



РОСЭНЕРГОАТОМ

ЭЛЕКТРОЭНЕРГЕТИЧЕСКИЙ ДИВИЗИОН РОСАТОМА

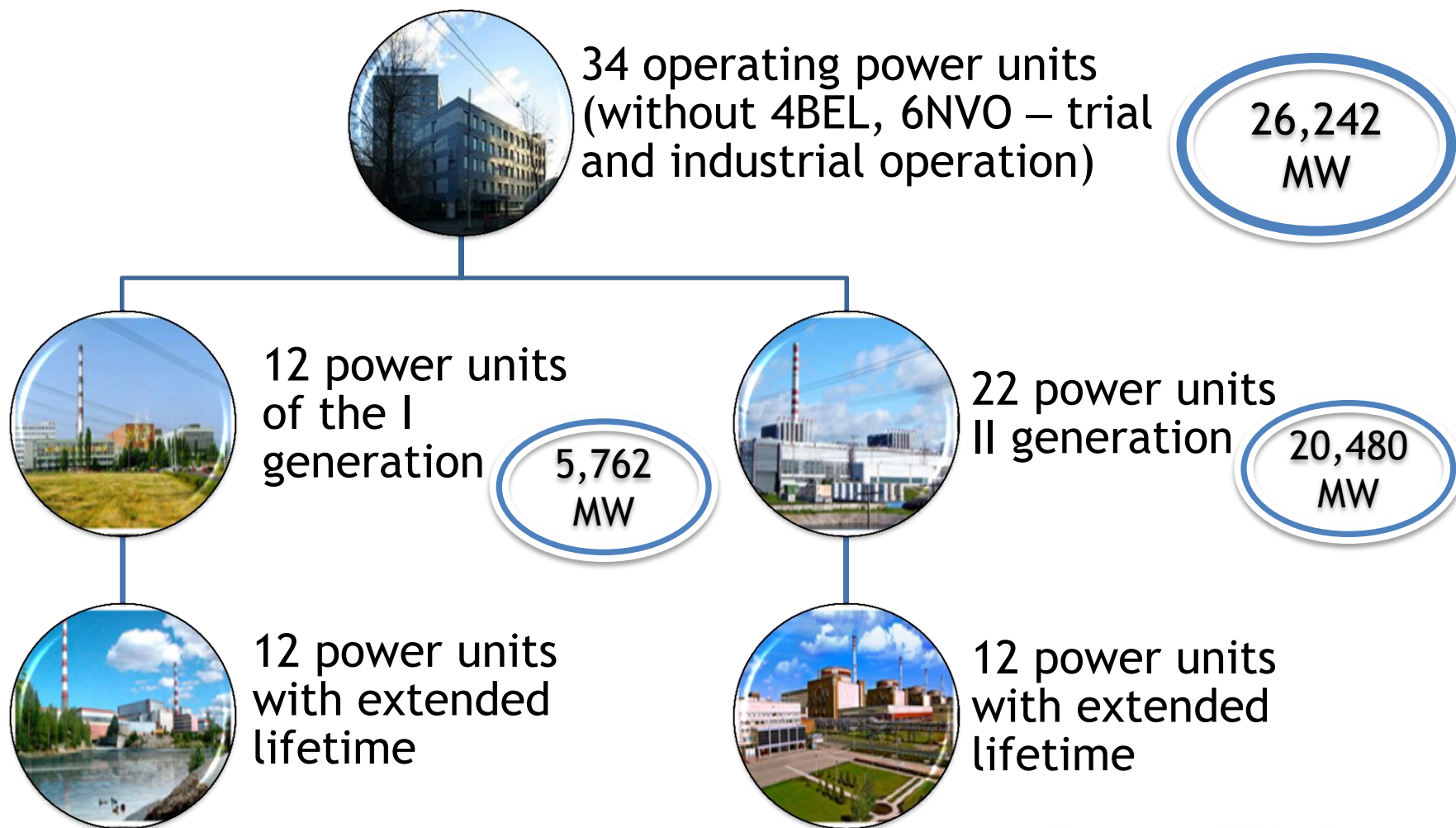
Lifetime Extension for NPP Units of the Russian Federation

***Speaker: Chief Technologist of Department for Production
Planning, Modernization and Lifetime Extension***

Gilev Vitaly Anatolyevich

www.rosenergoatom.ru

Designs of Operating NPPs



Strategy of Operating Organization on Lifetime Extension for NPP Power Units

Energy strategy of Russia for the period till 2030

(approved by Order of the Government of the Russian Federation No.1715-p dated November 13th, 2009)

State Program of the Russian Federation “Development of Nuclear Power Generation Complex”

(approved by Order of the Government of the Russian Federation No.506-12 dated June 2nd, 2014)

Strategy of Rosatom State Atomic Energy Corporation for the period till 2030

“Program of Lifetime Extension for Operating NPP Power Units of Rosatom State Atomic Energy Corporation for 2013–2023”

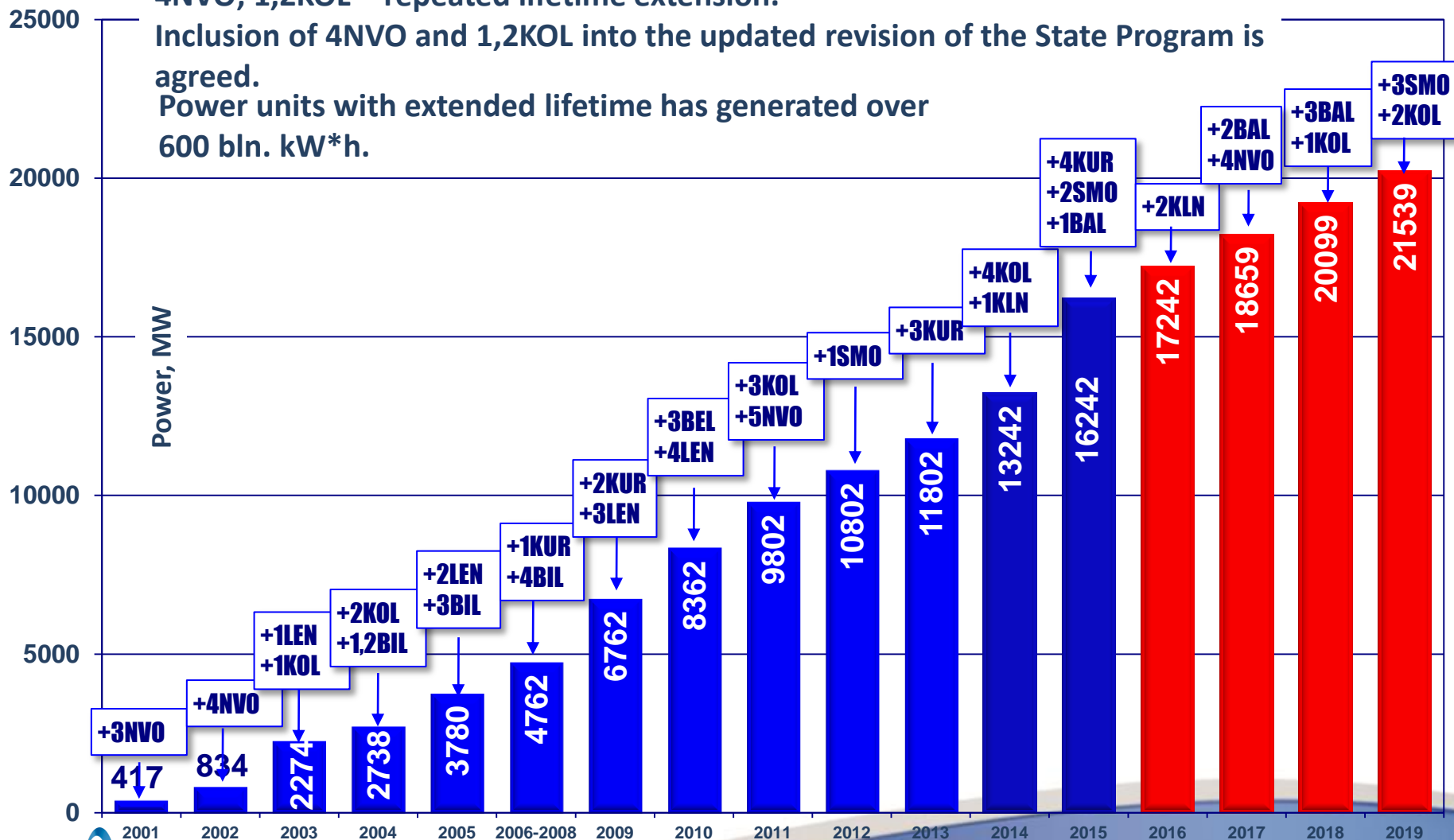


State Program of the Russian Federation “Development of Nuclear Power Generation Complex” with Regard to Preservation (Lifetime Extension) of Generating Capacities for NPP Power Units

4NVO; 1,2KOL – repeated lifetime extension.

Inclusion of 4NVO and 1,2KOL into the updated revision of the State Program is agreed.

Power units with extended lifetime has generated over 600 bln. kW*h.



РОСЭНЕРГОАТОМ
ЭЛЕКТРОЭНЕРГЕТИЧЕСКИЙ ДИВИЗИОН РОСАТОМА

Status of Works on Lifetime Extension of NPP Power Units

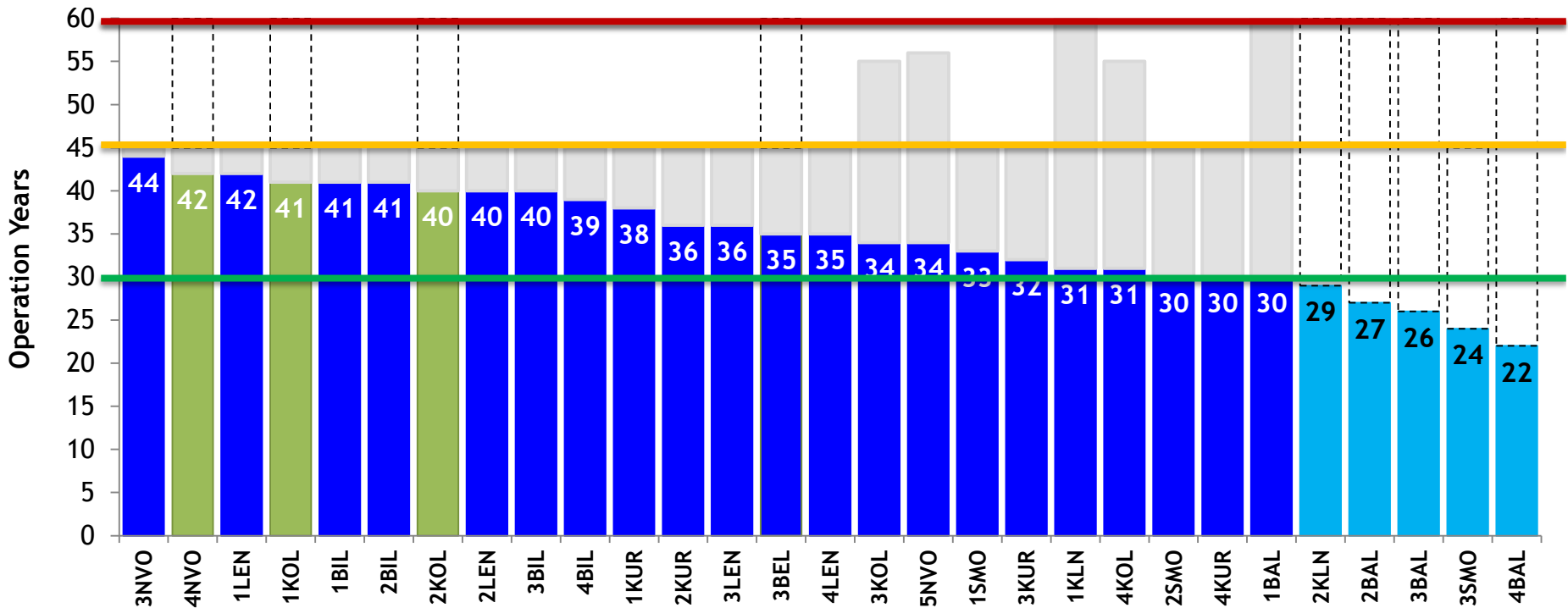
■ works on lifetime extension in excess of 30 years have been performed

■ works on lifetime extension in excess of 45 years are performed

□ planned operating lifetime

■ works on lifetime extension in excess of 30 years are performed

■ decisions of Rosatom State Atomic Energy Corporation for lifetime extension are executed



34 power units in industrial operation

24 power units having passed lifetime extension

power units under lifetime extension program implementation

8 2-4BAL NPP; 2KLN NPP; 1,2KOL NPP (repeated lifetime extension); 4NVO (repeated lifetime extension); 3SMO



РОСЭНЕРГОАТОМ
ЭЛЕКТРОЭНЕРГЕТИЧЕСКИЙ ДИВИЗИОН РОСАТОМА

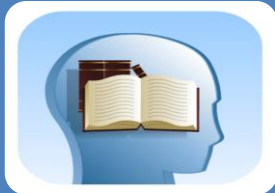
Concept of Lifetime Extension for Power Units of Operating NPPs



Conservatism of accepted designing basis for substantiation of 30-year operating lifetime for operating NPP



Significant modernization volume during design operating lifetime



New knowledge in the area of material sciences, assessment of safety and life, design codes



Specific financial costs for extension of power unit lifetime is significantly less than costs for putting any new power units into operation

The basic factors to make a decision about lifetime extension for NPP power units

The decision about power unit preparation for lifetime extension and determination of duration for additional operating lifetime of NPP power units

The possibility to ensure and maintain safety during further operation

Availability of the possibility for temporary storage of additional enriched nuclear fuel amount or its removal from the site

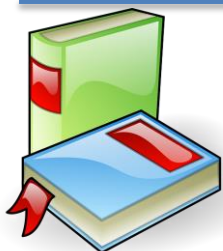
Raising of the safety level by modernization and replacement of equipment

Availability of the required remaining life for nonrecoverable elements of the power unit

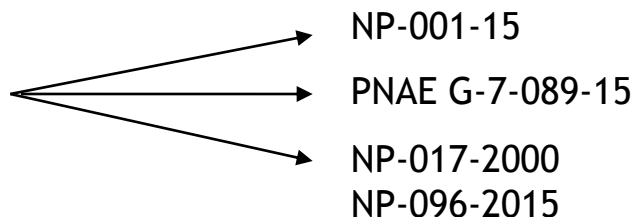
The possibility to ensure safety at handling of RW produced during additional lifetime



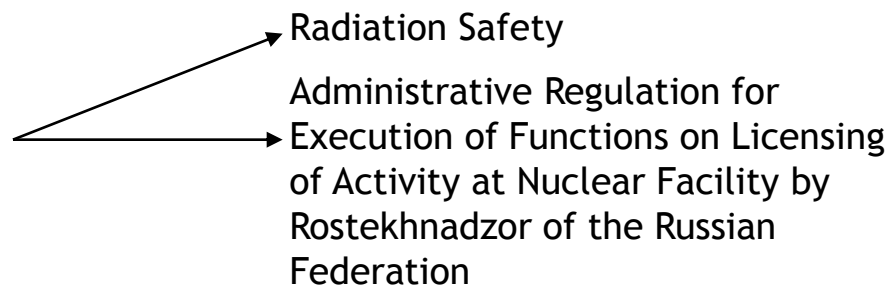
Normative Base for Lifetime Extension



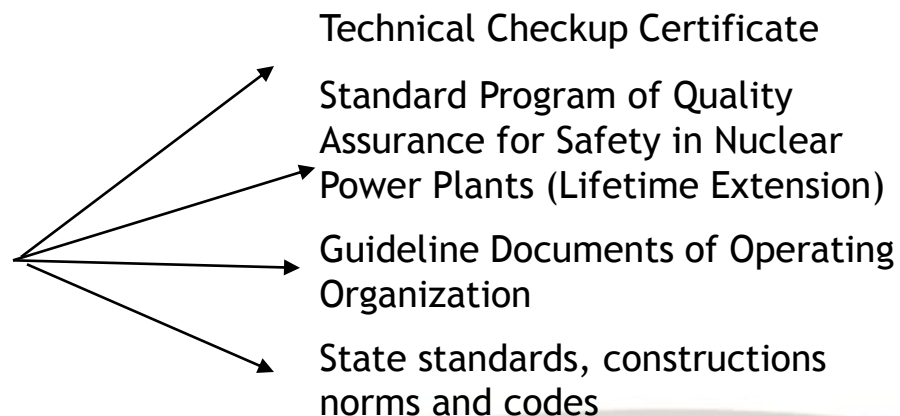
Federal rules and regulations in the area of nuclear energy use



Normative documents of state safety regulatory authorities

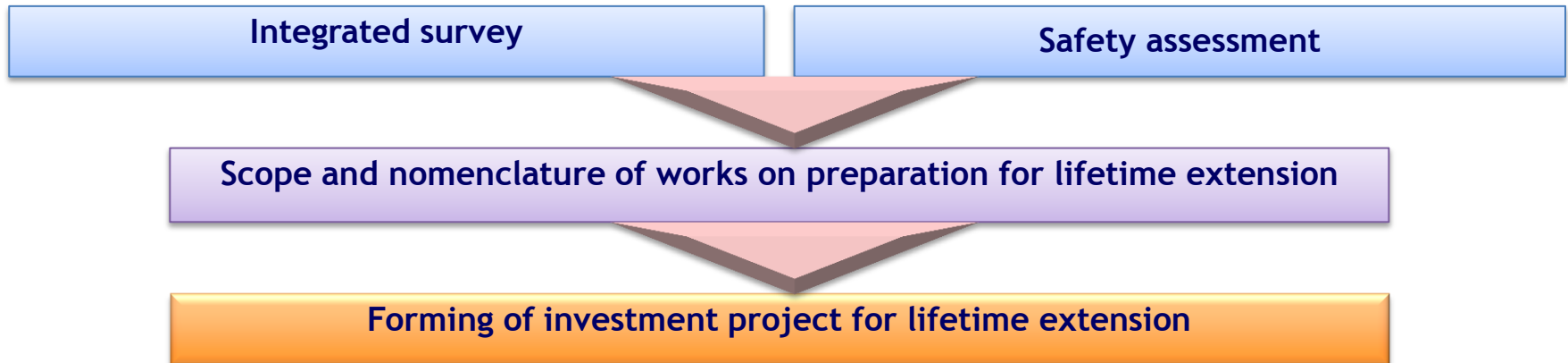


Normative documents of operating organization, standards constructions norms and codes

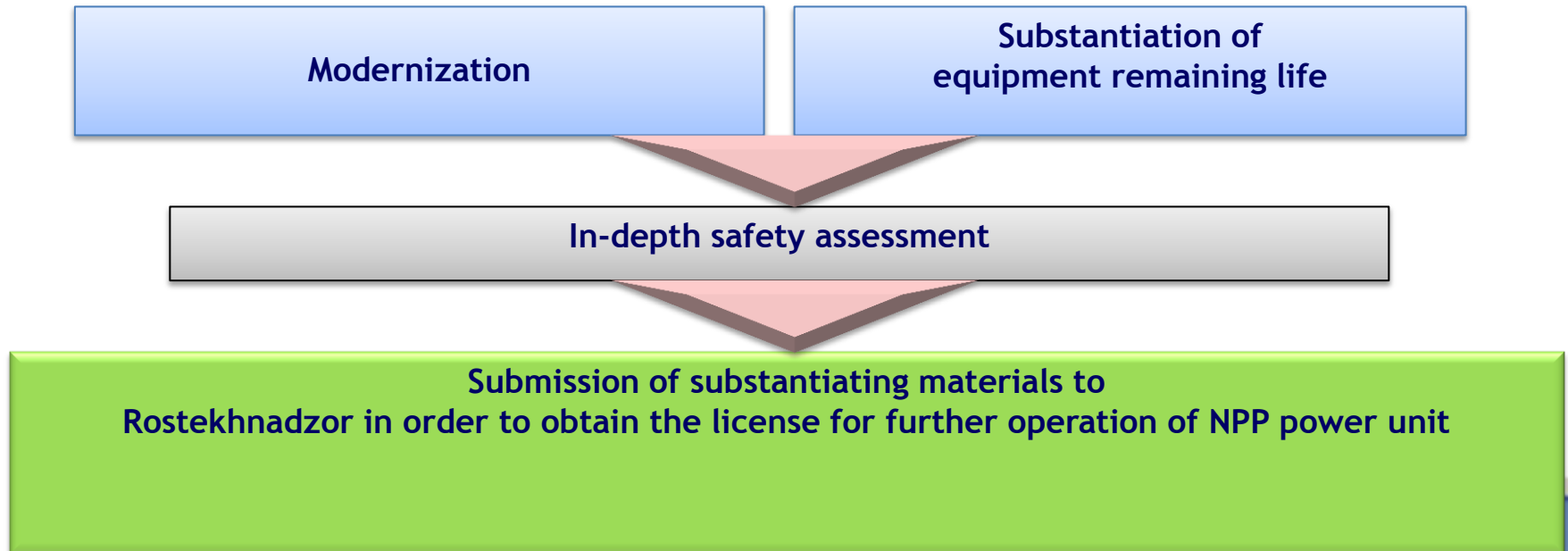


Procedure on preparation for lifetime extension of NPP Power Units

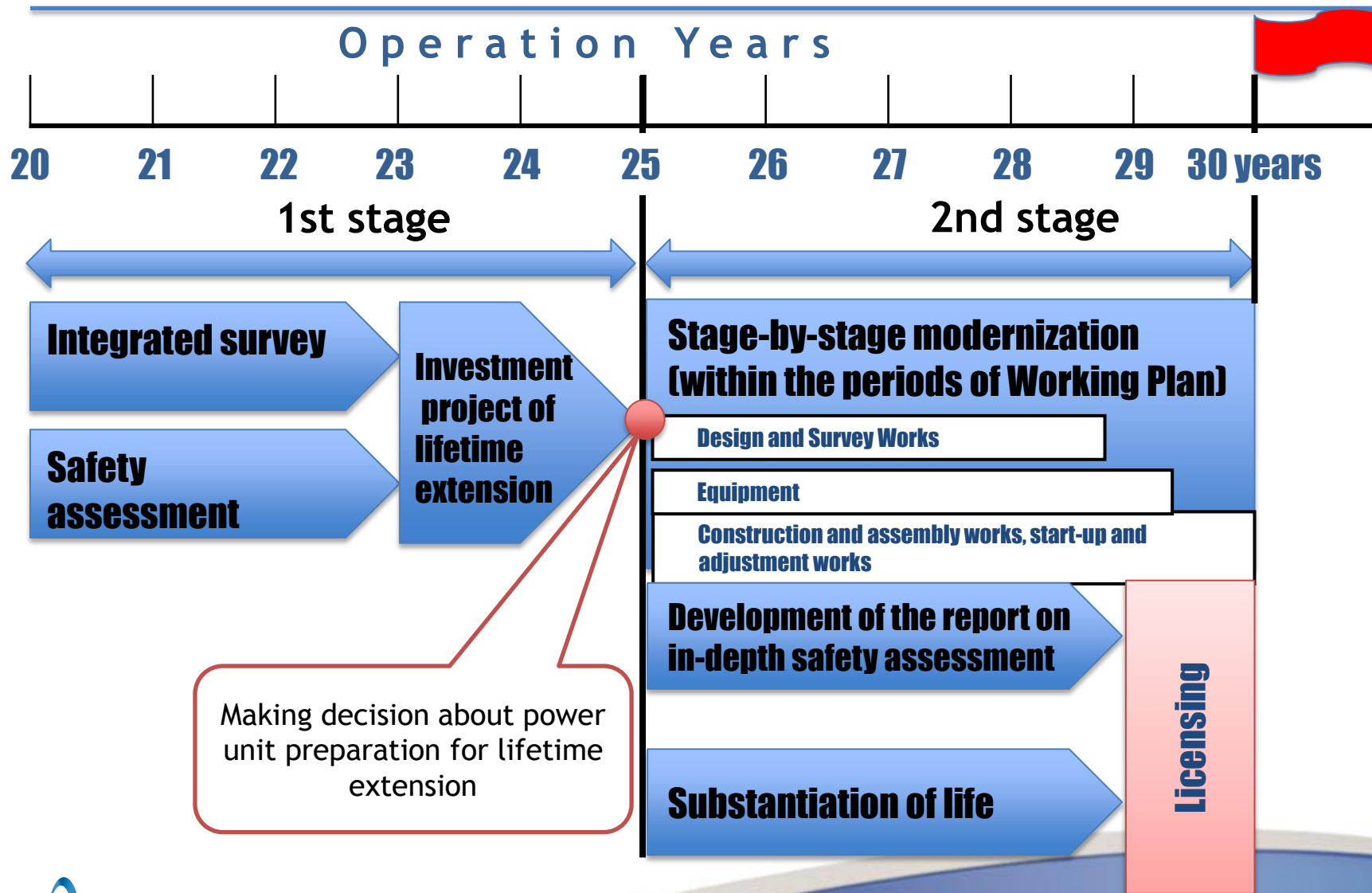
1st stage – forming investment project for lifetime extension



2nd stage – stage of lifetime extension investment project implementation

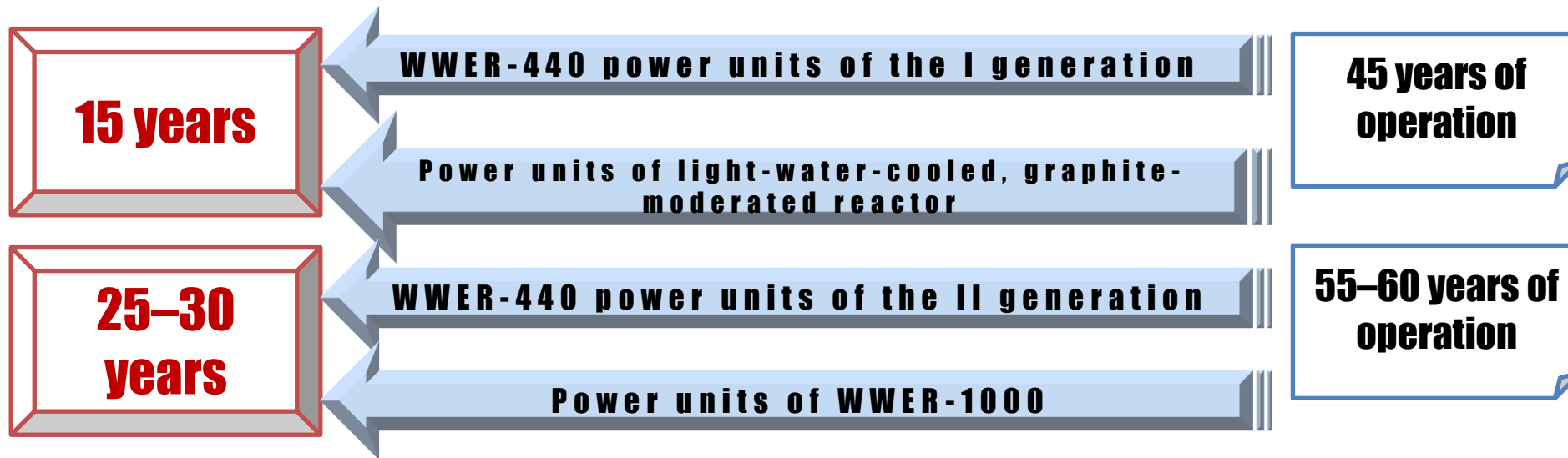


Standard works schedule for lifetime extension of NPP power units



Substantiation of remaining life for power unit elements

Duration of additional power unit operating lifetime



Limitation: remaining life of noninterchangeable elements

When getting new knowledge and experience, the possibility for substantiation of longer additional operating lifetime occurs.

List of standards measures of the work program on preparation for power unit lifetime extension:

- Replacement of equipment being overaged or not meeting the modern safety requirements.
- Creation of additional systems and independent channels of safety system with internal redundancy.
- Creation of additional channels of emergency power supply systems.
- Introduction of automated radiation situation monitoring system (ARSMS).
- Introduction of measures on hydrogen safety.
- Introduction of modern gas fire fighting systems.
- Construction of RW processing and storage complexes.
- Introduction of industrial television system for monitoring of NPP equipment condition in unattended zones.
- Construction of protected control post for emergency actions.

All measures are included into the investment projects of NPP power unit lifetime extension. The work results are submitted to the regulatory authority for independent examination and receipt of the license for power unit operation.

Safety increasing during lifetime extension for NPP power units

Probability of Core Damage

No.	Power Unit/NPP	Prior	Now
1	5NVO NPP	2.24E-04	9.60E-06
2	3BEL NPP	4.90E-04	3.60E-05
3	3KOL NPP	7.96E-05	8.32E-06
4	4KOL NPP	1.28E-04	7.46E-06
5	3LEN NPP	1.98E-04	1.34E-05
6	4LEN NPP	1.98E-04	8.17E-06
7	1KLN NPP	9.06E-05	5.57E-05
8	1BAL NPP	4.30E-05	3.80E-05
9	3KUR NPP	1.83E-04	7.77E-05
10	4KUR NPP	1.83E-04	8.22E-05
11	1SMO NPP	1.84E-04	4.41E-05
12	2SMO NPP	2.45E-04	5.13E-05

Basic results on lifetime extension for power units of operating NPP in 2015



December 29th, 2015
license received for 30 years



December 22nd, 2015
license received for 15 years



May 29th, 2015
license received for 10 years

3000 MW
of preserved generation



Task on Lifetime Extension for Power Units of NPPs of the Russian Federation

Task of Russian Nuclear Power Concern JSC till 2025 is preservation of operating 9 power units of NPP in line with total installed capacity of **6,897 MW**.

Lifetime extension of Russian NPP power units of the I generation in excess of 45 years



4NVO



1,2KOL

Lifetime extension of Russian NPP power units of the II generation



3SMO



2KLN



2-4BAL



3BEL

in excess of 45 years



Basic tasks on lifetime extension for NPP power units for 2016



till November 25th, 2016
license receipt for additional operating lifetime



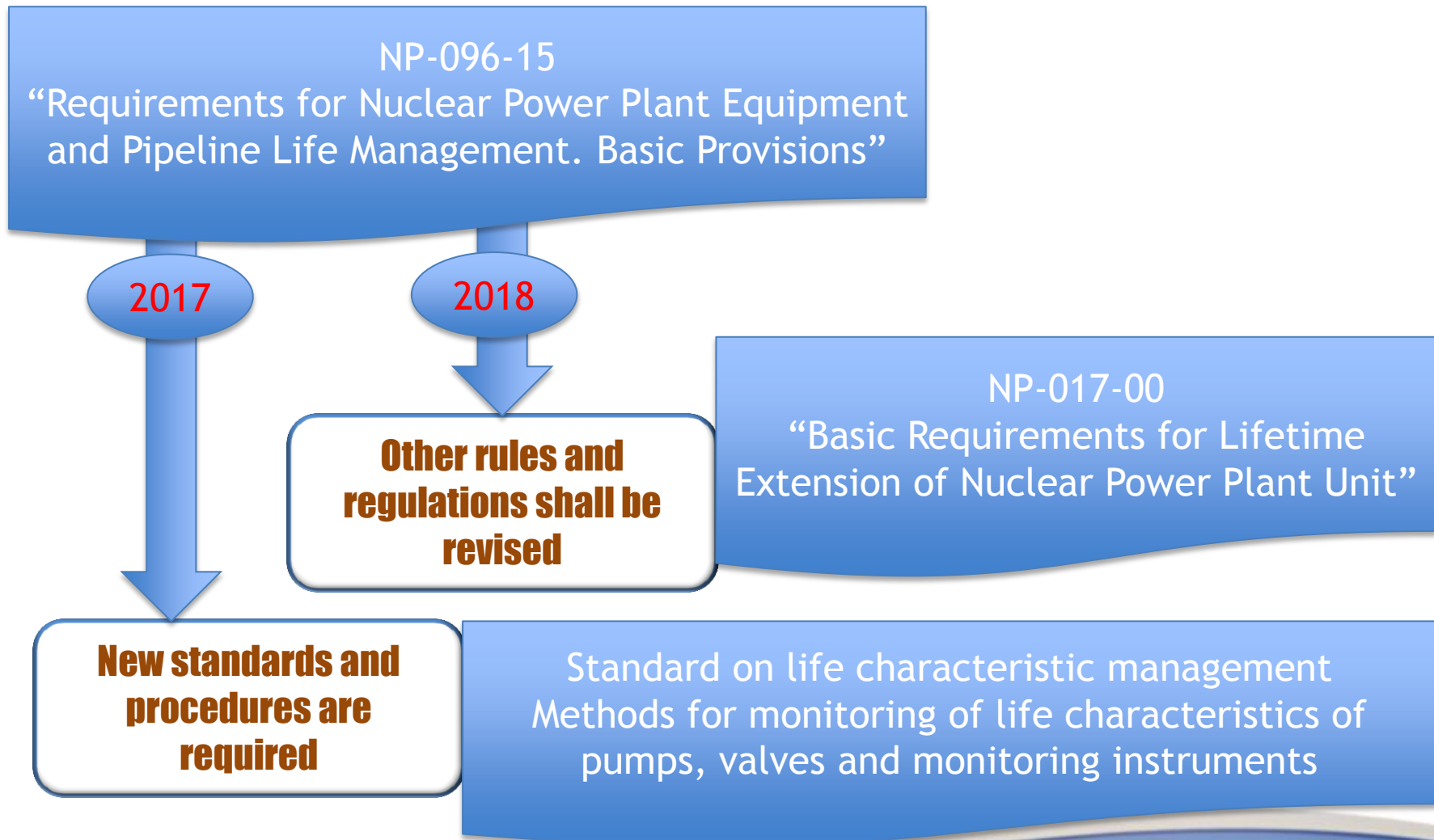
till December 29th, 2016
direction of the application into Rostekhnadzor



till October 17th, 2016
direction of the application into Rostekhnadzor



Tasks on modification of the normative methodological base on lifetime extension for 2017–2018



Tasks on modification of the normative methodological base on lifetime extension for 2017–2018

СОГЛАСОВАНО

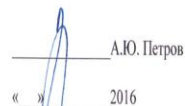
Заместитель руководителя Федеральной службы по экологическому, технологическому и атомному надзору


А.В. Фералонтов

« » 2016

УТВЕРЖДАЮ

Генеральный директор
АО «Концерн Росэнергоатом»


А.Ю. Петров

« » 2016

ПЛАН

организационно-технических мероприятий по приведению в соответствие с требованиями Федеральных норм и правил в области использования атомной энергии «Требования к управлению ресурсом оборудования и трубопроводов атомных станций. Основные положения» (НП-096-15) энергоблоков АЭС

№ п/п	Мероприятие	Ответственные	Срок исполнения	Примечание
1	2	3	4	5
1	Разработка Типовой программы управления ресурсом тепломеханического оборудования АС (первая редакция)	ДИП АО «Концерн Росэнергоатом»	20.12.2015	Выполнено. После утверждения Программы по п.11 данная Программа отменяется
2	Переработка НП-017-2000, ПНАЭ Г-002-87	ДИП, ДППМ АО «Концерн Росэнергоатом»	01.12.2018	Для устранения несоответствий с НП-096-15
3	Разработка типовых перечней оборудования и трубопроводов для различных типов АЭС, на которые распространяется действие НП-096-15	ДИП АО «Концерн Росэнергоатом», АЭС	01.12.2016	Перечни должны быть согласованы с Генпроектировщиком и Главным конструктором

1	2	3	4	5
				(в зоне их проектирования)
4	Разработка РБ «Установление и методы мониторинга ресурсных характеристик работающих под давлением оборудования и трубопроводов АС»	ДИП АО «Концерн Росэнергоатом»	01.02.2017	
5	Разработка РБ «Установление и методы мониторинга ресурсных характеристик насосов АС»	ДИП АО «Концерн Росэнергоатом»	01.03.2017	
6	Разработка РБ «Установление и методы мониторинга ресурсных характеристик арматуры АС»	ДИП АО «Концерн Росэнергоатом»	01.03.2017	
7	Разработка РБ «Установление и методы мониторинга ресурсных характеристик электротехнического оборудования АС»	ДИП АО «Концерн Росэнергоатом»	01.02.2017	
8	Разработка РБ «Установление и методы мониторинга ресурсных характеристик КИПиА АС»	ДИП АО «Концерн Росэнергоатом»	01.04.2017	
9	Разработка национального стандарта «Управление ресурсными характеристиками элементов энергоблоков атомных станций» в обеспечение требований НП-096-15	ДИП АО «Концерн Росэнергоатом»	01.08.2017	
10	Разработка национальных и отраслевых стандартов взамен действующих отраслевых руководящих и методических документов по оценке технического состояния и остаточного ресурса	ДИП АО «Концерн Росэнергоатом»	По графику пересмотра	Поэтапный пересмотр после ввода РБ по п.4-8
11	Разработка Типовой программы управления ресурсом тепломеханического, электротехнического оборудования и АСУТП АС	ДИП АО «Концерн Росэнергоатом»	01.08.2017	После ввода в действие РБ по п.4-8

Plan of organizational and technical measures on bringing of NPP power units in compliance with the requirements of NP-096-15 is approved by Rostekhnadzor



РОСЭНЕРГОАТОМ
ЭЛЕКТРОЭНЕРГЕТИЧЕСКИЙ ДИВИЗИОН РОСАТОМА

Conclusion



Lifetime extension for NPP power units is one of the strategic directions in development of nuclear power engineering in Russia ensuring preservation of generation and increase of safety level for operating power units.



The results for lifetime extension for NPP power units ensure safety and social and economic stability in the country due to assurance of minimum standard load, support of energy balance for regions prior to putting new power units into operation, preservation of scientific and research and production potential of Russia.