Commissioning of new nuclear power units in Russia

Lessons learnt and key issues arising in new construction

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РОСЭНЕРГОАТОМ

ЭЛЕКТРОЭНЕРГЕТИЧЕСКИЙ ДИВИЗИОН РОСАТОМА

Construction of new nuclear power units in Russia

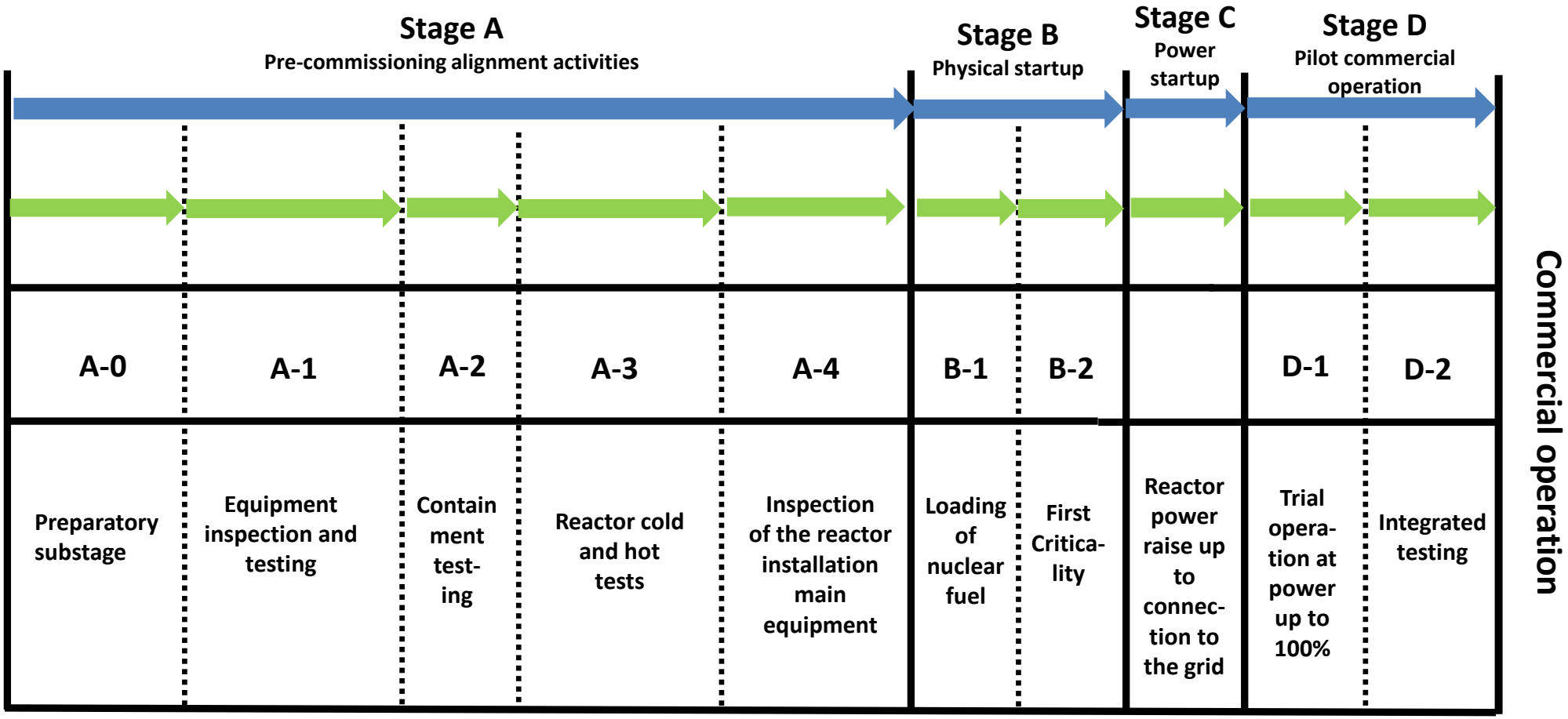
Units under construction:

Rostov NPP unit No. 4 (VVER-1000)
Leningrad NPP-II unit No. 1 (VVER-1200)
Novovoronezh NPP-II unit No. 2 (VVER-1200)
Leningrad NPP-II unit No. 2 (VVER-1200)
Kursk NPP-II unit No. 1 (VVER-TOI)
Kursk NPP-II unit No. 2 (VVER-TOI)

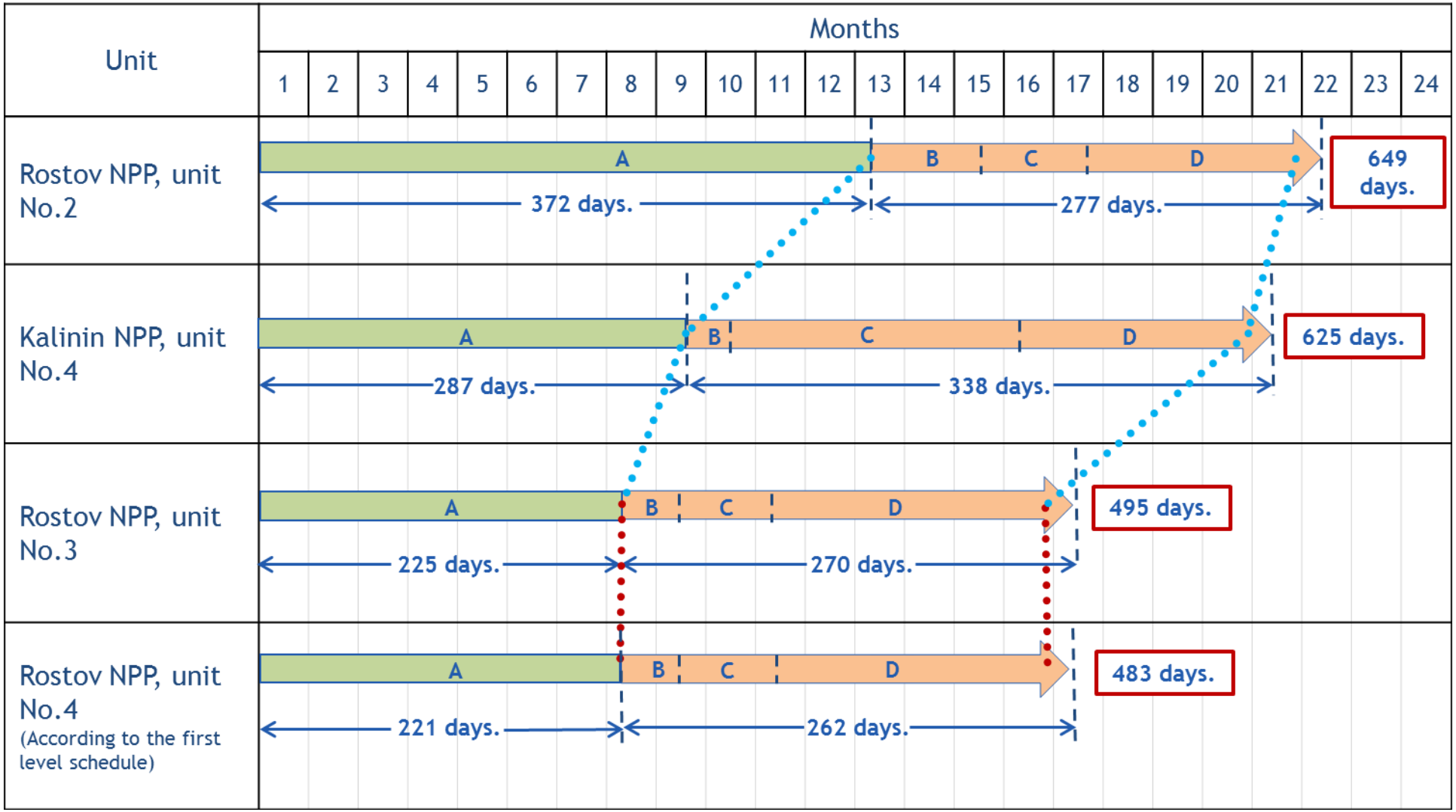
The following units were put in commercial operation:

Rostov NPP unit No. 3 (VVER-1000) - 2015
Beloyarsk NPP unit No. 4 (BN-800) - 2016
Novovoronezh NPP-II unit No. 1 (VVER-1200) - 2017

Generic commissioning schedule for a VVER nuclear power unit

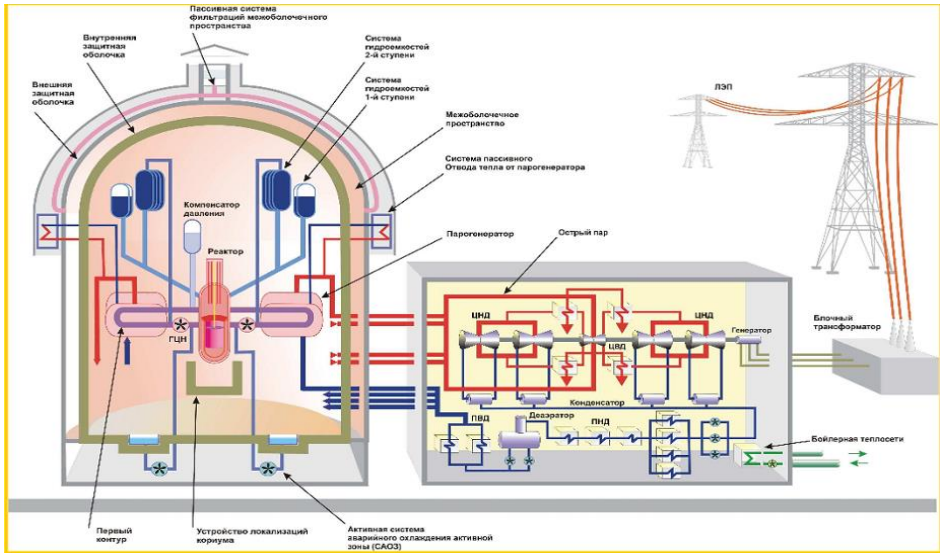


Duration of commissioning period for a VVER-1000 nuclear power unit



AES-2006 design with VVER-1200 reactor installation

Key milestones in the project implementation	
Commencement of the unit construction	2007
Beginning of the physical startup (B) Reactor reached the minimum controllable power level	23.03.2016 20.05.2016
Beginning of the power startup (C)	08.07.2016
Beginning of the pilot commercial operation (D)	09.09.2016
Putting the unit into commercial operation	27.02.2017



Basic Technical Charachteristics
(Novovoronezh NPP-II unit No. 1)

Thermal power: 3200 MW
Lifetime: 60 years
Combination of active and passive safety systems
New systems for management of beyond-design basis accidents
Double shell containment

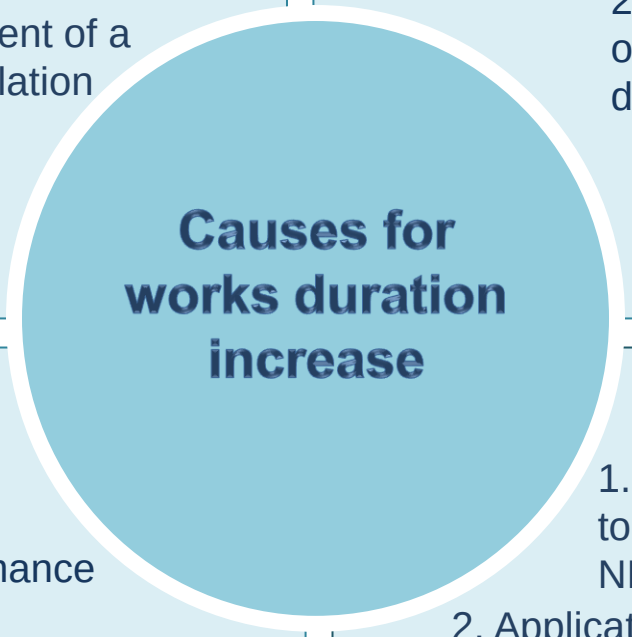
Main causes of the commissioning stages duration increase in case of Novovoronezh NPP-II unit No. 1

Organization and planning of the activities:

1. Partial unavailability of compartments and systems for transition to the next stages;
2. Non-readiness to installation of some systems by the time of commencement of a next stage of construction and installation activities;
3. Overlapping of construction, installation and commissioning activities

Documentation:

1. Changes in design documentation at the unit commissioning stage;
2. Delayed development and updating of commissioning and operational documentation;
3. Deviations from the quality requirements of commissioning and operational documentation



Equipment:

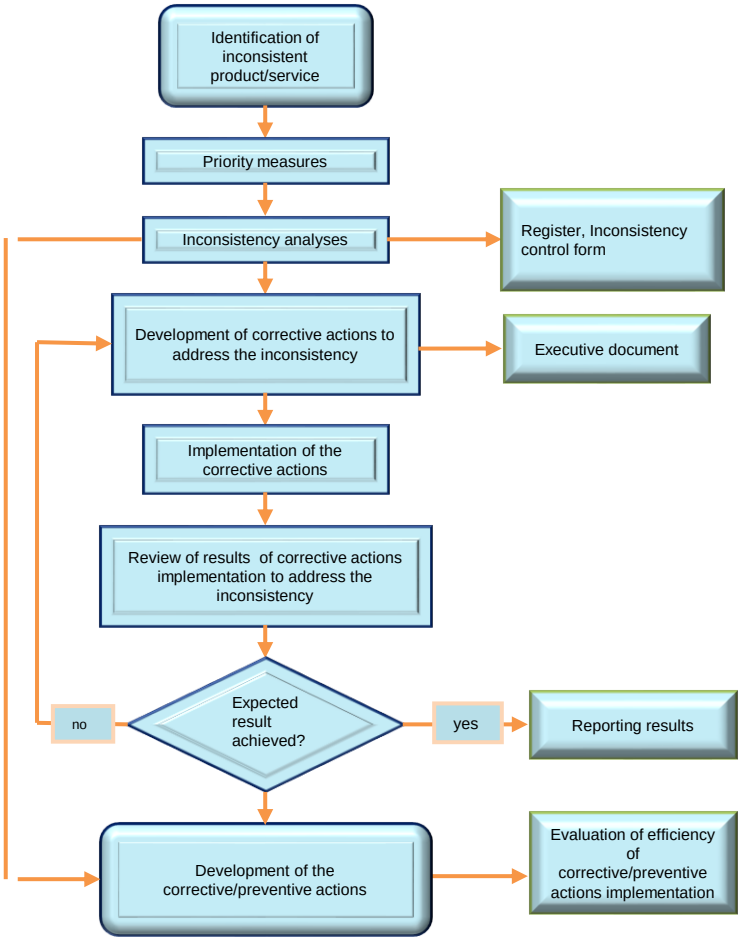
1. Delayed delivery of equipment and pipelines;
2. Delivered equipment non-conformance to the quality requirements;
4. Identified inconsistencies of the delivered equipment with the design requirements;
3. Defects and inconsistencies identified during various commissioning stages

Design solutions

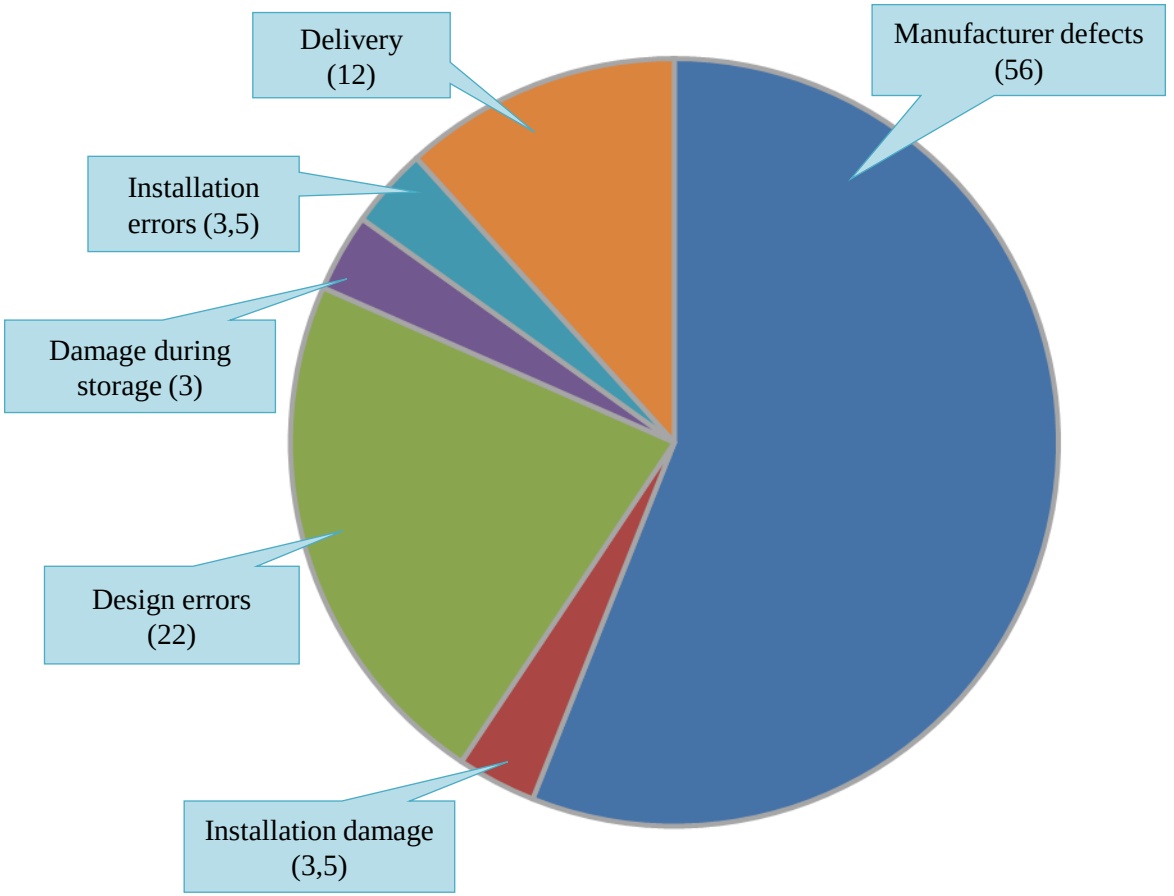
1. Design solutions that insufficiently took into account the experience of the NPP units commissioning;
2. Application of new and no-reference equipment;
3. Inconsistency of the design solutions with the requirements of the newly imposed codes and standards

Management of inconsistencies

Management of inconsistencies



Distribution of the inconsistencies identified by their main causes - the example of Novovoronezh NPP-II unit No. 1 commissioning (percentage)



Key areas for resolution of the issues arising during commissioning of nuclear power units under construction

Organization and planning of the activities:

1. Establishment of a group for operative planning, management and coordination of works;
2. Establishment of a group for operative management and coordination of works in terms of addressing the comments to licensing documentation;

Documentation:

1. Improvement of the regulatory basis for commissioning activities;
2. Systematic monitoring of commissioning and operational documentation development;
3. Development of corporate standards with focus on the order of conducting the concurrent construction and commissioning activities;

Equipment:

1. Control of equipment quality and delivery deadlines;
2. Improvement of the system for inconsistency management and accounting of operating experience;
3. Application of reference equipment with positive operating record;

Personnel:

1. Advanced personnel recruitment to ensure operating preparedness at early stages of the nuclear power unit construction;
2. Strengthening the shifts during the NPP commissioning period to meet the requirement of the work orders and permits system.

Thank you for your attention