

# Multi-D Platform for Life Cycle Management of Complex Engineering Facilities

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# THE WORLD RUSHES TO DIGITAL ECONOMIES AND STATES



Information technologies and digital platforms – nucleus of the generated technological setup («Industry 4.0)

<p>Internet, mobile connection, social networks (Apple, Facebook)</p> 	<p>Swift transfer of business processes into on-line ones, generation of global digital platforms (Google, Amazon, Uber, Airbnb, Paypal, eBay, Bandcamp)</p> 	<p>Significant distribution of information systems for management of enterprise resources (SAP, Oracle)</p> 	<p>Application of digital technologies in state and local governance and services (Leaders – Sweden, Denmark, Finland)</p> 
<p>Generation of huge array of digital content and generation of Big Data (Google)</p> 	<p>Active digitization and automation of processes of information modeling, structuring, designing, construction and operation of production facilities within the framework of PLM (Dassault, Intergraph, IBM Maximo)</p> 	<p>Initiation of the Internet of things (IBM)</p> 	

Blockchain – a breakthrough technology in creation of digital economy and the society of confidence

			
<p>Blockchain 1.0 Crypto-currencies (Bitcoin)</p>	<p>Blockchain 2.0 Smart- contracts (Ethereum) - co</p>	<p>Corporate blockchains (Hyperledger, R3 Corda)</p>	<p>Blockchain 3.0 (at the stage of conceptual developments) Crypto Governance</p>

Russia's challenge is to become a leader on the new wave of digitization based on the blockchain



# STRUCTURE OF DIGITAL DESTABILIZATION AS PER THE INDUSTRIES – «DIGITAL WHIRLWIND»



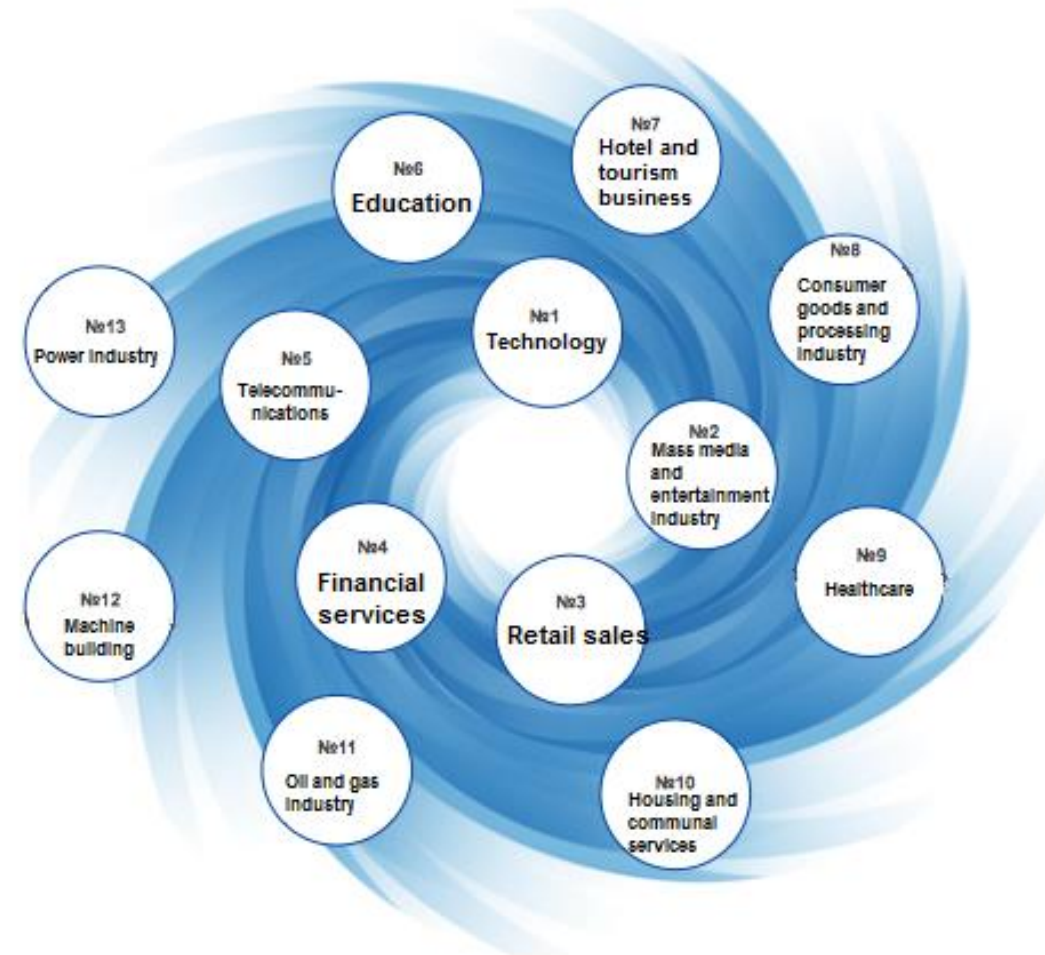
Digital technologies destruct the existing methods of creation and consumption of the products, and create new ones. Digitization in various industries is not homogeneous and is represented by the whirlwind model.

Traditional companies have advantages in the capital, developed brand and accumulated client base.

New companies-destabilizers have advantages in innovations (they actively use new technologies), maneuvering (speed of reaction and organizational flexibility), readiness for the experiments and risk.

## Principles of digital destabilization:

1. Everything that may be digitized, must be digitized.
2. Value creating chains do not matter; only the value itself matters.



# RUSSIA TOOK UP THE CHALLENGE OF DIGITIZATION



The President of the Russian Federation V.V. Putin in the message to the Federal Assembly dd. December 01, 2016 proposed to launch the program of development of the digital economy and pointed out the “necessity to focus on directions where the powerful potential of the future is being accumulated, i.e. digital, other so called end-to-end technologies which today determine the character of all life spheres”



National technological initiative (it is being implemented according to provisions of the message of the President of the Russian Federation to the Federal Assembly dd. December 4, 2014)



Russia development strategy for the period of 2018-2024, prepared by the Center of Strategic Developments on the basis of the concept «State as a platform»

The projects capable of becoming the basis of accelerated digitization of the country’s economy are being developed and implemented on the corporate level:



Central Bank of Russia  
Masterchain Project  
(interbank settlements and payment system)



Sberbank of Russia  
The package of projects on blockchain  
(Digital Ecosystem, trade financing platforms, Evotor and others)



RF Ministry of Finance  
The project for creation of registers on blockchain



Bank for Development and Foreign Economic Affairs  
National Blockchain Project



ASE, SC «Rosatom»  
Multi-D  
(the platform for creation and development of NPP and other technologically complex facilities in PLM concept  
RFNC - VNIIEF  
Digital enterprise)



SC «Roscosmos»  
(the platform for designing and production of complex industrial items in PLM concept)



Decree of the President of the Russian Federation dd. 01.12.2016 No. 642 “On the strategy of scientific and technological development of the Russian Federation”



Presidium of the Presidential Council of the Russian Federation issued an order to develop and approve the plan of stage-by-stage introduction of information modeling technologies in the sphere of industrial and civil construction



Draft program «Digital economy of the Russian Federation» is prepared

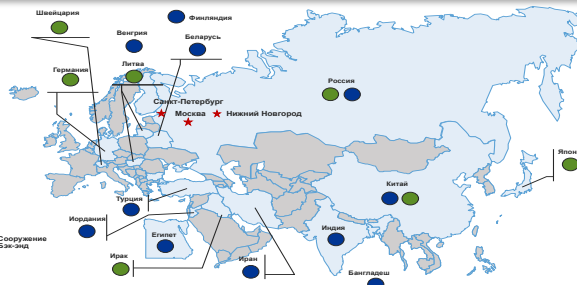
# ASE GROUP – AN ENGINEERING DIVISION OF STATE CORPORATION «ROSATOM»



30+ NPPs –  
in the process of designing and  
construction



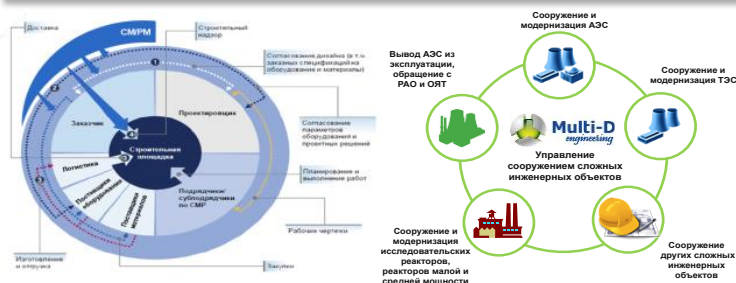
~30% of the world market level of NPP  
construction



80% of the order portfolio – projects  
abroad



Engineering at all stages of life cycle  
from designing to decommissioning



8 GW of installed capacity  
commissioned for the last 10 years



Presence in 18 countries of the world





# CAPITAL PROJECT MANAGEMENT STANDARD ON THE BASIS OF MULTI-D® PLATFORM



Complex project management system on the basis of Multi-D Technology allows implementing complex capital projects with set cost and deadlines with necessary quality

## Unified Information Space

**IT tools**

	Deadline management – Unified schedule		Cost management – ACMS
Quality management – work according to a unified standard in the Unified Information Space			
	Equipment catalogue		Designing tools
	Electronic document flow		Requirement management
	Supplier portal		Storehouse Bar coding
	Construction modeling		Field engineering

More than 25 IT tools proven in practice

## Information model including 3D

**Project databases**

			+	Schedules	Certificates
				Estimates	Reference data
				Documents	Catalogues

## Methodology Organizational Support



Project management standard

Principles, rules

Role models, Design offices

Process regulations

Methodologies, Instructions

## People

World standard and practice training program

Own training school

Increasing of the maturity level

International certification

Involvement of Regulators

Involvement of Customers

Involvement of Suppliers

Involvement of Contractors

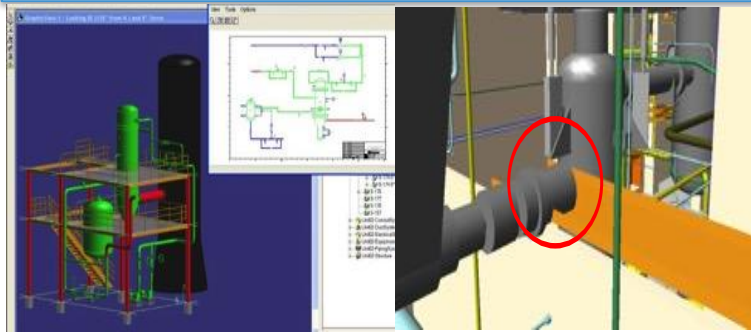
Regulations of processes and methodologies of «protection» inside IT tools. «Correct» structures, classifications, attributes of «protection» in the project database. Training is carried out immediately with application of IT tools. This ensures decrease in dependence on the human factor during the work according to the unified standard in the process of the project implementation.

Engineering of the future – today!

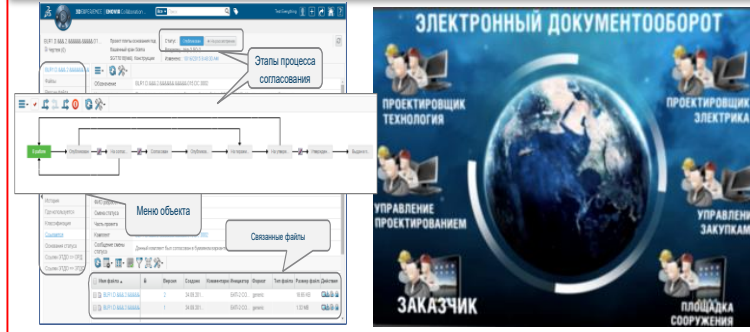
# DESIGN LIFE CYCLE STAGE



## Creation of qualitative information 3D model (BIM)



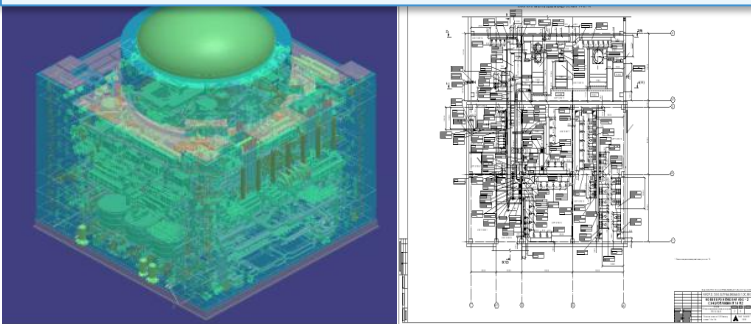
## Work in the unified information space



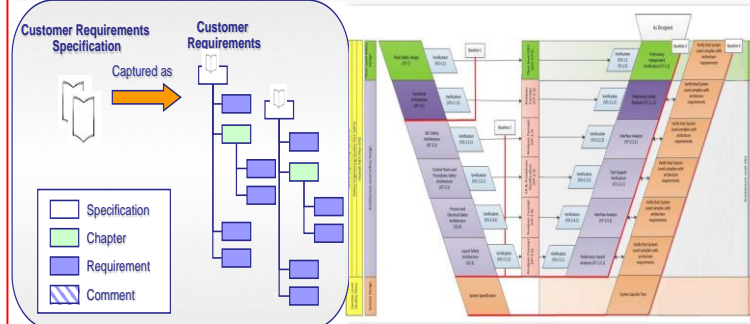
## Electronic equipment catalogue Digitization of the supplier market



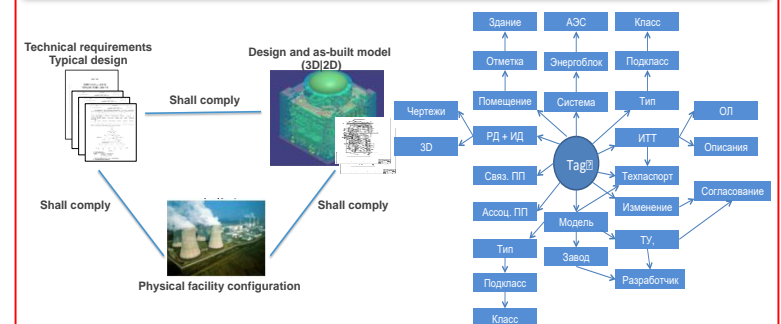
## Issue of the detailed design documentation from the information model



## Requirement management system = Facility complexity management



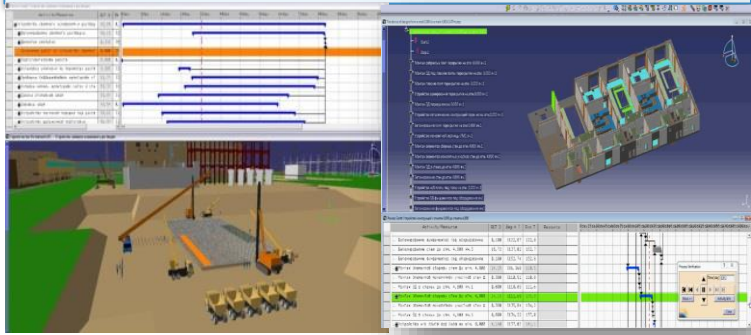
## Configuration management = change management



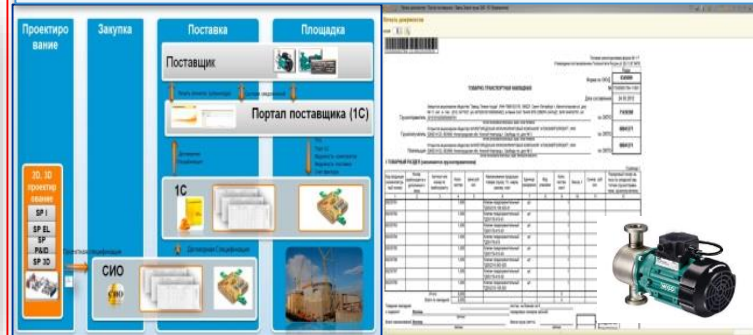
# CONSTRUCTION LIFE CYCLE STAGE



### Construction modeling Provable construction schedule



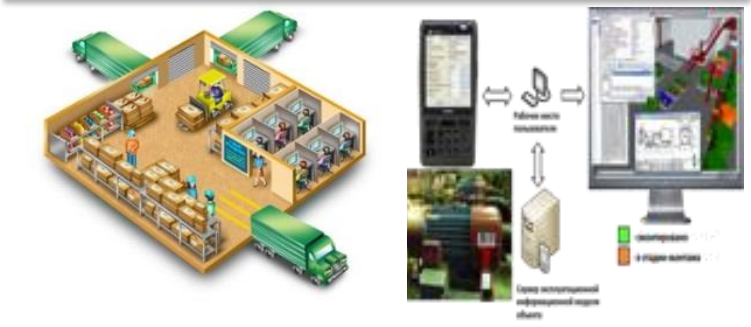
### Procurement-supplies management Supplier portal



### Field engineering Arrangement of the works at the site



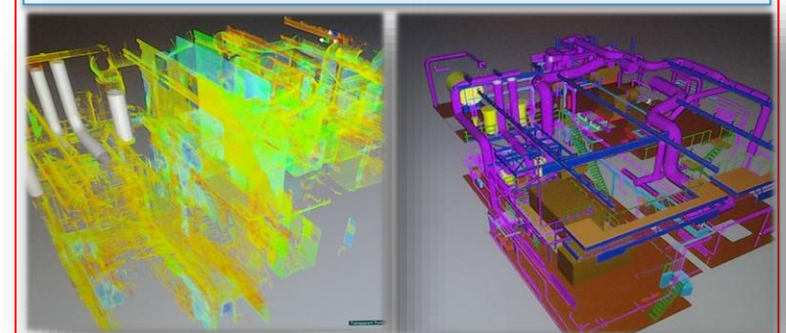
### Arrangement of the storage facility Bar coding



### Visual 3D modeling studio



### Generation of the as-built model









# PROJECT MANAGEMENT



### Unified schedule Deadline management

Индикаторы, определяющие уровень критичности проблемы

### Automated Cost Management System

### Risk management

### Incident management Support chain

Линия 1 - Индикатор

Линия 2 - 24

Линия 3 - 48

Линия 4 - 72

Линия 5 - 72

Линия 6 - 72

Линия 7 - 72

Линия 8 - Президент

Уровень иерархии в Компании

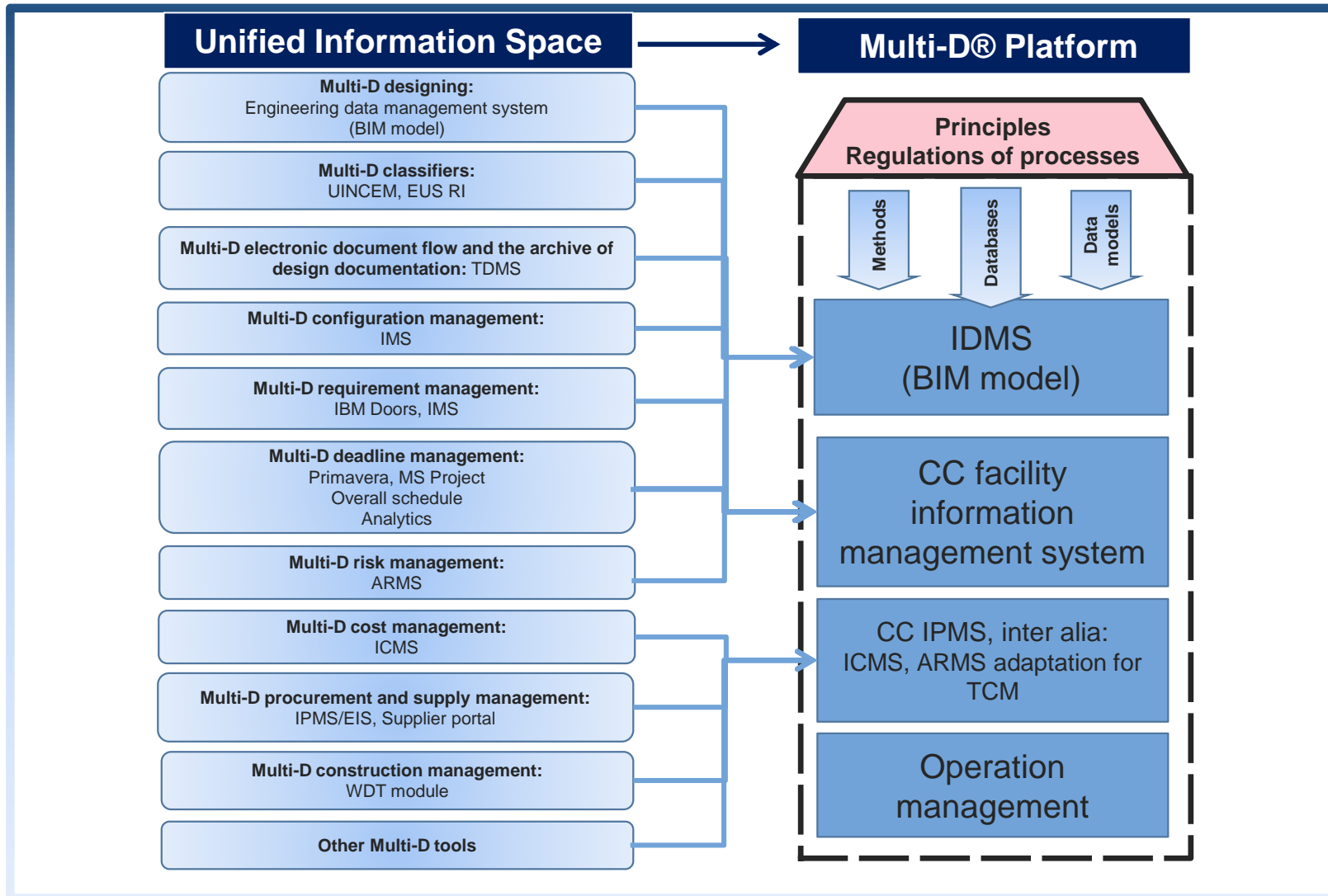
- Линия-02 Президент
- Линия-03 Старший вице-президент/УП
- Линия-04 (Старшие) Вице-президенты
- Линия-05 Функциональные блоки
- Линия-06 Проектный офис
- Линия-07 Филиал/Представительство
- Линия-08 Группа/управление/ЦП

### Communication management Project management portal

### Training and Certification Multi-D technology school

- Multi-D training and Project Managers and Teams Training Academy
  - Training modules: "Procurement management", "Sales management", "Chain-of-Supply management", "Construction management", "Multi-D Field Engineering", "Rosatom Industry system" etc.
- Personnel training at facilities under construction for Customers and Vendors
  - Preparation for construction projects – training provided for engineers and workers at the facilities under construction
- Long-term and short-term internship training for students
  - 150 Vietnamese workers worked as trainees at the Rostov NPP in 2014

# THE AGGREGATE OF UIS TOOLS CREATE THE INDUSTRY PLATFORM FOR MANAGEMENT OF THE LIFE CYCLE OF CAPITAL CONSTRUCTION FACILITIES



# MULTI-D PLATFORM IS AN INDUSTRY CHAIN CONVEYOR



**WHAT? Industrial Process Digital Platform** – means of production and management of complex engineering facilities digital information models throughout all life cycle stages

**WHAT DOES IT CONSIST OF?** It consists of:

- IT platforms and Software solutions based on IT platforms
- Tools generated on the basis of software solutions and technological management processes with digital interfaces
- Structures and updated data bases

**WHERE?** It is deployed in the relevant infrastructure within the information space

**WHO?** All participants of the industrial-technological investment process performing their roles using IT tools are subjects of the Platform

**WHAT FOR?** To create added value (of goods and services) within the digital economy and to reduce costs by means of modeling and optimization of design, construction, managerial solutions, using of reference standard solutions, transferring of routine works to smart computer programs, shortening time of production operations and minimizing errors and reworks.

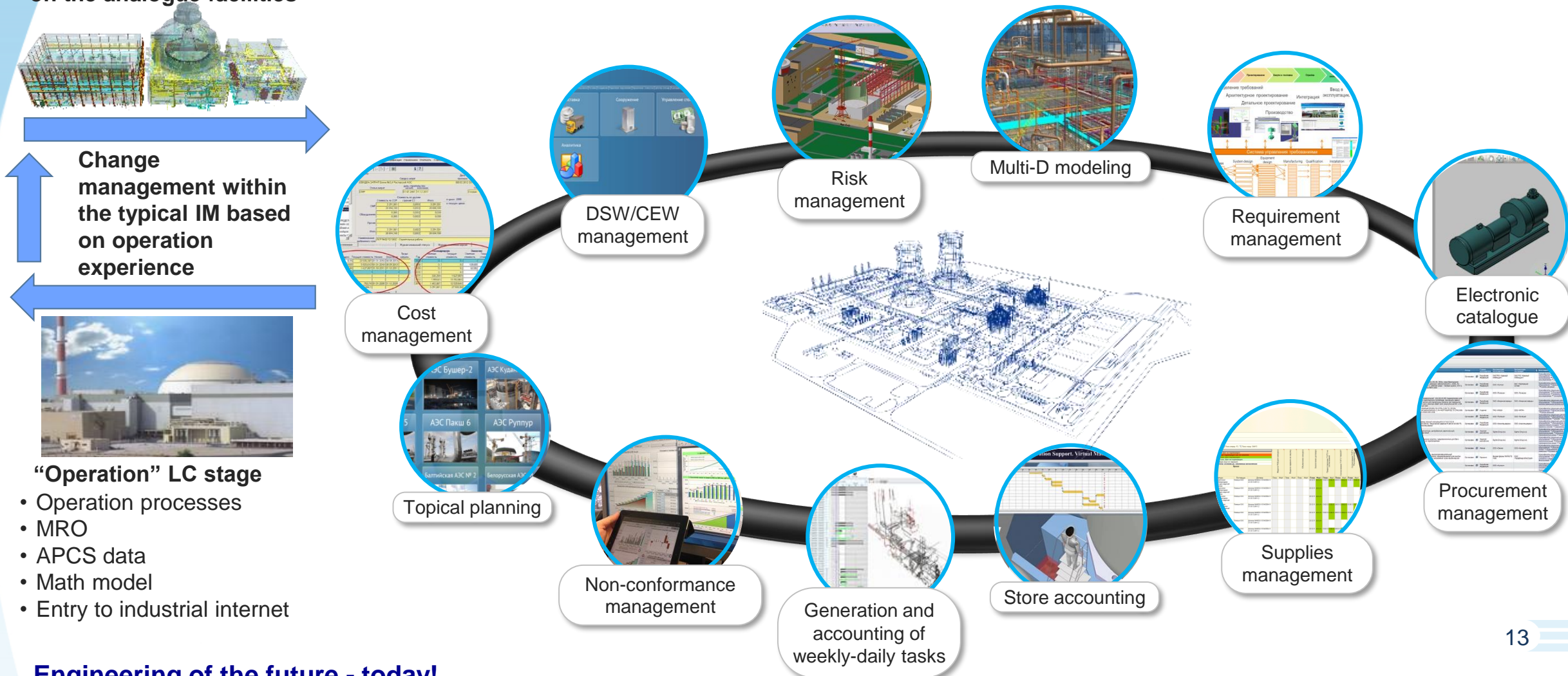
**It is an integral industrial and process part of the digital economy and the key component of a new technological wave generated in the course of the 4th Industrial Revolution**

# INFORMATION MODEL ON THE CONVEYOR



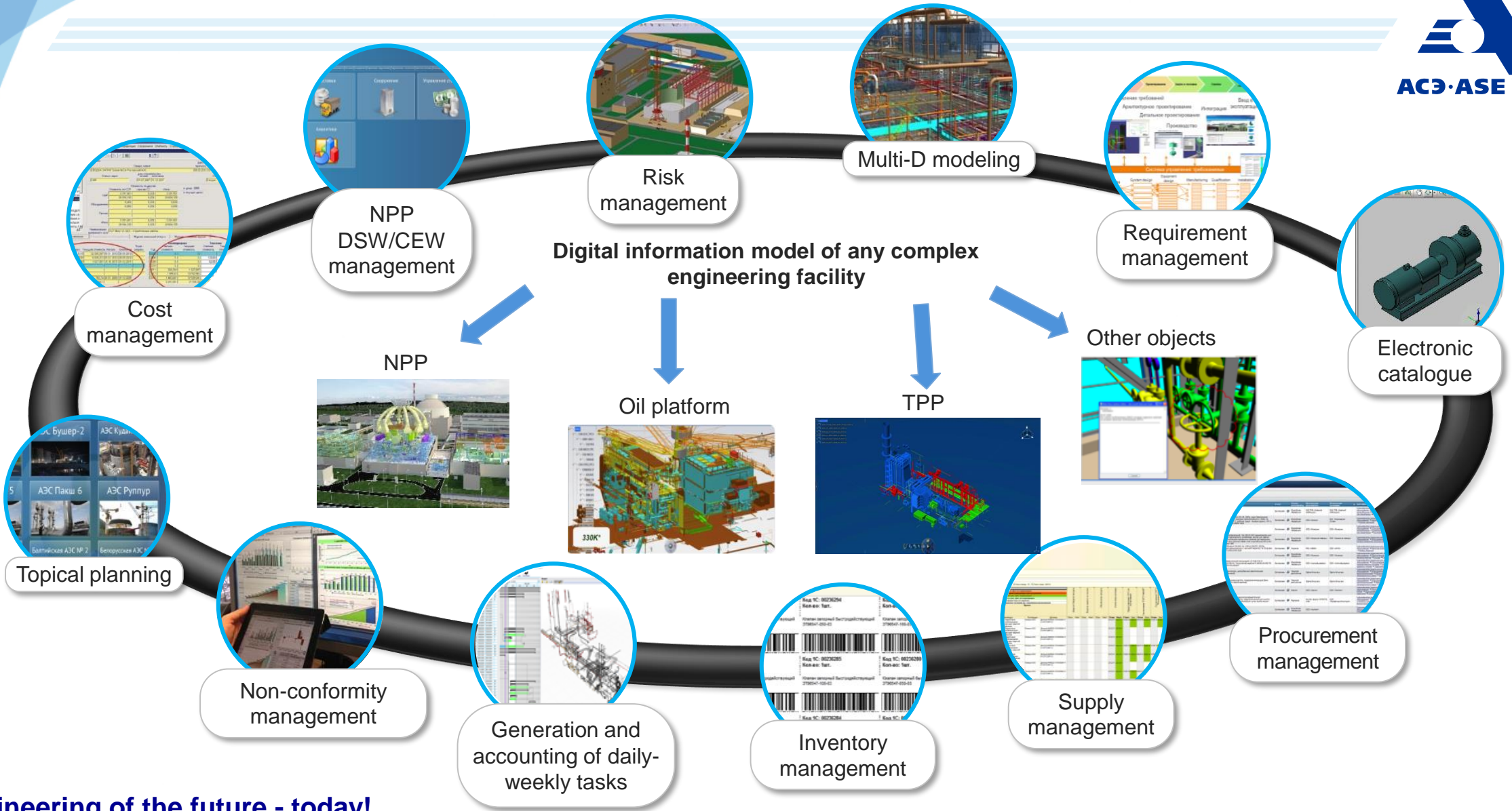
Typical information model based on the analogue facilities

“Design”, “Construction” Life Cycle stages





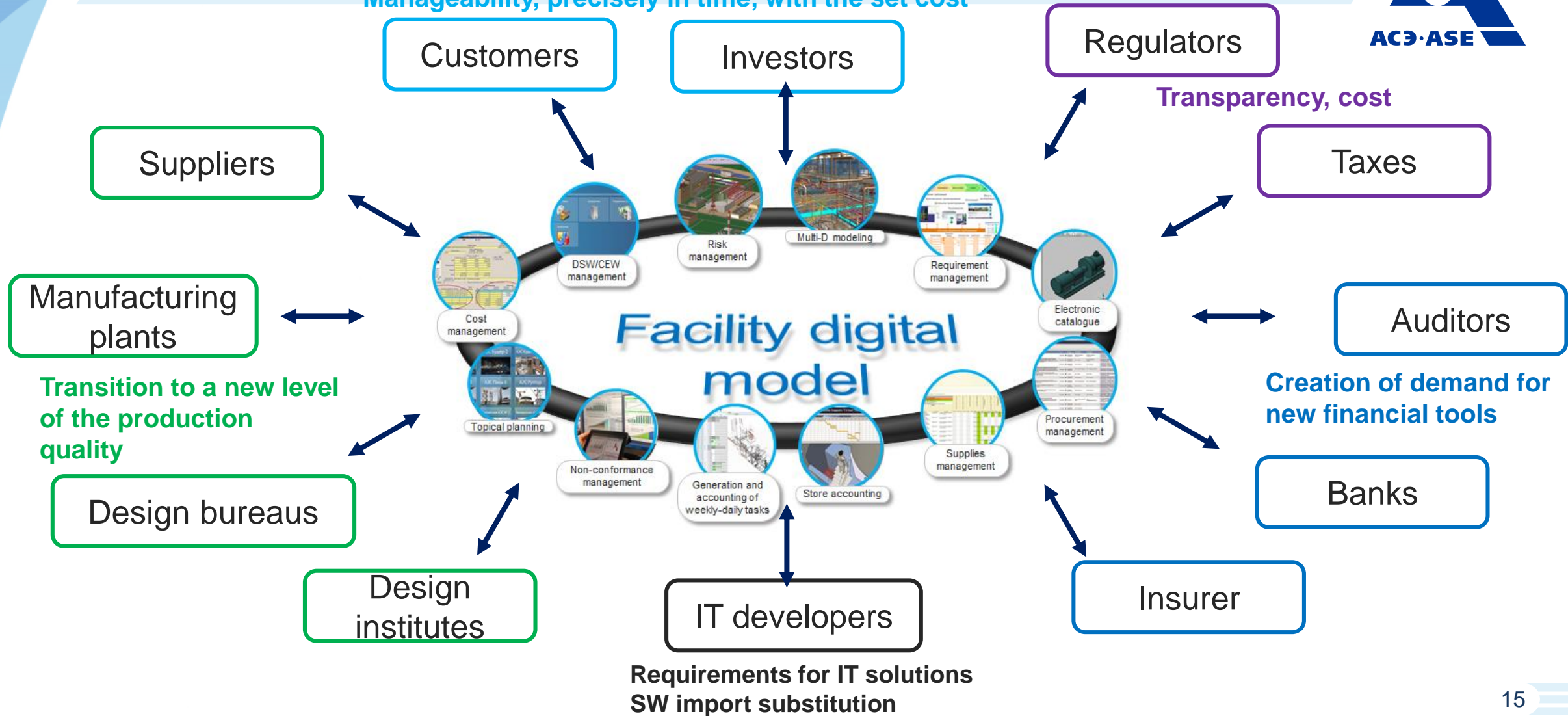
# INDUSTRIAL PROCESS DIGITAL MULTI-D PLATFORM FOR ANY COMPLEX CAPITAL FACILITIES



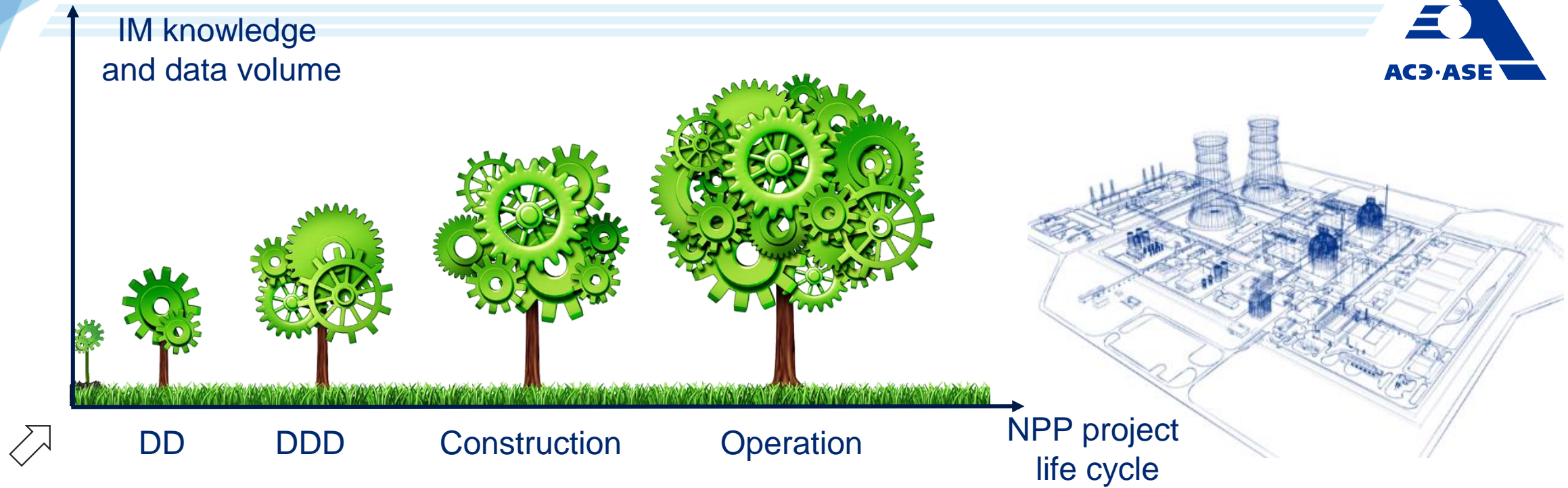
# MULTI-D PLATFORM – A PULLING MECHANISM FOR THE ECONOMY, CREATING THE ECOSYSTEM



Manageability, precisely in time, with the set cost



# INFORMATION MODEL DEVELOPMENT THROUGH THE LIFE CYCLE STAGES



NPP-2006  
NPP-92  
VVER-TOI  
V-320

**NPP information model (NPP IM) is the aggregate of INTERRELATED knowledge and data regarding a facility, stored in the electronic form according to the established rules.**

IM is generated at the stage of designing, and it is updated and filled throughout the whole NPP life cycle.

The information model is submitted to the Customer as a final product at the commissioning stage for using the data in operation management systems.



# INFORMATION INTERFACES OF MULTI-D TECHNOLOGY CREATE INDUSTRY CHAINS OF COOPERATION

Information interfaces allow to decrease the expenditures for communication and increase the quality of the result

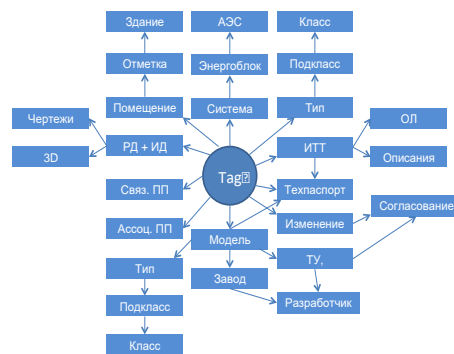


Interfaces	Interaction processes	Unified Information Space Tool	Status
<b>Design Unit – the Supplier</b>	Generation of the catalogue in the ITR section	Unified Industry Nomenclature Catalogue of Equipment and Materials (UINCEM)	All projects
<b>Design Unit – the Customer</b>	Concurrence of TC/ToR	TC/ToR portal	BelNPP, RoNPP, Kursk NPP-2
	Concurrence of TC/ToR	Supplier portal	BelNPP, RoNPP, Kursk NPP-2
	Concurrence of the documentation	FTP, SPF, TEDM (IMS module)	RoNPP, NVONPP-2, Kursk NPP-2, BelNPP
<b>Design Unit – the Designer</b>	Concurrence of the documentation connected with the requirements and configuration	IMS	Adjustment of the solution: Paks-2 NPP, Hanhikivi-1 NPP
	Creation of IM including 3D Concurrence of the documentation Generation of specifications	SPF SP3D SP P&ID	Rooppur NPP, Paks-2 NPP, Bushehr-2 NPP, Hanhikivi-2 NPP
<b>Design Unit – the Regulator</b>	Concurrence of the documentation	SPF	Rooppur NPP
<b>Supply Unit– the Supplier</b>	Concurrence of the equipment supply to the site, concurrence of the accompanying documentation	Supplier portal	RoNPP, NVONPP-2, Kursk NPP-2, BelNPP
<b>Supply Unit- the Designer</b>	Planning of the manufacture and supply	Supplier portal	Gidropress, AEM Turbine Technologies. Expansion to other AEM enterprises
<b>Supply Unit – the Customer</b>	Concurrence of the supply documentation	Supplier portal	RoNPP, NVONPP-2, Kursk NPP-2, BelNPP
<b>CEW Unit – the Customer</b>	Electronic concurrence of certificates for pipelines and equipment	System certificates portal	RoNPP
<b>Project Management Unit – the Customer</b>	Monitoring of deadlines	Unified schedule	RoNPP, NVONPP-2, Kursk NPP-2, BelNPP, LNPP-2
	Monitoring of the cost	ACMS	The access is provided for RoNPP, NVONPP-2, Kursk NPP-2 Improvement of the tool for the Customer requirements

# MULTI-D MARKET PLATFORM DIGITAL ENGINEERING CATALOGUE OF EQUIPMENT



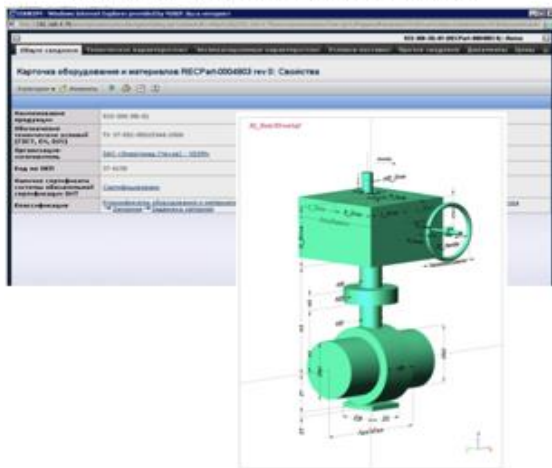
Карточка оборудования и материалов RECPart.0018769 rev 0: Свойства	
Внутренний диаметр цилиндрической части	0.8 metr
Давление гидрокислородный	1.2 pascal
Конструктивное исполнение	Цилиндрический горизонтальный сосуд, состоящий из обечайки и приваренных к ней двух эллиптических днищ
Максимальная рабочая температура	130.0 celcius
Максимальное рабочее давление	0.8 megapascal
Максимальное расчетное давление	0.8 megapascal
Масса заполненного аппарата	1495.0 kilogram
Материал корпуса	08X18H10T
Номинальный объем	1.0 m3



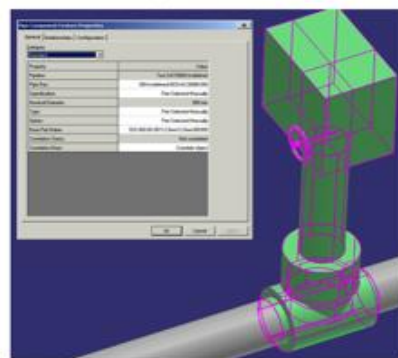
Complete engineering description of equipment for the whole life cycle – the basis for a qualitative production catalogue

- Equipment classes classification with inheritance of attributes
- Detailed attributive structure describing the equipment
- Engineering description, documentation, information 3D models in neutral formats including intellectual connection points
- Initial technical requirements
- Support of different classifications “customized”, “project based”
- Multilinguality
- Link to design and information modeling systems
- Localization technology, detailed requirements for import substitution
- Operation feedback, rating of goods and suppliers
- Notification regarding subscription of suppliers/buyers on request/offer for a category of goods

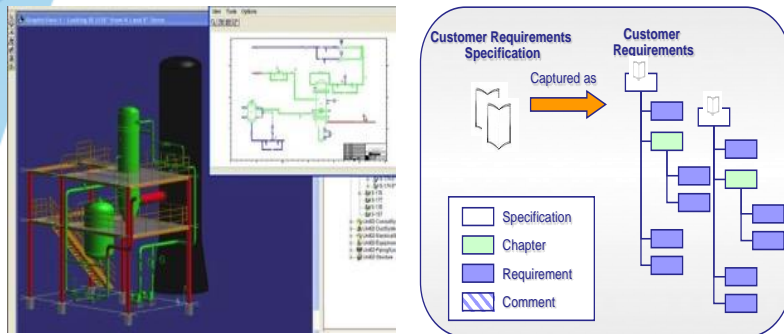
Задвижка запорная 933-300-ЭБ-01 в ЕОНКОМ



Задвижка запорная 933-300-ЭБ-01 в SP3D

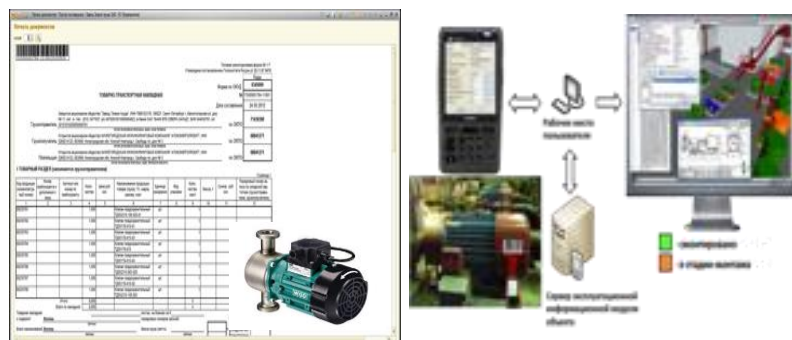
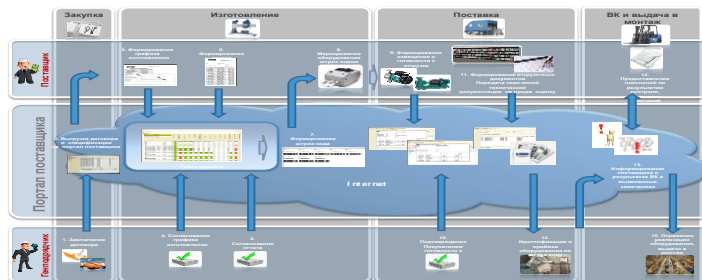


# MULTI-D MARKET PLATFORM COOPERATION DIGITAL CHAINS



## CUSTOMER - DESIGNER – SUPPLIER - MANUFACTURER

- Providing the market with initial technical requirements in a digital form
- Technical assessment of suppliers' offers by customers/designers
- Automated analysis of supply and demand, typing demand management
- Generation of procurement demand considering ready-made market offers
- Selection of requirements on the part of the regulatory authority to take them into account in the buyer's requirements for a supplier
- Suppliers pre-qualification and selection of the procurement strategy
- Electronic agreement of equipment requirements per each attribute of goods, TS/TA
- Agreement of delivery terms, including standardized life cycle
- Goods configuration management, change management
- Automated tracking of goods within the approved life cycle
- Visual remote control of manufacturing, logistics, installation
- Agreement of inspection/test/incoming inspection program
- Non-conformity management in the course of incoming inspection



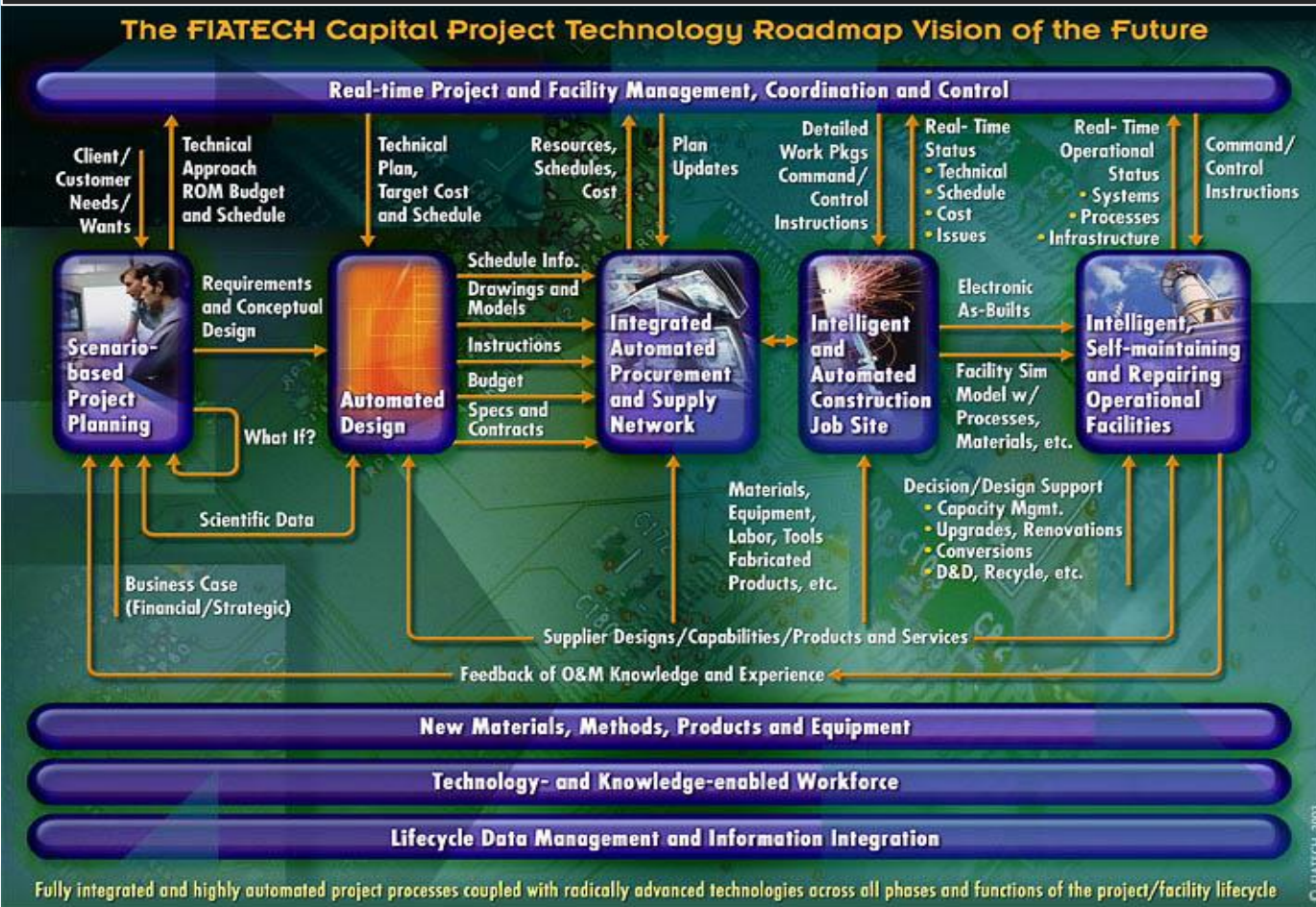


# BEST PRACTICE OF PROJECT MANAGEMENT BASED ON INFORMATION MODELLING



FULL and INVIOABLE life cycle management scheme created in the beginning of 2000 by FIATECH, a globally renowned association in the field of complex projects management systems

ASE project management standard is recognized by the world professional community



**Best in Russia** – the 3d class of the **Company competence** in the field of project management on the international level based on IPMA-Delta model

**First top** in the Operational Excellence nomination at the International atomic exhibition in Le Bourget (Competitors – French companies Apave и EDF)

**Triumph** in the International contest **Fiatch CETI Award 2016**, the USA in mega-project nomination with project «Life cycle management based on Multi-D® Technology at Rostov NPP»

**Best BIM in Russia** - First place in competition “BIM technologies 2016” with Kursk -2 NPP

# THANK YOU

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ASE Group

# BACK-UP

# STATE PROGRAM «DIGITAL ECONOMICS OF THE RUSSIAN FEDERATION» (THE PROJECT DEVELOPED BY THE MINISTRY OF COMMUNICATIONS)

## 8 directions are highlighted in the draft state program:

- state regulation
- information infrastructure (including the network of the data processing center)
- R&D
- staff and education
- information security
- state governance
- smart city
- digital healthcare

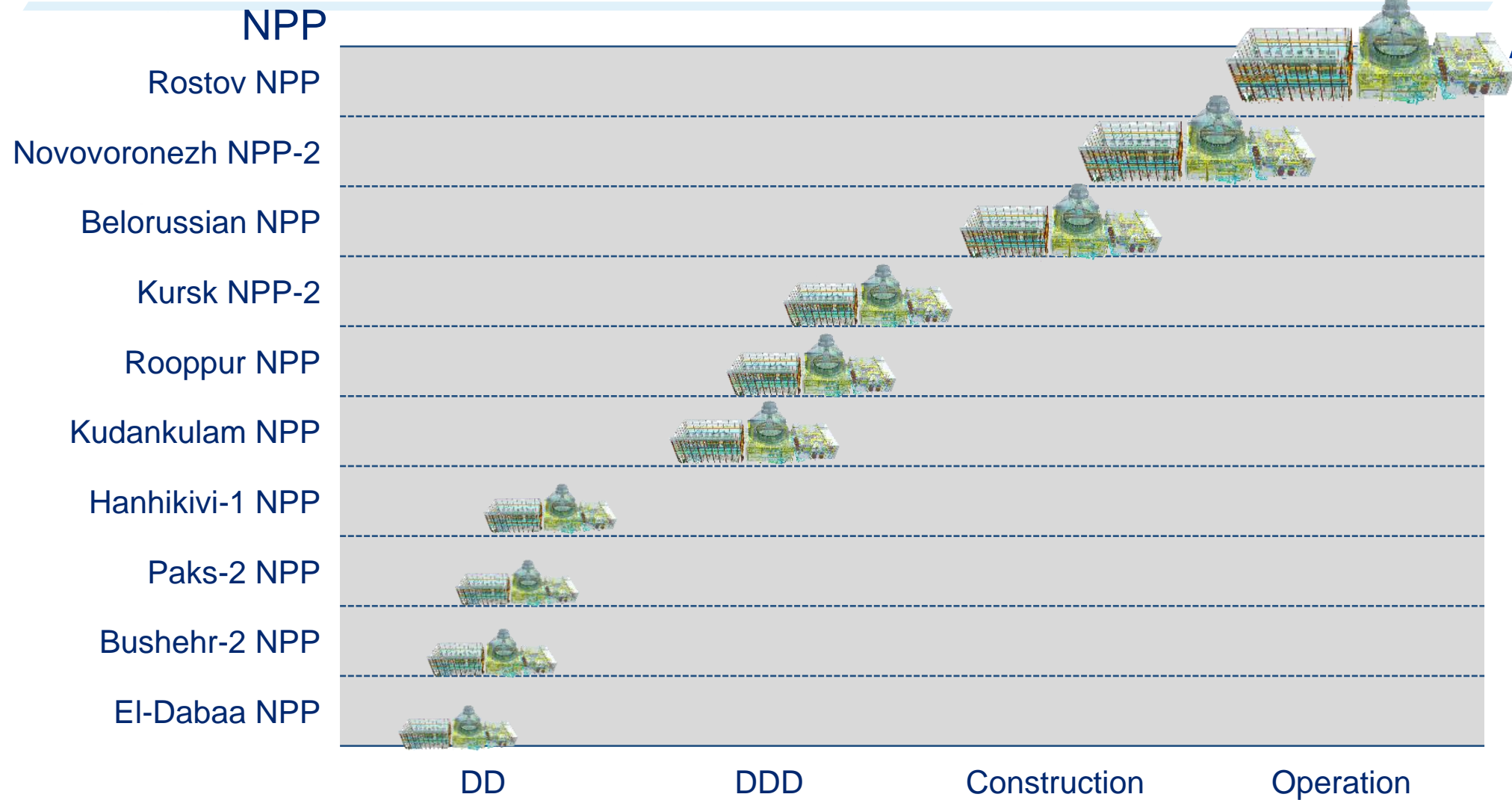
## Main results of the state program implementation in 2025:

- creation of not less than 10 digital platforms, the first one - in 2017;
- operation of not less than 10 companies-champions in the sphere of «end-to-end» technologies;
- not less than 10 test fields for practicing «end-to-end» technologies;
- creation of the information infrastructure with priority use of domestic technologies;
- broadband internet, networks of generation 5, sputnik and/or technologies of access to Internet in the distant regions;
- the network of centers for collective use of the digital equipment;
- operation of the system for preparation of the staff for the digital economics;

**AMONG THE DIRECTIONS THERE ARE NO INDUSTRIAL AND CONSTRUCTION SECTORS OF THE ECONOMICS**



# PARALLEL DEVELOPMENT OF THE INFORMATION MODELS



NPP project life cycle

# ASE – RFNC-VNIIEF COOPERATION AGREEMENT

## Benefits of the Russian Federation:

- (a) advanced digitization of the capital construction and other segments of the real sector of the economics;
- (b) increasing of independence from import in SAPR and other SW;
- (c) formation of the industry of domestic super-computers and components of cyber-physical systems;
- (d) military and industrial complex information security and independence from import;

## 4.2. Benefits of SC Rosatom:

- (a) digitization of the industry;
- (b) increasing of effectiveness of the industry specialization and cooperation on the basis of digital platform solutions and end-to-end digital links;
- (c) diversification;

## 4.3. Benefits of RFNC-VNIIEF:

- (a) monetization and expansion of the scales of activity on digital transformation of operating production enterprises and creation of new digital ones;
- (b) use and transfer (through cooperation with ASE) of the best world practices;

## 4.4. Benefits of ASE:

- (a) decrease in the risk of dependence from world monopoly vendors;
- (b) Speedup of ASE transformation into the digital engineering company of high maturity;
- (c) development of Multi-D based multi-profile industrial and technological platform (digital factory digital factories).



## INDUSTRY CONFERENCE «DIGITAL ECONOMICS»

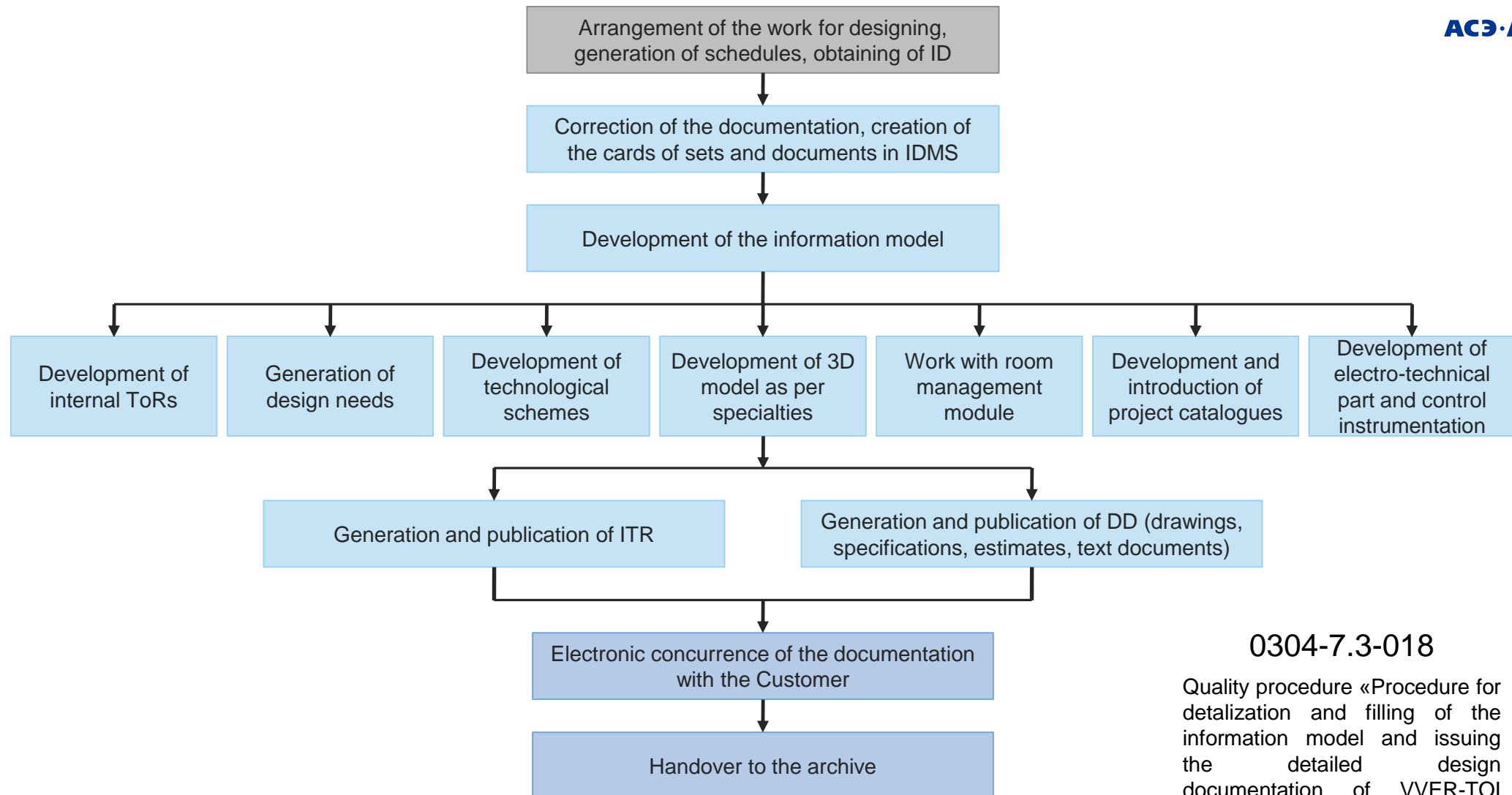


- ✓ Launching of industry program «Digital transformation of the industry» (hereinafter - the Program).
- ✓ Sending of a letter of State Corporation “Rosatom” Director General to the assistant of the President of the Russian Federation A.R. Belousov with the proposal on inclusion of “Digital industry and construction” direction into “Digital economics” program.

**In part of direction “Digital platform. Digitization of the life cycle of complex engineering facilities” the following projects should be included in the Program:**

- «Multi-D platform for management of the life cycle of complex engineering facilities (The factory of factories)», the competence center on the basis of JSC ASE EC, FSUE RFNC-VNIIEF;
- «Complex items trading platform (Multi-D Market)», the competence center on the basis of JSC ASE EC, FSUE RFNC-VNIIEF;
- «Full life cycle system «Digital enterprise», the competence center on the basis of FSUE RFNC-VNIIEF, JSC ASE EC;
- «The platform of engineering analysis and super-computer modeling «LOGOS», the competence center on the basis of FSUE RFNC-VNIIEF, JSC ASE EC.

# SCHEME OF FILLING THE INFORMATION MODEL AND GENERATION OF THE DOCUMENTATION



0304-7.3-018

Quality procedure «Procedure for detalization and filling of the information model and issuing the detailed design documentation of VVER-TOI series NPP designs»