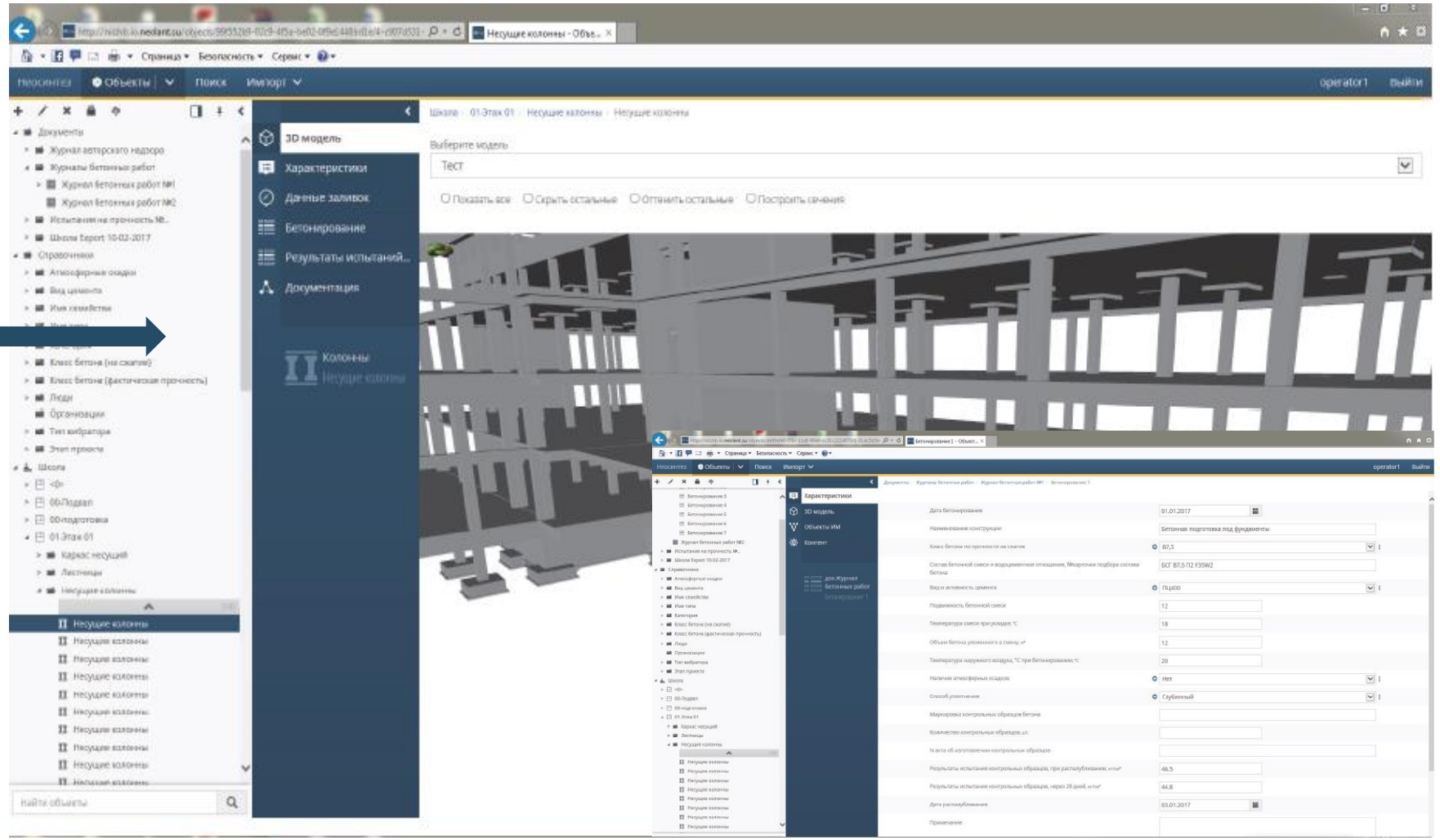
Management in construction stage
Formation of As-Built Information Model

- DATA:
  - In-situ Concrete Strength
  - Fresh concrete properties
  - As-Built Dimensions
  - Temperature monitoring
  - Suppliers
  - Date of execution
  - Date of formwork removing
  - Defects and its repair



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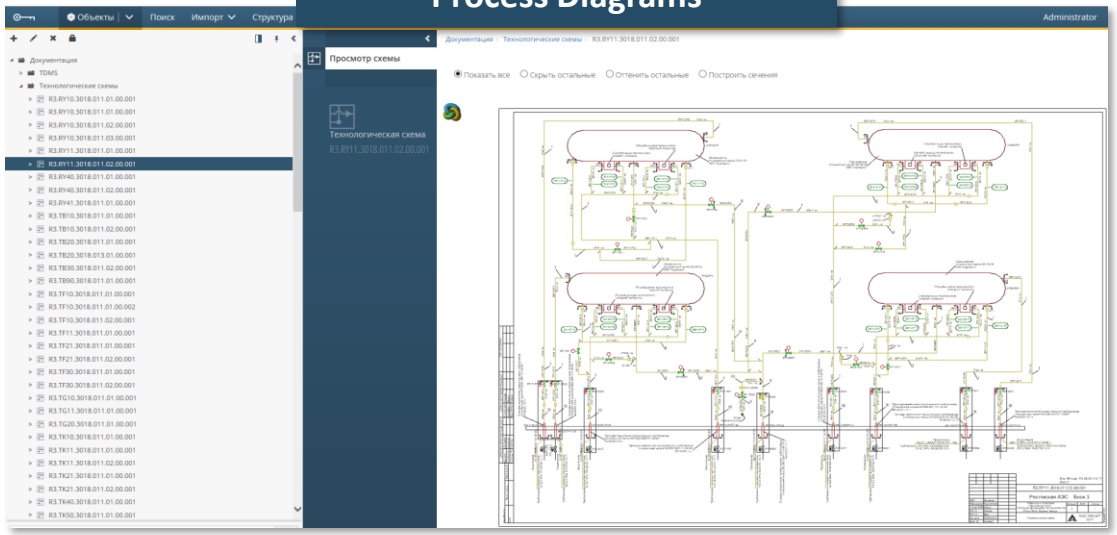
Management in Operation Stage
Single Access Point to Information

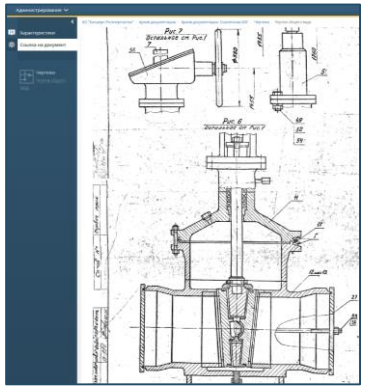
Process Diagrams



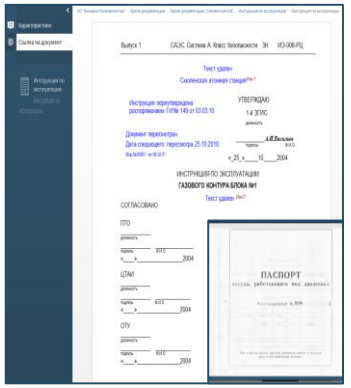
Detailed 3D Model

Documentation Archive

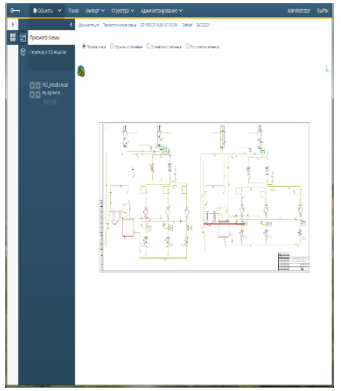
Archive documentation (TDMS)



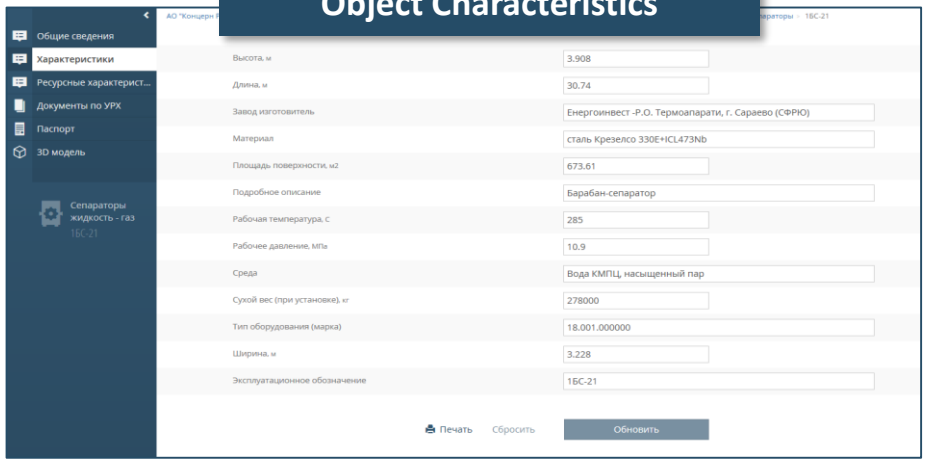
Operating instructions



P&ID diagrams



Object Characteristics



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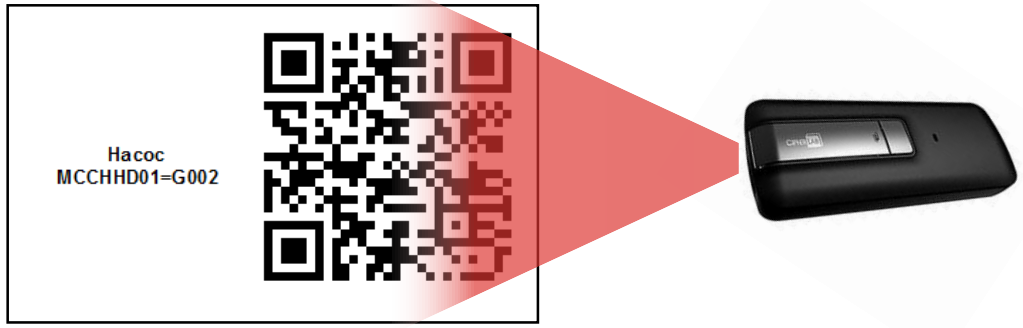
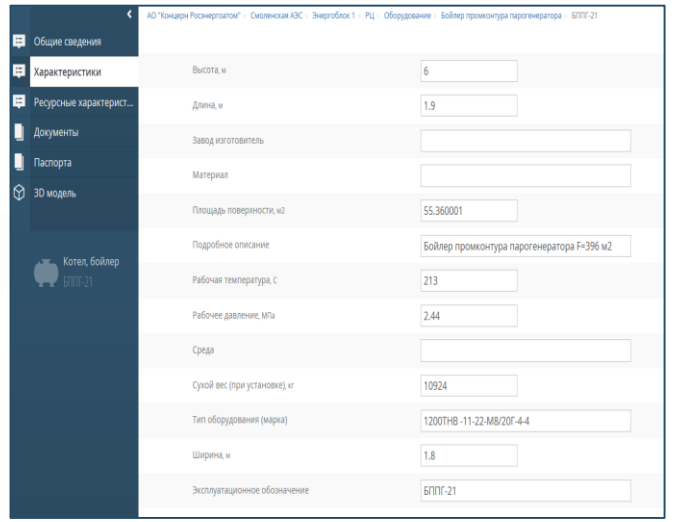
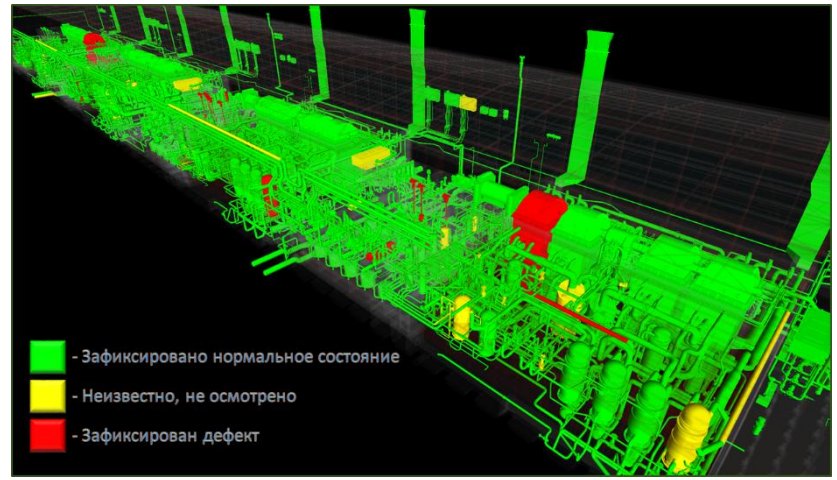
Management in Operation Stage
Scheduled Works: inspections, walkdowns and etc.







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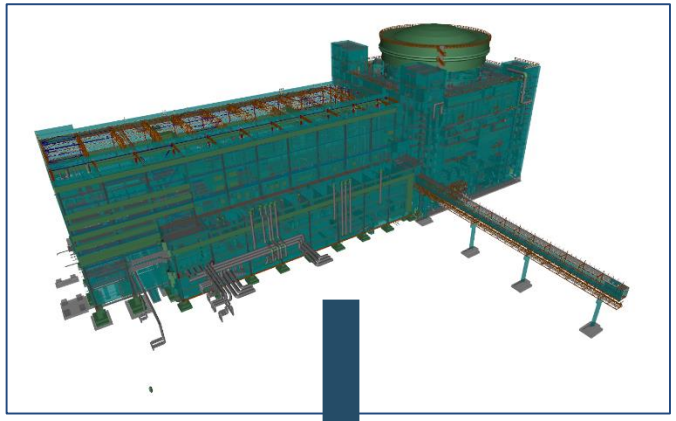
Management in Operation Stage
Support of Modernization and Reconstruction



Attributes and documentation

Geometry updates

POLYNOM
Designing Complex Plants in 3D

Update Information Model

Decision about modernization

Design

Procurement

Mounting or Construction

All information for making decisions

- ✓ Design and Engineering documentation
- ✓ Data from forecasting mathematical models
- ✓ Data from scheduled works
- ✓ 3D-Model
- ✓ Recording data about required equipment and materials
- ✓ And Etc.

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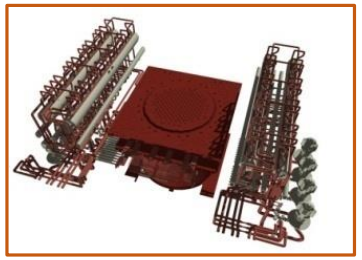
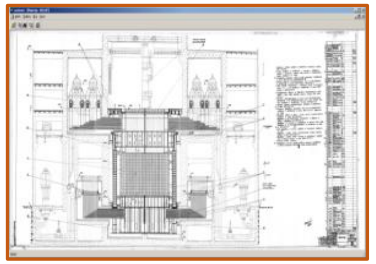
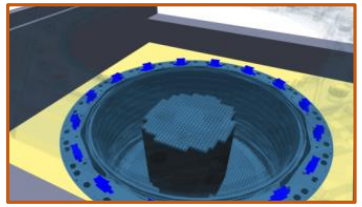
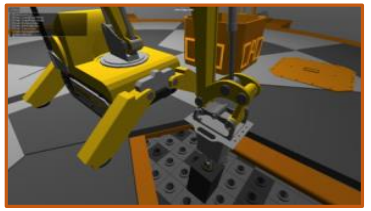
Management in Decommissioning Stage

1. Accumulation and Arrangement of Nuclear Facility Design and Engineering Data (drawings, specifications, diagrams, CAD models etc.) Keep the Data Available for Hundreds of Years

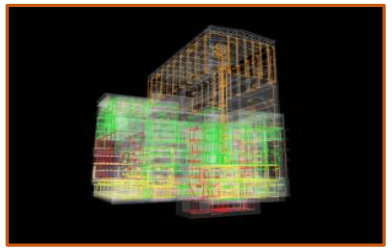




2. Simulation of On-Site Activities That May Affect Facility Nuclear and Radiation Safety

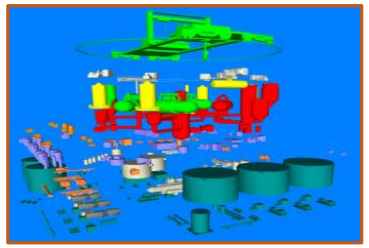
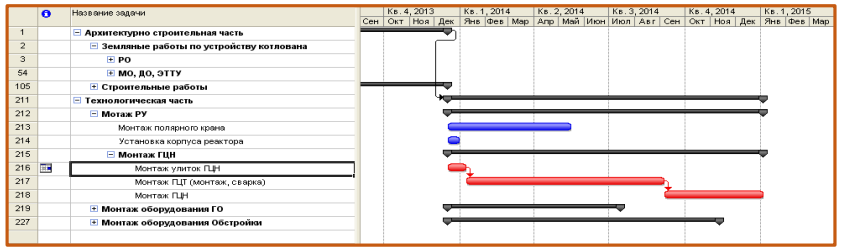




3. Radiation Exposure Data Gathering and Integration into Facility 3D Model:
- forecast amounts of radioactive waste arising from decommissioning;
- information support of radioactive waste management.





4. Decommissioning Projects Planning and Management Including Optimization of Decommissioning Activities Depending Regulatory Restrictions.

Further Development

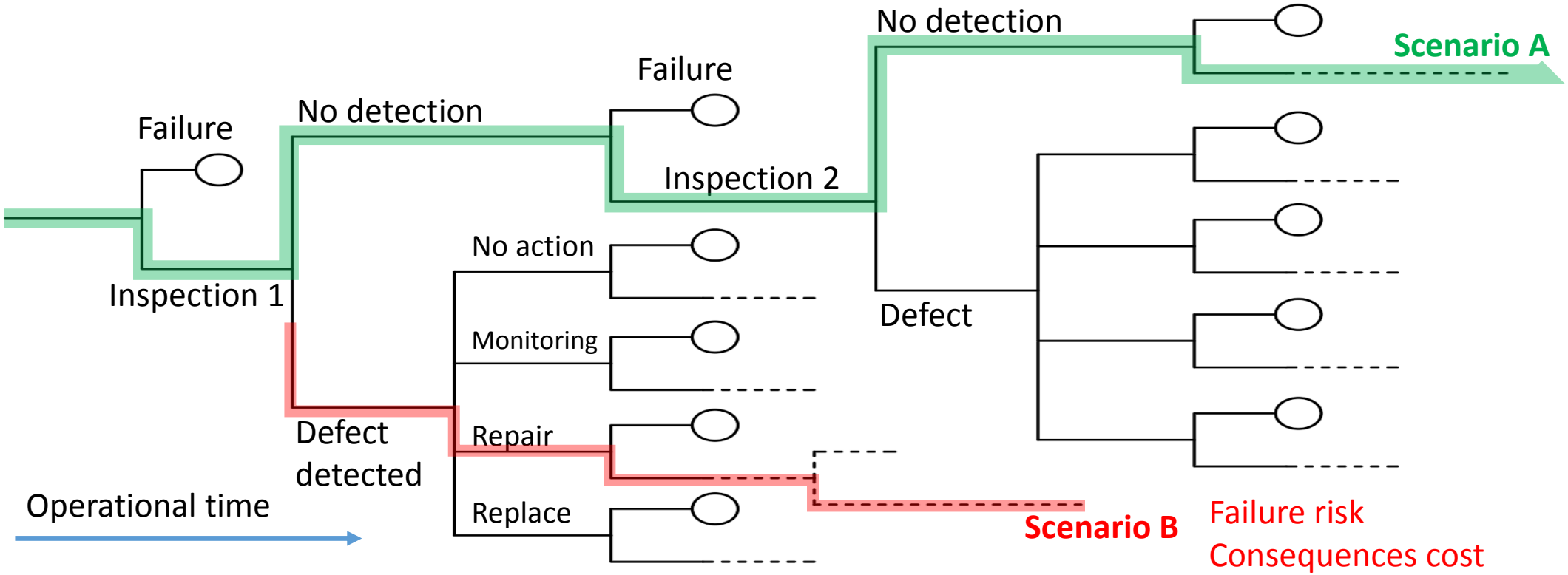
Optimal Life-Cycle Management → RISK BASED DECISION MAKING ←

Pre-posterior decision analysis
Big data analysis
Bayesian and neural nets

JCSS

RILEM

fib CEB-FIP



life Cycle Management Scenario - plans for ensuring performance of a structure throughout its life cycle [ISO 22040]

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Conclusion

- Nowadays, the Digital form of information is seen as mandatory for the concept of a long life cycle and the development of systems to support solutions for the managing of life cycle, including on the basis of risk assessment and optimal strategies
- IT solutions allow you to organize suitable accounting and reliable storage of information and the company NEOLANT and Russia are actively on this path today
- In ISO 22040 would like to see more specific parameters and indicators that can be taken into account for the development of advanced engineering data management systems

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Thank You!

The group of companies NEOLANT (Russia)

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