

Applied Systems Ltd

USER'S GUIDE FOR THE NUCLEAR MATERIALS ACCOUNTING
AND CONTROL AUTOMATED SYSTEM
«ATOMIC KEEPER»

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CONTENTS

1. SYMBOLS AND ABBREVIATIONS	3
2. GENERAL PROVISIONS	4
2.1. Scope of area.....	4
2.2. Main functions of NM A&C AS.....	4
2.3. User's skills.....	5
2.4. Preparing to work with NM A&C AS	5
3. WORKING IN THE SOFTWARE NM A&C AS "ATOMIC KEEPER"	6
3.1. Working with monitoring modules.....	6
3.2. Module "Operations"	8
3.3. Working in the Cards module.....	16
3.4. Working with the "Journals" module.....	19
3.5. Working with the Reporting Documentation module	21
3.6. Module "Documents"	22
3.7. Working with the module "Tamper-indicating devices"	24
3.8. Working with the Campaigns module	28
3.9. Module "References"	29
3.10. Working with the "Notifications" module.....	31
4. EMERGENCY ACTIONS	37
4.1. Actions in case of non-compliance with the technological process conditions, including the case of long-term technical failures.....	37
4.2. Actions to restore programs and / or data in case of the failure of magnetic storage media or detection of errors in data.....	37
4.3. Actions in cases of detection of unauthorized data tampering	37
4.4. Actions in other emergencies.....	38

1.SYMBOLS AND ABBREVIATIONS

Abbreviation (symbol)	Decoding (explanation)
NM A&C AS	Nuclear materials accounting and control automated system
NPP	Nuclear power plant
MBA	Material balance area
CPS AR I	Control and protection system absorbing rod(s) imitator
IC	Isotopic composition
FAI	Fuel assembly imitator
STC	Shell tightness control
KMP	Key Measurement Point
IAEA	International Atomic Energy Agency
MBR	Material Balance Report
RP	Responsible person
ICR	Inventory quantity change report
OS	Operation system
SW	Software
CPS AR	Control and protection system absorbing rod(s)
DBMS	Database management system
NNF	New nuclear fuel
FA	Fuel Assembly
IU	Inventory unit
TID	Tamper-indicating device
NM	Nuclear material
ICR	Inventory Change Report
MBR	Material Balance Report
PIL	Physical Inventory Listing

2. GENERAL PROVISIONS

The User's Guide for the "Atomic Keeper" nuclear materials accounting and control automated system (hereinafter referred to as the "Guide") contains step-by-step instructions and explanations on the main operations performed by the system user.

2.1. Scope of area

The software of the automated nuclear material accounting and control system "Atomic Keeper" (hereinafter referred to as the ACS&C NM) is designed to automate the procedures for accounting and handling nuclear materials at nuclear power plants, and it has the following capabilities:

- accounting for the qualitative and quantitative characteristics of the used nuclear materials, as well as their change;

- accounting and documentary support of operations provided by the technological scheme for handling nuclear materials at a nuclear power plant;

- formation of reporting documentation provided to the state competent authority of the system of accounting and control of nuclear materials (SNK, SFNK, ICR, MBO) and of IAEA (ICR, PIL, MBR);

- simultaneous monitoring of the state of all material balance areas, of all active operations and events, performed in presentation mode;

- monitoring the detailed parameters of the selected material balance area and/or measurement control point, as well as the containers and other pieces of equipment.

2.2. Main functions of NM A&C AS

NM A&C AS provides the following key functions:

1. accounting for the characteristics of each accounting unit, maintaining their history of change;
2. accounting for the location of each accounting unit;
3. registration of operations, works and special procedures performed with accounting units;
4. registration of all relocations of accounting units;
5. formation of working documentation required by NPP specialists before, during or after the performance of work with nuclear materials;
6. providing data on the amount of nuclear materials in all MBAs and KTIs;
7. formation of documentation on the presence of nuclear materials and accounting reports by the established form (ICR, PIL, MBR);
8. maintenance of accounting documents (Main and Auxiliary journals, registration cards, cartograms of nuclear materials placement);

9. provision of information support for inspections and physical inventories conducted on the territory of the NPP;
10. Ensuring the verification of input (selected) data for compliance with validation criteria.

2.3. User's skills

The user must know:

this Guide;

operating systems of the Microsoft Windows family and Microsoft Office;

the relevant terminology of this document;

terminology of the system of accounting and control of nuclear materials.

2.4. Preparing to work with NM A&C AS

Before starting to work with the software, the administrator, in accordance with the Administrator's Guide, must install the appropriate software included in the delivery and, if necessary, additional application software.

Make sure that the user's workstation has the Google Chrome browser (version 105 and higher) installed and the user has access to the software in accordance with his authority.

Login to the software is carried out by a personal login and a user password, which is issued by the administrator. At the initial entrance to the software, the user is automatically prompted to change the password to his personal one.

3. WORKING IN THE SOFTWARE NM A&C AS "ATOMIC KEEPER"

Upon successful user authentication in NM A&C AS "Atomic Keeper", the page for monitoring the current status of nuclear materials opens.

In the upper left part of the page there is a button to open the main navigation menu, which contains the following modules:

1) Monitoring module (includes a set of the pages: Monitoring; Core 1; Core 2; Fuel Pool 1; Fuel Pool 2; Fresh Fuel Storage) carries out the functions of monitoring the current state of NM;

- 2) Documents;
- 3) Campaigns;
- 4) Magazines;
- 5) Reporting documentation;
- 6) Operations;
- 7) Cards;
- 8) Intrusion indication devices;
- 9) Reference books;
- 10) Notifications.

3.1. Working with monitoring modules

The module for monitoring the current state of nuclear materials is a set of pages displaying the actual placement of equipment and containers in the premises of a nuclear power plant and the contents of containers and equipment, that is, nuclear materials (usually in the form of fuel assemblies), CPS AR installed inside the FA, as well as FA/CPS AR simulators and CPS AR frameworks. The main purpose of this module is as follows:

- visual display of information about the current location of nuclear materials and other resources;
- providing reliable information about the main parameters of nuclear materials and other resources, as well as the history of changes in parameters through color coding of parameter values according to the legend;
 - output of parameter values in tabular form;
 - provision of reliable information on the number of free and occupied cells in containers and equipment.

This module is "unique" for a specific nuclear power plant, due to differences in nuclear power plant designs.

The NM current state monitoring module is connected with other NM A&C AS modules, since it is designed for visual display of data obtained on the basis of work with other modules.

Functionally, the monitoring pages support the following features:

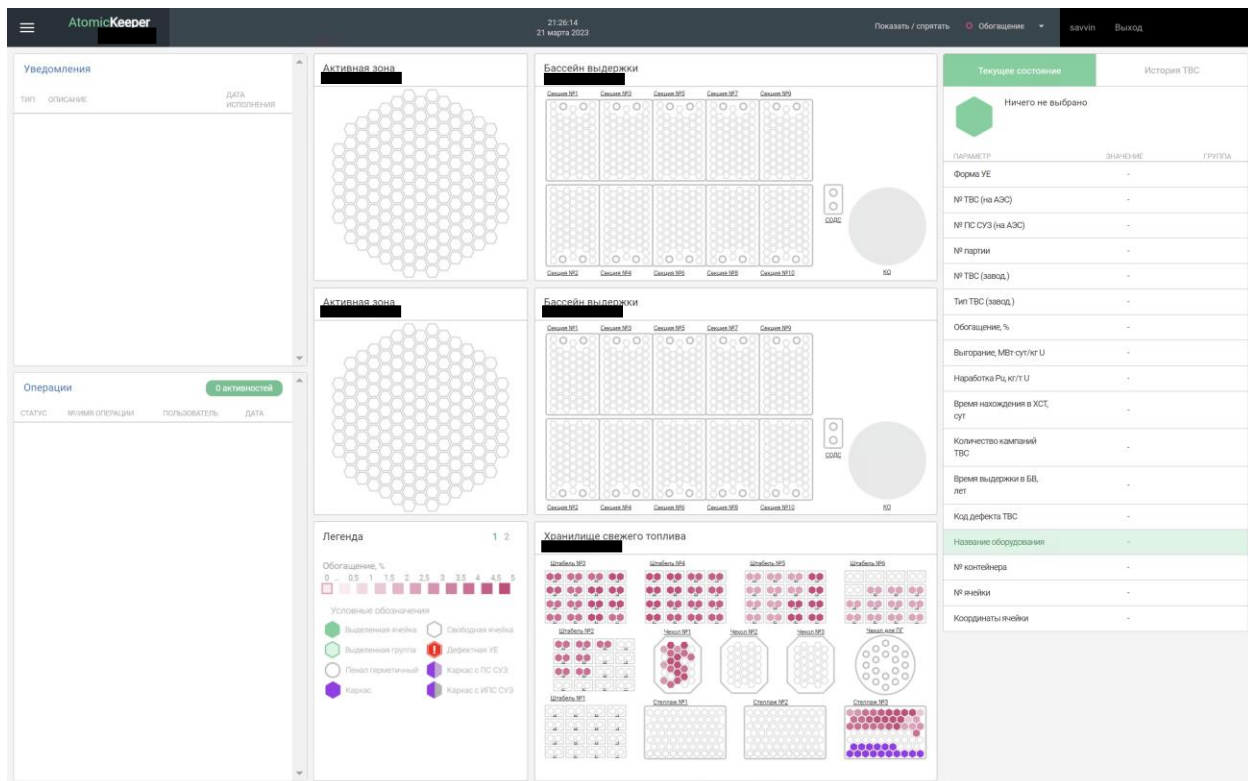
- the change of viewing modes;
- using the Show/Hide option;
- interaction with graphic elements:
- selection of one cell of a container or equipment with viewing information about the contents of the cell;
- selection of a group of cells;
- selection of the entire container or piece of equipment.

The visualization of the main characteristics of FA and CPS AR is implemented in NM A&C AS using various color gradings and symbols according to the legend. In total, NM A&C AS supports five color modes:

four modes ("Enrichment", "Type", "Burnup" and "Pu production") are designed to display cells of containers and equipment containing nuclear materials, taking into account the differences in parameter values. The possible range of values of one or another parameter is divided into intervals; cells are colored in the color of the interval corresponding to the current value of the FA parameter. Interaction (clicking on a cell or group of cells) with elements in these modes leads to the display of information about the properties of nuclear materials in the selected elements in a tabular form;

the "Equipment" mode is designed to display cells of containers and equipment containing not only nuclear materials, but also absorbing rods and simulators. Each of the possible combinations of accounting units that can be installed in a cell of one or another equipment or container is assigned its own color. This mode has its own color scale, which is applied to certain cells of the reactor core, provided that absorber rods are installed in them. The scale is intended to display the group numbers of the NM A&C AS controls and protection of a nuclear reactor. Interaction (clicking on a cell or group of cells) with elements in the "Equipment" mode leads to the display of information about the properties of non-nuclear materials (that is, CPS AR and simulators) located in the selected elements in a tabular form.

The main purpose of the "Show/Hide" option is to display the number of free and occupied cells of containers and equipment.



3.2. Module “Operations”

The "Operations" module is one of the most important parts of NM A&C AS, because through the processing of transactions

- registration of transport and technological operations performed with nuclear materials throughout their life cycle at NPPs;
- Changes in the qualitative and quantitative characteristics of nuclear materials are recorded, starting from the moment they enter the territory of the NPP and ending with export;
- information is recorded on the implementation of organizational measures (appointment and change of materially responsible persons for the MBA);
- providing support for inspections and physical inventories taking place at nuclear power plants;
- the formation and automatic filling of the necessary working documentation takes place.

Based on the completed operations, data is filled in the registration cards, journals and reports, information about campaigns, that is, almost of all NM A&C AS modules.

Functionally, the following features are implemented in the "Operations" module:

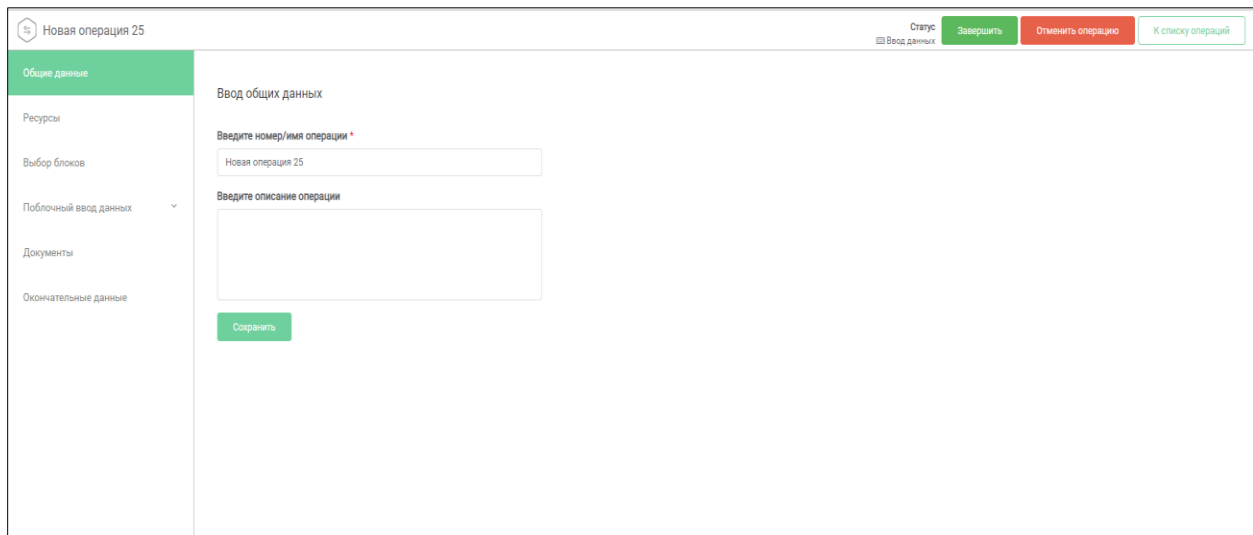
- viewing a list of all operations;
- creation of an operation (“from scratch” or by copying another operation);

viewing the operation of interest;
editing the operation of interest with the status "Data entry";
downloading and uploading documents.

Visually, the "Operations" module is a table with a list of all NM A&C AS operations. The table supports sorting (from largest to smallest and vice versa) and filtering of values (by one or more conditions). It is possible to scroll through the pages of the table and change the number of rows displayed on one page. The new operation supports two modes: viewing and editing. The transition to the operation occurs by clicking on the "view" (or "edit") icon in the line with this operation.

Each operation consists of separate thematic stages: "General data", "Resources", "Block selection", "Block data entry", "Documents" and "Final data".

The "General data" stage is intended for specifying general information about the operation (number, description) and configuring additional parameters (MBM, overload scheme) provided that certain blocks are present in the operation.



The screenshot shows a web interface for creating a new operation. The title is "Новая операция 25". The status is "Ввод данных". There are three buttons: "Завершить" (green), "Отменить операцию" (red), and "К списку операций" (blue). The main form is titled "Ввод общих данных" and contains two input fields: "Введите номер/имя операции *" (with "Новая операция 25" entered) and "Введите описание операции". A "Сохранить" button is at the bottom. A sidebar on the left lists stages: "Общие данные" (selected), "Ресурсы", "Выбор блоков", "Поблочный ввод данных", "Документы", and "Окончательные данные".

The "Resources" stage is designed to select the resources that will be involved in this operation. Passing the stage is not mandatory, since NM A&C AS supports the registration of operations in which resources do not participate (for example, an operation with the "RP Assignment" block, or the availability of resources is determined in the "General data" stage by selecting the MBA). During the registration of operations, it is possible to select resources (FA, CPS AR, batch, container, equipment, simulators) from the resources already available in NM A&C AS and create new resources (the same categories as when selecting, except for "equipment"). When registering FA, CPS AR, containers through the xml-passport, resources are automatically created like, FA, party, CPS AR, container according to

the data from the xml-passport. (Please note that the creation of the required FA type occurs according to the "factory designation" parameter, which is available both in the "FA Types" reference book and in the xml-passport itself).

Explicit resource selection not only allows you to set the "scope" of the operation, but also ensures data consistency, because:

accounting cards of resources participating in the operation are blocked for editing;

the resource participating in the operation will not be available in other operations until the end of this operation;

if a resource participating in an operation has related resources, these resources will not be available in other operations, their cards will be blocked for editing. As an example, the following can be given: when choosing an FA to participate in an operation, it will automatically be selected with the CPS AR installed in it.

<input type="checkbox"/>	№ ТВС (на АЭС)	№ ТВС (завод.)	№ партии	Тип (Заводской тип)	Код ЗЕМ	Код КТИ количества	Статус
<input type="checkbox"/>	N1300 FL221	N1300 FL221	N1300 FL221	Z13 (1200.01.00.000-01)	ВУВО	А	участвует в операции
<input type="checkbox"/>	N1300 FL217	N1300 FL217	N1300 FL217	Z13 (1200.01.00.000-01)	ВУВО	А	участвует в операции
<input type="checkbox"/>	N1300 FL219	N1300 FL219	N1300 FL219	Z13 (1200.01.00.000-01)	ВУВО	А	не участвует в операции
<input type="checkbox"/>	N1300 FL215	N1300 FL215	N1300 FL215	Z13 (1200.01.00.000-01)	ВУВО	А	не участвует в операции
<input type="checkbox"/>	N1300 FL209	N1300 FL209	N1300 FL209	Z13 (1200.01.00.000-01)	ВУВО	А	не участвует в операции
<input type="checkbox"/>	N1300 FL213	N1300 FL213	N1300 FL213	Z13 (1200.01.00.000-01)	ВУВО	А	не участвует в операции
<input type="checkbox"/>	N2400 TFL037	N2400 TFL037	N2400 TFL037	Z24 (1200.01.00.000-03)	ВУВО	А	не участвует в операции
<input type="checkbox"/>	N1300 FL207	N1300 FL207	N1300 FL207	Z13 (1200.01.00.000-01)	ВУВО	А	не участвует в операции
<input type="checkbox"/>	N1300 FL205	N1300 FL205	N1300 FL205	Z13 (1200.01.00.000-01)	ВУВО	А	не участвует в операции
<input type="checkbox"/>	N1300 FL203	N1300 FL203	N1300 FL203	Z13 (1200.01.00.000-01)	ВУВО	А	не участвует в операции
<input type="checkbox"/>	N1300 FL201	N1300 FL201	N1300 FL201	Z13 (1200.01.00.000-01)	ВУВО	А	не участвует в операции

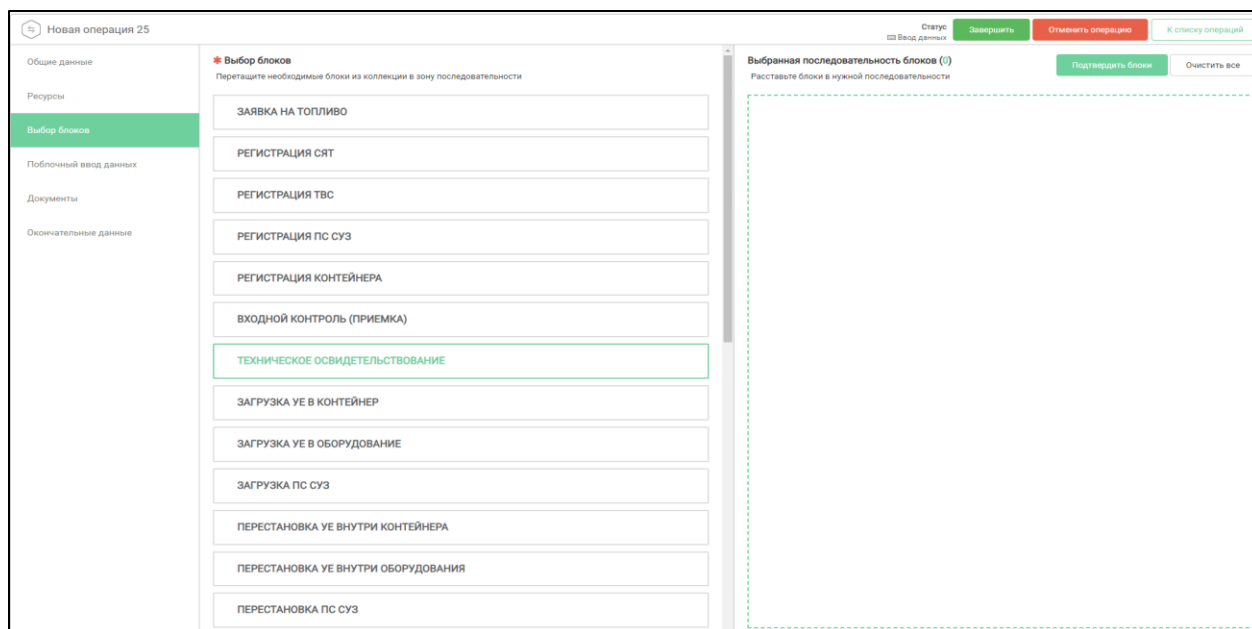
The "Block selection" stage is a set of elementary independent blocks; by dragging them you can compose a sequence that corresponds to the actual or planned sequence of actions when performing the operation in reality. The available blocks include:

1) "Application for fuel" (for the formation of a preliminary or final application for fresh FA and CPS AR);

2) "Registration NNF" (when this block is selected, the blocks "Registration of a container", "Registration of FA", "Registration of CPS AR", "Incoming control (Acceptance)" appear in the selected sequence);

3) "FA Registration", "CPS AR Registration", "Container Registration" (for registering new resources in NM A&C AS, entering resource identification data and other parameters);

- 4) "Incoming control (acceptance)" (for entering data on the incoming control of fresh FA and CPS AR when they arrive at the NPP);
- 5) "Technical examination" (for entering data on technical examination FA and CPS AR);
- 6) "Loading IU into a container", "Loading IU into equipment", "Loading IU into a tank" (for installation of FA (FAI) in containers and equipment);
- 7) "Loading CPS AR" (for installing CPS AR and their simulators in containers and equipment);
- 8) "Replacement of IU inside the container", "Replacement of IU inside the equipment", "Replacement of IU in the tank" (for registration of the fact of rearrangement of FA (FAI) from one cell to another within the container or equipment);
- 9) "CPS AR Swap" (to record the fact of CPS AR (ICPS AR) swapping from one cell to another within a container or equipment);
- 10) "Removal of IU from the container", "Removal of IU from the equipment", "Unloading of IU from the gas station" (for the removal of FA (FAI) from a container or equipment);
- 11) "Removal of CPS AR" (for the removal of CPS AR (ICPS AR) from a container or equipment);
- 12) "Movement of a container" and "Movement of equipment" (for registering the movements of containers or mobile equipment with their contents from one room or building to another);
- 13) "Performance of CGO" (for entering data on the control of the tightness of the fuel cladding);
- 14) "Measurement" (for registration of measurements of containers);
- 15) "Calculation" (to recalculate the isotopic composition of FA based on data on its burnup);
- 16) "Assignment of RP" (for the appointment of a NPP specialist as a financially responsible person);
- 17) "Conducting a physical inventory", "Conducting an inspection" (to accompany ongoing physical inventories and inspections, documenting their results);
- 18) "Deregistration (Export)" (to enter data on the export of the container and its contents, that is, on deregistration of nuclear materials).



At the stage "Selecting blocks" the following functionality is implemented:

1) adding a block to the block sequence (by "dragging" a block from the block collection to the sequence area);

2) editing the distribution of resources selected in the "Resources" stage and automatically distributed to each suitable block. It supports the ability to add a resource, setting and unchecking the flag about the use of the resource of interest in the operation block);

3) changing the MBA (for the block "Conducting a physical inventory") or the reloading scheme (for blocks for loading, rearranging and unloading IU from the core) selected at the stage "General data";

4) removing a block from the sequence (by clicking on the corresponding icon in the block name);

5) rearrangement of the selected blocks in places (by "dragging" the blocks);

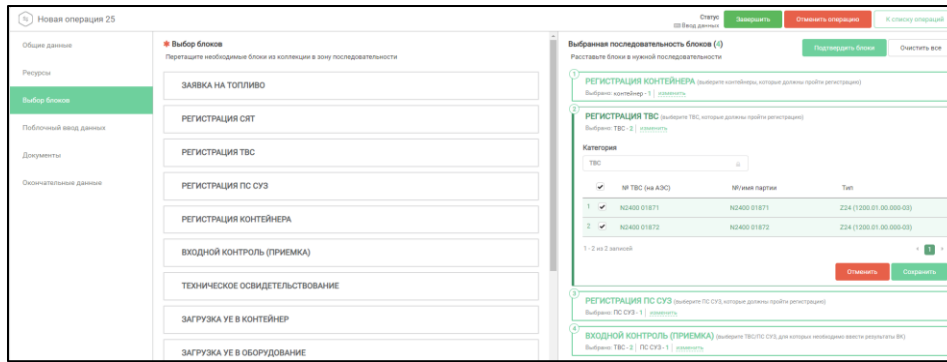
6) deleting all selected blocks (by clicking on the "Clear all" button);

7) confirmation of the sequence of selected blocks, which leads to:

- blocking the possibility of deleting (adding) a separate block from (to) the operation;

- blocking the possibility of rearranging blocks in places;

- activation of the "Block data entry" stage: each of the selected blocks is displayed as a separate tab of this stage.



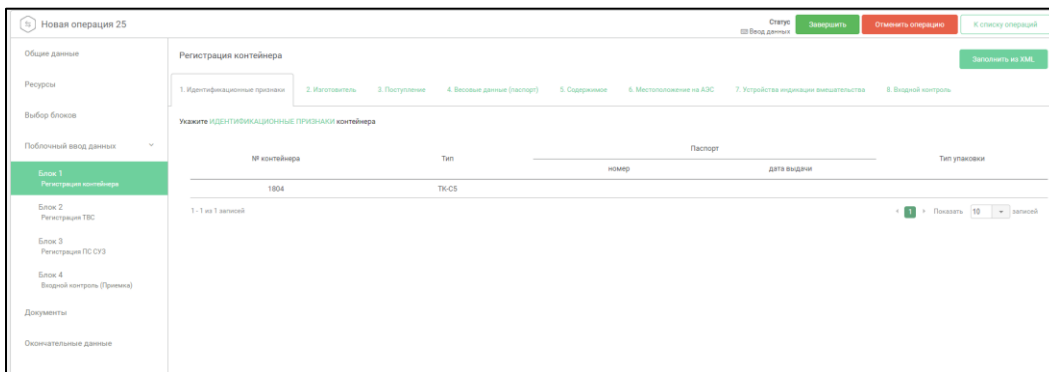
Each of the blocks in which changes in resource parameters are recorded works with one or more categories of resources. NM A&C AS implements automatic distribution of all resources selected for participation in the operation at the “Resources” stage, according to the blocks in which they can be involved. The distribution takes place at the "Block selection" stage. Under each of the selected blocks, it is noted which categories of resources can participate in the block, the number of resources automatically allocated to the block is indicated, and a list of these resources is displayed. Automatic resource allocation takes into account not only the category of the resource, but also whether the resource is selected or created. As an example, the following can be cited: only FAs created in the current operation (not yet registered, not registered with NPPs) will be automatically distributed to the “FA Registration” block. With automatic allocation of resources, extra resources of this category can get into the block, therefore, it is possible to adjust the participation (non-participation) of any resource in the blocks of the operation until the end of the operation.

NM A&C AS supports two options for block selection and resource allocation: one block and multiple resources participating in it, or a separate block is selected for each resource. An example is the following: one "Move Container" block, into which two containers are distributed, or two consecutive "Move Container" blocks, into each of which one container is distributed.

The "Block selection" stage is mandatory for the operation to pass: any operation must consist of at least one block, otherwise it is considered invalid and cannot be completed.

The "Block Data Entry" stage is a set of blocks selected in the "Block Selection" stage, with resources allocated to the blocks. Each block is a set of data entry fields, drop-down lists and other elements that are filled in by the user NM A&C AS . In some cases, the user needs to fill in all the fields on his own, in some situations, certain fields are automatically filled in. As an example, we can cite operations for working with the reactor core, where the fields are automatically filled

in based on the applied scheme. At this stage, the main array of data on nuclear materials is entered, therefore, in each block, not only the verification of input and selected values for compliance with validation criteria, but also the verification of compliance with logical conditions and aspects specific to nuclear power plants is provided. For example: compliance with the "rule of two persons" when registering for the removal or installation of TIP; the impossibility of rearranging the FA from a container located in one MBA to a container located in another MBA, and so on. Also, for the registration of fresh nuclear fuel, automatic filling in of data from the xml format passport, which is transmitted to the NPP by the nuclear fuel manufacturer, is also used.

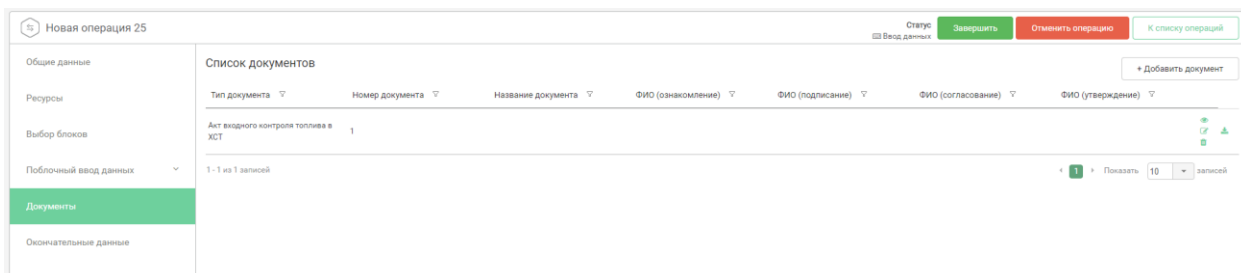


Since a resource can take part in several operation blocks, all changes to its properties registered in previous blocks are reflected in subsequent ones. Data consistency is ensured by checking and introducing restrictions on the specified date / time of each action, the position and availability of resources (for example, a container allocated in the "Deregistration (Export)" block will not be displayed in the subsequent "Container movement" block).

The "Documents" stage is intended for:

- creating documents and their partial automatic filling with the data specified in the operation blocks (one or more document templates are assigned to some blocks, the fields of which coincide with the fields of the blocks and are filled with the data specified in these blocks);

- uploading documents that belong to the batch of documents of the operation.



When creating a document, the flag “Use data from the operation to generate the document” must be checked if the document template is designed to receive the values specified in the operation blocks.

Новая операция 25

Статус: Ввод данных Завершить Отменить операцию К списку операций

Общие данные

Ресурсы

Выбор блоков

Поблочный ввод данных

Документы

Окончательные данные

Редактирование документа

Категория документа: Документация ХСТ

Тип документа *: Акт входного контроля топлива в ХСТ

Номер документа *: 1 Дата документа: 22.09.2022

Скан документа: Выберите файл (Файл не выбран)

Название документа:

Использовать данные из операции для формирования документа

Укажите лиц:

ФИО (составление): выбрать...

ФИО (подписание): выбрать...

ФИО (согласование): выбрать...

ФИО (утверждение): выбрать...

The "Final data" stage is informational in nature and displays the inventory changes that will be generated at the time the operation is completed. Rows appear only when the accounted changes in nuclear material are registered in the operation. Such a preliminary display of records, which will then be taken into account in the reporting and accounting documents of the nuclear power plant, allows the user to detect an error in the data in time and correct it until the operation is completed, that is, until the values in the database are overwritten. The "Final Data" lines show the current state of the data; if the data in the block(s) changes, the user will be shown the updated records when going to this stage again.

Новая операция 25

Статус: Ввод данных Завершить Отменить операцию К списку операций

Общие данные

Ресурсы

Выбор блоков

Поблочный ввод данных

Документы

Окончательные данные

Окончательные данные

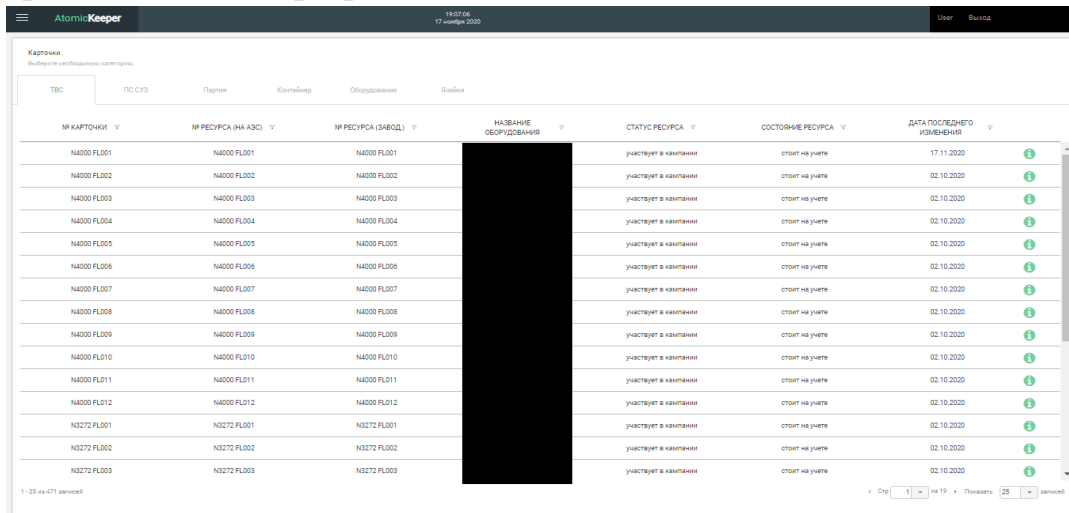
Строки отчета об изменении инвентарного количества

BYBD

Date of inventory change	Country / MBA		Type of inventory change	KMP code	Name or number of Batch	Number of items in Batch	Material Description	Accountancy Data					Measur. Basis
	From	To						Element	Weight of element	Unit kg/g	Weight of fissile isotopes (Uranium only) (g)	Isotope code	
220920	Z		RF	1	N2400 01871	1	BQ2F	E	468900.00	g	1399.00	G	N

3.3. Working in the Cards module

The "Cards" module is a set of accounting cards for the following categories of resources: FA and batches of nuclear materials, CPS AR, containers, pieces of equipment and individual cells of containers and equipment (hereinafter referred to as resources). The cards contain detailed information about the characteristics and parameters of resources, as well as the history of changes in these properties during the use of resources at a nuclear power plant. Providing reliable information about the state and properties of resources throughout their entire life cycle at nuclear power plants is the main purpose of this module.



The screenshot shows the 'Cards' module interface in AtomicKeeper. The top navigation bar includes the logo, user information, and a date. Below the navigation bar, there are tabs for different resource categories: 'ТВС' (highlighted), 'ПС СУЗ', 'Парни', 'Контейнер', 'Оборудование', and 'Ячейка'. The main area displays a table with columns for card number, resource ID (NM A&C AS), resource ID (SABOD), name of the equipment, status, condition, and last change date. The table contains 18 rows of data, with the 'НАЗВАНИЕ ОБОРУДОВАНИЯ' column redacted with a black box. At the bottom, there is a pagination control showing '1-25 из 471 записей' and a 'Показать 25 записей' button.

№ КАРТОЧКИ	№ РЕСУРСА (НА АЭС)	№ РЕСУРСА (SABOD)	НАЗВАНИЕ ОБОРУДОВАНИЯ	СТАТУС РЕСУРСА	СОСТОЯНИЕ РЕСУРСА	ДАТА ПОСЛЕДНЕГО ИЗМЕНЕНИЯ
N4000 FL001	N4000 FL001	N4000 FL001	[REDACTED]	участвует в кампании	стоит на учете	17.11.2020
N4000 FL002	N4000 FL002	N4000 FL002	[REDACTED]	участвует в кампании	стоит на учете	02.10.2020
N4000 FL003	N4000 FL003	N4000 FL003	[REDACTED]	участвует в кампании	стоит на учете	02.10.2020
N4000 FL004	N4000 FL004	N4000 FL004	[REDACTED]	участвует в кампании	стоит на учете	02.10.2020
N4000 FL005	N4000 FL005	N4000 FL005	[REDACTED]	участвует в кампании	стоит на учете	02.10.2020
N4000 FL006	N4000 FL006	N4000 FL006	[REDACTED]	участвует в кампании	стоит на учете	02.10.2020
N4000 FL007	N4000 FL007	N4000 FL007	[REDACTED]	участвует в кампании	стоит на учете	02.10.2020
N4000 FL008	N4000 FL008	N4000 FL008	[REDACTED]	участвует в кампании	стоит на учете	02.10.2020
N4000 FL009	N4000 FL009	N4000 FL009	[REDACTED]	участвует в кампании	стоит на учете	02.10.2020
N4000 FL010	N4000 FL010	N4000 FL010	[REDACTED]	участвует в кампании	стоит на учете	02.10.2020
N4000 FL011	N4000 FL011	N4000 FL011	[REDACTED]	участвует в кампании	стоит на учете	02.10.2020
N4000 FL012	N4000 FL012	N4000 FL012	[REDACTED]	участвует в кампании	стоит на учете	02.10.2020
N3272 FL001	N3272 FL001	N3272 FL001	[REDACTED]	участвует в кампании	стоит на учете	02.10.2020
N3272 FL002	N3272 FL002	N3272 FL002	[REDACTED]	участвует в кампании	стоит на учете	02.10.2020
N3272 FL003	N3272 FL003	N3272 FL003	[REDACTED]	участвует в кампании	стоит на учете	02.10.2020

NM A&C AS stores records of all resources registered at the nuclear power plant (FA and NM batches, CPS AR, containers, pieces of equipment, individual cells), including exported resources. All resource cards are permanently stored in NM A&C AS; cards cannot be deleted.

For NM A&C AS, as a rule, each batch of nuclear materials consists of only one fuel assembly, which is most typical for nuclear power plants. That is, in the vast majority of cases, "FA" and "consignment of nuclear materials" in NM A&C AS mean the same object. However, they are allocated to separate categories of resources, separate cards are maintained for them (FA card and party card). However, when registering a division of a party, the categories "FA" and "party" are not the same.

Visually, the "Cards" module is a page divided into six tabs ("FA", "CPS AR", "Batch", "Container", "Equipment", "Cell"). Each tab is a table with a list of cards of a certain category of resources. The name of the active tab is highlighted in color. Tables with cards support sorting (from largest to smallest and vice versa) and filtering (by one or more conditions) of values. It is possible to scroll through the pages of the table and change the number of rows displayed on one page. Each card

supports two modes: viewing and editing. The transition to the card of interest occurs by clicking on the "view" (or "edit") icon in the line with this card.

Resource cards are created automatically in NM A&C AS:

- cards of all pieces of equipment and cards of their cells are created by default during NM A&C AS initialization, depending on the delivery configuration;
- FA and batch cards, CPS AR cards, containers and container cells are created at the moment of completion of the resource data registration operations.

The following functionalities are implemented in the "Cards" module:

- 1) viewing a list of all cards of a certain category of resources;
- 2) viewing a card of a specific resource, including the history of changes;
- 3) editing some values of the resource properties displayed in the card, including the procedure for "correcting" the mass and location of the FA;
- 4) following the links
 - to the cards of other resources;
 - to the operation in which the resource parameters were changed;
 - to the page of the tamper indication device installed on or removed from the container or equipment;
 - to the reference page "Defect Codes" (only from an FA registration card with a defect);
- 5) export card contents to a .docx file (with support for two types of templates for FA and CPS AR) by clicking on the buttons of the same name;
- 6) downloading documents (FA passports and NM batches, CPS AR, containers) attached to resource cards;
- 7) search for the required word, character set.

Following links, performing searches, exporting a card, and downloading attached documents is available only in card view mode.

In view mode, the card for a specific resource is a page divided into two parts. Thematic tabs are displayed on the left side (for example, "Admission to the NPP", "Campaigns", "Sending from the NPP", "Data on TIP", etc.). The active (open) tab is highlighted in color. The right side of the page contains a text description with the names of the parameters and their values. The top menu contains a number of controls. In edit mode, on the left side of the page, only tabs that contain editable fields are presented, on the right side - a set of editable fields.

The need to ensure data consistency imposes a number of restrictions on editing values in cards:

- 1) data editing is not possible for:

- the resources of any category that are currently participating in the operation;

- exported containers and their cells;
- deregistered nuclear power plant FA, batches and CPS AR;

2) data on the location and isotope composition of FA (NM batches) are displayed not only in registration cards, but also in reporting documents (ie PIL, ICR, MBR reports). Editing the specified parameters in the cards may lead to the need to add a record of "correction" to the reports. The decision to reflect the "correction" in a particular report must be made by the user NM A&C AS. Correction of reporting documentation is possible with the following options:

a) an error in the data was discovered before the reporting documents were generated: it is enough to correct the values in the FA record card (or the lot to which this FA belongs), and the new values will automatically appear in subsequent reports without records of "correction";

b) an error in the data was detected at the moment when reports with incorrect data were generated, but not yet sent to third parties: it is enough to correct the values in the FA or NM batch record card, delete the reports with incorrect data and create new reports for the date of interest. The new reports will automatically include the corrected data without records of "correction";

c) an error in the data was discovered after the accounting reports were generated and sent: after making changes to the data on the location and / or isotopic composition in the FA card (or NM batch), it is necessary:

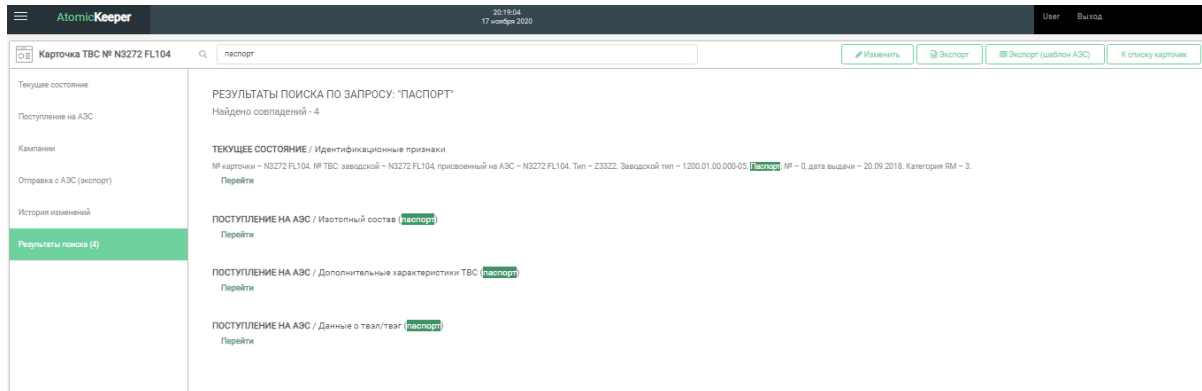
- mark the flag "Reflect corrections as corrections in reporting documents";
- indicate the type of report, the number of the sent report and the line number of the report with incorrect data that will be corrected;
- indicate the number of the report in which the record of the "correction" will appear;

- save the data in the card, which will automatically lead to the appearance of records about the "correction" in the reporting documents;

3) location and isotopic composition data of FA (NM batches) are also displayed in accounting documents (i.e. Main and Auxiliary Logbooks), which accumulate records of changes in the amount of nuclear materials occurring on the territory of a nuclear power plant. Changing the mass of elements and isotopes in the card leads to automatic updating of data in the Main and Auxiliary logs; editing a location that changes the KMP quantity results in new entries in the Auxiliary Log with the words "from/to".

The search for a symbol (character set) in the card is carried out as follows:

- the card of interest opens in view mode;
- in the search field, the character or set of characters of interest is entered;
- press the "search" icon or the ENTER key, which will lead to the appearance of a separate tab "Search Results" with search results;
- by clicking on the "Go to" link displayed under each of the search results, the transition to the part of the card of interest is carried out.



3.4. Working with the "Journals" module

The "Journals" module is represented by two types of journals - the Main journal (General Ledger) and the Auxiliary journal (Subgeneral Ledger). Along with the FA and CPS AR record cards, the journals are the records of the nuclear power plant. They are designed to display up-to-date information on the amount of nuclear materials, as well as on all changes in this amount over a certain period of time, broken down into material balance areas or key points for measuring the amount.

The logs are intended for chronological display of events important for accounting and control at the level of the material balance area (MBA) (Main log) or at the level of the key measurement point (KMP) (Auxiliary log). Events important for accounting and control are changes in the amount of nuclear material in the zone under consideration, including in each individual batch of the zone, that is, the arrival of nuclear fuel (NF), its shipment, batch renaming, recalculation of FA, the occurrence of a sender-receiver difference, emergency loss, accidental increase. It also logs the generated PILs.

AtomicKeeper 22:35:11 17 ноября 2020 User Выход

Журналы

Журналы

Главный журнал (General Ledger)

Вспомогательный журнал (Subgeneral Ledger)

Экспорт в Excel (русская)

Экспорт в Excel (английский)

Элемент: E - Обогащенный уран

Единица измерения: g

Период (с): 17.10.2020

Период (по): 17.11.2020

ГЛАВНЫЙ ЖУРНАЛ (GENERAL LEDGER)

Facility: ВУВ0 MBA: ВУВ0

Material Description: #02F, BV2F Element Code: E Isotope Code: G Unit: g

Line	Date	Inventory change	Supporting document	Number of Items	Increases				Decreases				Inventory		Total Number of Items	
					Receipts		Other		Shipments		Other		U	U-235		
					U	U-235	U	U-235	U	U-235	U	U-235	U	U-235		
1	201021	RF		28	12348000.00	295352.00								18775863.20	407766.40	42
2	201021	RD		2	882000.00	21168.00								19657863.20	428936.40	44
3	201022	RF		18	7938000.00	190512.00								27595863.20	619448.40	62
4	201023	RF		25	11025000.00	264600.00								38620863.20	884048.40	87
5	201023	RD		2	882000.00	21168.00								39502863.20	905216.40	89
6	201024	RF		18	7938000.00	190512.00								47440863.20	1095728.40	107

AtomicKeeper 22:35:14 17 ноября 2020 User Выход

Журналы

Главный журнал (General Ledger)

Вспомогательный журнал (Subgeneral Ledger)

Экспорт в Excel (русская)

Экспорт в Excel (английский)

Элемент: E - Обогащенный уран

Единица измерения: g

Период (с): 17.10.2020

Период (по): 17.11.2020

ВСПОМОГАТЕЛЬНЫЙ ЖУРНАЛ (SUBGENERAL LEDGER)

Facility: ВУВ0 MBA: ВУВ0 КМР-КТИА

Material Description: #02F, BV2F Element Code: E Isotope Code: G Unit: g

Line	Date	Name of batch	Inventory change	Supporting document	Number of Items	Increases				Decreases				Inventory		Total Number of Items
						Receipts		Other		Shipments		Other		U	U-235	
						U	U-235	U	U-235	U	U-235	U	U-235	U	U-235	
8	201021	FA550183585	RF		1	441000.00	10584.00							12601863.20	259592.40	28
9	201021	442892657FA	RF		1	441000.00	10584.00							10395863.20	206672.40	23
10	201021	572039500FA	RF		1	441000.00	10584.00							10837863.20	217256.40	24
11	201021	183451312FA	RF		1	441000.00	10584.00							11279863.20	227840.40	25
12	201021	922724032FA	RD		1	441000.00	10584.00							11719863.20	238424.40	26
13	201021	FA112132235	RF		1	441000.00	10584.00							12160863.20	249008.40	27
14	201021	FA550183585	RF		1	441000.00	10584.00							12601863.20	259592.40	28

In the logs, new entries are added automatically as the user performs actions in NM A&C AS .

Data sources for logs are as follows:

- 1) carrying out operations in which NM inventory changes take place;
- 2) correction of the isotopic composition;
- 3) PIL reports.

Each of these inventory changes corresponds to a code that is determined by the International Atomic Energy Agency and is universal for all nuclear power plants. After the operation is completed, a line (or several lines) with the corresponding code will appear in the logs. Opening and closing of journals is also implemented using the codes BB (Book beginning) and BE (book ending).

In the journals, separate records are kept for different elements (for uranium and plutonium);

Visually, the "Journals" module is a page divided into two parts. The left part provides switching between "Main log" and "Auxiliary log". You can view the records of one log at a time. The name of the active (open) journal is highlighted in color. In the right part, the records (lines) of the active log are presented directly in a table. Above the magazine there are a number of controls (filters, buttons).

The Logs module provides the following functionality:

- viewing log entries (with configuration of displayed information by means of filters);
- export of the journal of interest (part of the journal) to an .xlsx file in Russian or English (by clicking on the buttons of the same name).

3.5. Working with the Reporting Documentation module

The "Reporting Documentation" module is a set of reporting documents and corrective references to them (based on international documents (IAEA code 10), as well as adding information about sending accounting reports to the regulatory body.

Visually, the Reporting Documentation module is a page divided into three parts. The upper part switches between individual types of reports (PIL, ICR, MBR, TR) The left part provides switching between MBAs, the right part directly shows the lines with reports in a tabular form. At the bottom of the table there is a "New Report" button for creating a report depending on the selected type on the top tabs and the selected MBA.

In the column of the table "Actions" there are a number of controls (buttons):



– add a summary to the report;



– save a summary added to the report (FIX format);



– enter information about sending the report;



– save the selected report;



– delete the generated report (only available if no information about sending the report has been entered).

Simultaneous deletion of several reports is not supported, each report is deleted separately. Reports for which at least one field about sending to third-party organizations is filled in are not subject to deletion.

Tables with reports support sorting (from largest to smallest and vice versa) and filtering (by one or more conditions) of values. It is possible to scroll through the pages of the table and change the number of rows displayed on one page.

INVENTORY CHANGE REPORT										PHYSICAL INVENTORY LISTING	MATERIAL BALANCE REPORT	TEXTUAL REPORT
№ ОТЧЕТА	НАЧАЛО ПЕРИОДА	ОКОНЧАНИЕ ПЕРИОДА	ОТВЕТСТВЕННЫЙ	ИСПРАВЛЕНИЯ	ДАТА РЕГУЛЯТОР	ФИО РЕГУЛЯТОР	ДАТА МАГАТЭ	ФИО МАГАТЭ	ДЕЙСТВИЯ			
ICR#2	25.03.2020	24.04.2020		нет	27.04.2020							
ICR#5	30.06.2020	29.07.2020		нет	31.07.2020							
ICR#8	30.07.2020	29.08.2020		нет								

1 - 3 из 3 записей | Показать 25 записей

The Reporting Documentation module provides the following functionality:

- creation (generation) of reports;
- viewing a table with all reports of a given type;
- deleting a specific report;
- entering data on sending a report to third-party organizations;
- export of the report of interest to an .xlsx file in Russian or English.

If an error is found in the records of the sent reports, a "correction" procedure is performed, that is, the values in the FA (or NM batches) accounting cards are edited, indicating the type and number of the report, the number of the "corrected" line of the report, as well as the number of the report, at the end of which to add line with corrected data (clause 3.3.). In the table with all reports, in the row with the corrected report, a mark will appear indicating the presence of a correction.

3.6. Module “Documents”

The "Documents" module is designed to store all documentation that was generated by NM A&C AS in automatic mode or attached by the user independently as a result of operations, the function of printing (exporting) cartograms, as well as preparing a list of NM inventory for MBA (LII). The module provides the ability to sort and filter documents by Document Number, Document Type, Attached File Name, Date, as well as the download function.

Номер документа	Тип документа	Название документа	Дата	Имя операции
21	Акт приема-передачи ТУК		25.08.2020	Новая операция 18
20	Акт приема-передачи ТУК		10.08.2020	Новая операция 17
14	Акт приема-передачи ТУК		26.07.2020	Новая операция 14
12	Приказ		25.04.2020	Новая операция 10
13	Приказ		25.04.2020	Новая операция 11
2	Акт приема-передачи ТУК		23.04.2020	Новая операция 1
7	Акт приема-передачи ТУК		23.04.2020	Новая операция 4
1	Акт приема-передачи ТУК		21.03.2020	Новая операция 2
0	Акт приема-передачи ТУК			Новая операция 3
6	Акт приема-передачи ТУК			Новая операция 5
10	Заявка на поставку СЯТ			Новая операция 8
11	Акт приема-передачи ТУК			Новая операция 9
13	Приказ			Новая операция 12
14	Приказ			Новая операция 13
18	Приказ			Новая операция 16
2222	Акт приема-передачи ТУК			Новая операция 19
565465	Акт приема-передачи ТУК			Новая операция 22
45646	Заявка на поставку СЯТ			Перегрузка А31
45465465	Приказ			Новая операция 24

The module is divided into the following tabs: General Plant Documentation, Block #1 Documents, Block #2 Documents, Fresh Fuel Storage Documentation, Cartogram Printing, List of Inventory Items (LII).

Visually, the "Documents" module is a page divided into two parts. The left side provides switching between tabs. Only one tab can be viewed at a time. The name of the active (open) tab is highlighted in color. In the right part, the documents of the active category of documents are presented directly in a tabular form or a list of equipment / locations for which a cartogram can be generated.

Документы	Активная зона №1 Активная зона №2
Общестанционная документация	Бассейн выдержки №1 Бассейн выдержки №2
Документы Блок № 1	Хранилище свежего топлива
Документы Блок № 2	Штабеля ХСТ
Документация хранилища свежего топлива	Чехлы ХСТ -Чехол №1 -Чехол №2 -Чехол №3
Печать картограмм	-Стелаж №1 -Стелаж №2 -Стелаж №3

Documents support sorting (from largest to smallest and vice versa) and filtering (by one or more conditions) of values. It is possible to scroll through the pages of a table with documents and change the number of table rows displayed on one page.

In addition to the ability to view, filter and sort documents, the Documents module has a functional download option. The user can download any document and view it.

At any time, it is possible to obtain (export) a nuclear material status cartogram showing the numbers of equipment (container) cells and their contents (FA number, CPS AR number, simulators) in the form of a .vsd file. Cartograms reflect the state at a given point in time and, accordingly, coincide with the data displayed on the pages for monitoring the current state of NM.

NM A&C AS supports the ability to obtain cartograms of individual pieces of equipment, groups of pieces of equipment and entire rooms (or key points for measuring the amount of nuclear materials).

The cartogram can be downloaded in black and white or color. Color charts display the distribution of FA according to their enrichment, type, burnup, plutonium production. Also, a color cartogram can display the selected location in the "Equipment" mode (similar to the similar mode of the "Monitoring" module).

Similar to the "Monitoring" module, cartograms are a "sensitive" part of NM A&C AS, that is, cartogram templates are made for each nuclear power plant separately, taking into account the location of buildings, premises and equipment.

3.7. Working with the module "Tamper-indicating devices"

The "Tamper-indicating devices" module is a list of all tamper-indicating devices (leads, seals) registered in NM A&C AS, which, due to their design, make it possible to detect unauthorized access to nuclear materials. The module allows the registration of tamper indicating devices (TIDs) used by both NPP personnel and third-party organizations (for example, the IAEA or the state competent authority for the NM accounting and control system) inspecting nuclear power plants.

Visually, the "Tamper-indicating devices" module is a table with a list of all devices registered at the nuclear power plant. The table supports sorting (from largest to smallest and vice versa) and filtering (by one or more conditions) of values. It is possible to scroll through the pages of the table with devices and change the number of table rows displayed on one page.

№ УИВ	Тип	Принадлежность	Кратность использования	Статус	Состояние	Участие в операции
1	o4dJ	ПК-910П(320)	АЭС	одноразовое	Установлено	целое
2	MqGs	ПК-910П(320)	АЭС	одноразовое	Утилизировано	целое
3	Tomr	ПК-910П(320)	АЭС	одноразовое	Хранение (после снятия)	снето
4	xYOb	ПК-910П(320)	АЭС	одноразовое	Установлено	целое
5	pF1g	ПК-910П(320)	АЭС	одноразовое	Установлено	целое
6	ywku	ПК-910П(320)	АЭС	одноразовое	Хранение (после приемки)	целое
7	999999997	Кобра-М	АЭС	одноразовое	Хранение (после приемки)	целое
8	999999998	Кобра-М	АЭС	одноразовое	Хранение (после приемки)	целое
9	999999999	Кобра-М	АЭС	одноразовое	Хранение (после приемки)	целое
10	TFCL184	Кобра-М	Поставщик	одноразовое	Установлено	целое
11	FCL2201	Кобра-М	Поставщик	одноразовое	Экспортировано	целое

The "Tamper-indicating devices" module provides the ability to record changes in the life cycle of each TIP, starting from the moment it appears at a nuclear power plant and ending with export or disposal. The module allows you to quickly analyze general information about all registered TIPs (for example, to estimate the number of whole seals of a certain type that can be used for sealing), and also allows you to view and change detailed information about each of them separately.

Tamper-indicating devices go through certain stages of the life cycle, which is accompanied by an automatic change in the status of the TID.

Several options are supported for changing the status of the IIP, depending on

- multiplicity of application (single or multiple application);
- receipt at the nuclear power plant of the TID previously installed on the facility (container).

The scheme for changing the statuses of the tamper indicator device in the NM A&C AS is described as follows:

1) if the TIP is registered through the "Tamper-indicating devices" module, it is automatically assigned the status "Storage (after acceptance)". If the TIP was received on the container, and the registration went through the passport, then, after the completion of the operation, the TID will immediately have the status "Installed". If a TFI is both registered and withdrawn in the same operation, its first status will be "Storage (after withdrawal)".

2) A TID with the status "Storage (after acceptance)" can be installed on a container or equipment (in the "Tamper-indicating devices" module or in the "Operations" module), then the TID will have the status "Installed».

3) the installed TID can be removed through the "Tamper-indicating devices" module or the "Operations" module, then it will have the status "Storage

(after removal)". A single TFI with this status can no longer be applied, but a multiple one can.

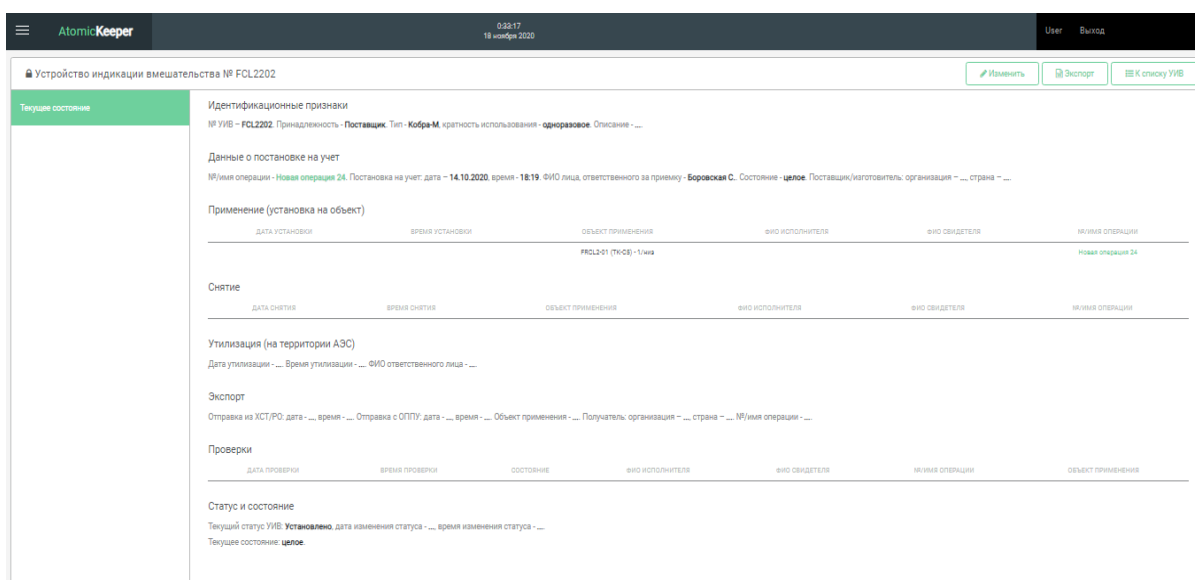
4) the removed device can be disposed of on the territory of the NPP. Information is entered in the "Tamper-indicating devices" module in the mode of editing information about a specific TID. Once the data is saved, the device status will automatically change to "Recycled". Data about a device with the status "Recycled" cannot be changed.

5) If the IPV has been installed on an exported container, its status will change from "Installed" to "Exported". Data about a device with the status "Exported" cannot be changed.

NM A&C AS provides and supports the following features of TIP handling:

- registration and editing of parameter values of both a single device and a batch of devices;
- installation, removal and verification of the integrity of the tamper indication device in compliance with the “two-person rule”;
- in order to minimize errors when entering TIS data, it is supported to check the identification number for uniqueness;
- the whole set of functionalities for TIS of third-party organizations;
- the ability to enter data on the performed inspections of TIS and their results.

The transition to detailed information about the device of interest is carried out by clicking on the corresponding icon in the table row. You can view detailed information about one tamper indication device at a time.



In addition to the ability to view detailed information about the tamper indication device, the following functional options are implemented in the module:

1) registration of a device or a batch of devices (by clicking on the buttons "Add UIV" and "Add batch of UIV" and filling in the required form fields);

The screenshot shows a web form titled "Регистрация партии УИВ". The form is divided into several sections: "Идентификационные данные" (Identification data) with fields for "Номера УИВ" (UIV numbers), "Тип" (Type), and "Принадлежность" (Belonging); "Иготовитель/поставщик" (Manufacturer/Supplier) with fields for "страна" (Country) and "организация" (Organization); and "Данные о поступлении" (Arrival data) with fields for "Дата приемки" (Acceptance date), "Время приемки" (Acceptance time), "Состояние (на дату приемки)" (Status) with radio buttons for "Целое" (Intact) and "Нарушено" (Damaged), and "ФИО лица, ответственного за приемку" (Full name of the person responsible for acceptance). There are "Отменить" (Cancel) and "Сохранить" (Save) buttons at the top right.

2) editing the values of the device parameters (by clicking on the "edit" icon and changing the current values). Editing is not subject to tamper-indicating devices that are involved in an incomplete operation;

The screenshot shows the "AtomicKeeper" web application interface. The top navigation bar includes the logo, the time "0:36:25" and date "18 ноября 2020", and user information "User" and "Выход" (Logout). The main content area is titled "Устройство индикации вмешательства № 23" (Tamper indication device #23) and has "Режим просмотра" (View mode) and "К списку УИВ" (To UIV list) buttons. A left sidebar contains a menu with "Идентификационные данные" (Identification data) selected. The main panel shows the "Идентификационные данные" section with fields for "№ УИВ" (23), "Тип" (VOID), "Принадлежность" (АЭС), "Иготовитель/поставщик" (Manufacturer/Supplier) with "страна" (Country) and "организация" (Organization) fields, and "Описание" (Description). There are "Сохранить" (Save) and "Отмена" (Cancel) buttons at the bottom.

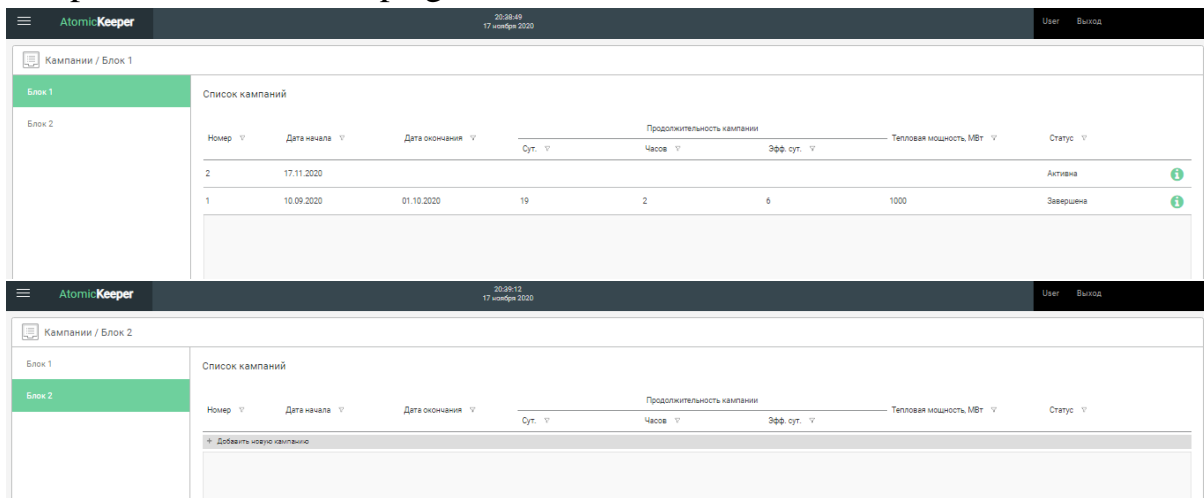
3) deleting the device (by clicking on the "delete" icon with confirmation of the action). Supported only for devices with the status "Storage (after acceptance)" that have never been installed on a container or equipment;

4) export of detailed information about the device of interest to a .docx file.

When registering or editing information about tamper-indicating devices, it is supported to check the entered values for compliance with validation criteria (for example, the impossibility of choosing a date in the future, valid characters, etc.). If the latter are violated, a corresponding warning message is displayed and the ability to save changes is blocked.

3.8. Working with the Campaigns module

In the Campaigns module, you can start and end campaigns on the core of any NPP power unit, as well as view information about ongoing or past campaigns. The main page of the module is a list of campaigns for the power unit selected on the left. The main purpose of this module is to provide reliable information about all campaigns of power units, including general information (campaign start / end date, campaign status - completed / active, etc.) and detailed information about the composition of each campaign.



Visually, the Campaigns module is a page divided into two parts. The left part provides switching between NPP power units. The name of the active (open) power unit is highlighted in color. On the right side, in tabular form, a list of all campaigns of the active power unit is presented. The list of campaigns supports sorting (from largest to smallest and vice versa) and filtering (by one or more conditions) of values. The ability to scroll through the pages of the table with campaigns and change the number of table rows displayed on one page is supported. The transition to detailed information about the composition of the campaign of interest occurs by clicking on the "view" icon in the line with this campaign.

The screenshot displays the 'Campaigns' module in AtomicKeeper. The top navigation bar includes the logo, date (20-02-2020), and user information. The main content area is titled 'Кампании / Блок 1 / Состав кампании № 1'. It features a sidebar with 'Блок 1' and 'Блок 2' and a main panel with 'Общие сведения' (General Information) and a table of campaigns.

Общие сведения:

- Кампания: № 1 (блок № 1)
- Дата начала кампании: 10.09.2020
- Дата окончания кампании: 01.10.2020
- Продолжительность кампании: эфф.сут.: 6
- Продолжительность кампании: сут.: 19
- Продолжительность кампании: ч.: 2
- Тепловая мощность, МВт: 1000
- Статус кампании: Завершена

Таблица кампаний:

№(360°)	координаты	№(60°)	№ TBC	Тип TBC (автомат. тип TBC)	№ кампании TBC	№ ПС СУЗ	№ группы ОП СУЗ	№ кампании ПС СУЗ	№ тип имитатора
1	15-24	13	N4000 FL012	Z40 (1200.01.00.000-08)	1				
2	15-26	18	N4372 FL009	Z4482 (1200.01.00.000-22)	1				
3	15-28	22	N4372 FL007	Z4482 (1200.01.00.000-22)	1				
4	15-30	25	N4372 FL005	Z4482 (1200.01.00.000-22)	1				
5	15-32	27	N4372 FL011	Z4482 (1200.01.00.000-22)	1				
6	15-34	28	N4000 FL006	Z40 (1200.01.00.000-08)	1				
7	14-21	28	N4000 FL008	Z40 (1200.01.00.000-08)	1				
8	14-23	7	N2329 FL021	Z3329 (1200.01.00.000-06)	1				
9	14-25	12	N2400 FL005	Z24 (1200.01.00.000-03)	1	N1FL005	2	1	
10	14-27	17	N3272 FL005	Z3322 (1200.01.00.000-05)	1	N4FL005	3	1	
11	14-29	21	N2400 FL006	Z24 (1200.01.00.000-03)	1	N1FL006	10	1	
12	14-31	24	N3272 FL002	Z3322 (1200.01.00.000-05)	1	N4FL002	4	1	
13	14-33	26	N2400 FL017	Z24 (1200.01.00.000-03)	1	N1FL017	1	1	
14	14-35	7	N3229 FL019	Z3329 (1200.01.00.000-06)	1				
15	14-37	13	N4000 FL010	Z40 (1200.01.00.000-08)	1				
16	13-20	27	N4372 FL024	Z4482 (1200.01.00.000-22)	1				

The following functionality is implemented in the Campaigns module:

- 1) start and end of campaigns;
- 2) viewing the list of all campaigns of the power unit, as well as the composition of each of the campaigns;
- 3) export campaign data to .docx document

When entering or editing data about a campaign, it is supported to check the entered values for compliance with validation criteria (for example, falling into the allowable range of values, etc.). If the latter are violated, a corresponding warning message is displayed and the ability to save changes is blocked.

3.9. Module "References"

The "Reference books" module is a set of 32 thematic reference books ("Positions", "Units of measurement", "KKS codes for buildings", "KKS codes for premises", "Defect codes", "Codes for the preparation of MBO (IAEA code 10)", "MBM Codes", "Isotope Codes (IAEA Code 10)", "Inventory Change Codes (IAEA Code 10)", "KMP Quantity Codes", "KMP Flow Codes", "Manufacturer Organization Codes", "Recipient Organization Codes", "Supplier Organization Codes", "Measurement Basis Codes (IAEA Code 10)", "Conservation (Packaging) Codes (IAEA Code 10)", "Irradiation and Purity Status Codes (IAEA Code 10)", "Country Codes", "Physical form codes (IAEA code 10)", "Chemical form codes (IAEA code 10)", "Element codes (IAEA code 10)", "Employees", "Specialists of other organizations", "Measuring instruments", "Structural subdivisions", "Transshipment schemes", "Types of documents", "Types of containers", "Types

FA”, “Types of UIV”, “Forms of accounting units”), each of which contains information about certain information parameters and when their own codes.

Visually, the "References" module is a page divided into two parts. On the left side is a list of all 32 reference books in alphabetical order. You can view the entries of one directory at the same time. The name of the active (open) directory is highlighted in color. In the right part, the records of the active directory are presented directly in a table form. All reference books support sorting (from largest to smallest and vice versa) and filtering (by one or more conditions) of values. The ability to scroll through the pages of the table and change the number of table rows displayed on one page is supported.

Reference books perform two main functions: first, they store and display reference information (for example, a list of nuclear material isotope codes); secondly, based on the directory entries, lists of predefined values are formed, which are used in all other NM A&C AS modules when entering data about a particular event and/or object. The latter allows not only to reduce the amount of re-entered data, but also reduces the likelihood of introducing errors by the user NM A&C AS.

All reference books can be divided into two groups according to the possibility of their editing: changeable and unchangeable. The group of invariable includes reference books containing information that is established by international documents and is the same for various nuclear installations and enterprises. From the point of view of user capabilities, this group of reference books supports the browsing function. The group of changeable (editable) reference books combines reference books that contain information specific to each nuclear installation (for example, "Employees" or "KKS codes of buildings"). Since this information may change over time, functionally, the NM A&C AS user has the ability to view, add, delete, and edit directory entries for this group.

All immutable reference books are filled with data by default. Some of the changeable reference books are initially empty and all values are entered by the user of NM A&C AS (for example, the directory "Codes of supplier organizations"). Another part of the changeable reference books is partially filled (for example, the directory "Country Codes"), but the user of NM A&C AS retains the ability to edit (change and / or delete existing entries, add new ones) entries.

Коды инвентарных изменений (код 10 МАГАТЭ)			
Должности	Код	Наименование	Описание
Единицы измерения	ИГ	Импортное поступление	Ядерный материал, импортный в страну
Коды ККС админ	ИВ	Внутригосударственное поступление	Внутригосударственное поступление ядерного материала из другой ЗЕМ
Коды ККС помещений	ИЗ	Поступление в начальной точке	Внутригосударственное поступление ядерного материала в начальной точке применения гарантий в соответствии с пунктом с) статьи 34 Соглашения
Коды дефектов	ИН	Поступление из не находящейся под гарантией сферы деятельности	Внутригосударственное поступление ядерного материала из не находящейся под гарантией (разрешенной волею) сферы деятельности
Коды для подготовки МВО (код 10 МАГАТЭ)	ИР	Ядерное производство	Производство расщепляющегося материала в реакторе (P _h U-233)
Коды ЗЕМ	ИУ	Повторная поставка под гарантии в связи с использованием	Возобновление применения гарантий в отношении ядерного материала, ранее освобожденного от применения гарантий в соответствии со статьей 36 Соглашения
Коды инвентарных изменений (код 10 МАГАТЭ)	ИФ	Повторная поставка под гарантии в связи с количеством	Возобновление применения гарантий в отношении ядерного материала, ранее освобожденного от применения гарантий в соответствии со статьей 37 Соглашения
Коды КТИ количества	ИХ	Экспортное отправление	Экспорт ядерного материала из страны
Коды КТИ потока	ИЦ	Внутригосударственное отправление	Внутригосударственная передача ядерного материала в другую ЗЕМ
Коды методов/средств измерения	ИЧ	Отправление в сферу деятельности, связанное с не находящимся под г.	Внутригосударственная передача ядерного материала в не находящуюся под гарантией (разрешенную волею) сферу деятельности
Коды организационной-изготовительной			
Коды организационной-получательной			

Most directories are independent of each other. Several edited references use data from other references. For example, to create an entry in the "Employees" directory, the user of NM A&C AS must enter data about the position held by the employee and the structural unit in which he works. Lists with positions and structural subdivisions are formed on the basis of entries from references of the same name. The presence of dependencies between references does not affect the correct functioning of NM A&C AS, but imposes certain restrictions on the order in which records are added to references. So, if there are no entries in the "Positions" and "Structural units" references, it will not be possible to add an entry to the "Employees" directory.

Edited references have the following controls: icons for "deleting" and "editing" a directory entry, the "Add" button for adding a new entry to the directory. Deleting an entry from the directory requires confirmation of the action. Clicking on the "edit" icon in the line with a specific directory entry leads to the transition from the view mode and into the edit mode. The NM A&C AS user is shown the current values of the parameters, which he can change to the required ones. A similar page is displayed when adding a new entry, except for the absence of the current parameter values. Saving and canceling actions for editing / adding a directory entry occurs by pressing the buttons of the same name. When changing or adding a new entry to the directory, it is supported to check the entered values for compliance with validation criteria (for example, the uniqueness of values, the range of valid values, etc.), if they are violated, a corresponding warning message is displayed and the ability to save changes is blocked.

3.10. Working with the "Notifications" module

The "Notifications" module is represented by two types of notifications (reminders) - one-time and periodic. The module provides the ability to create

reminders of upcoming events, activities, etc., track and change their status. The "Notifications" module can be considered as an optional organizational mechanism that, on the one hand, allows you to track the timely completion of a particular task by a responsible person, and, on the other hand, is a convenient way to monitor upcoming events, allows you to plan the distribution of resources in advance and perform necessary preparatory work, including the preparation of documentation.

Visually, the "Notifications" module is a page divided into two parts. The left side allows you to toggle between "One Time Notifications" and "Setting Periodic Notifications". At the same time, you can view records of either one-time or periodic notifications. The name of the active (open) type of notification is highlighted in color. In the right part, the records of the active type of notifications are presented directly in a tabular form. Notifications support sorting (from largest to smallest and vice versa) and filtering (by one or more conditions) of values. It is possible to scroll through the pages of the table with notifications and change the number of table rows displayed on one page.

№	Тип	Категория	Описание	Дата напоминания	Исполнение уведомления		Статус	Создание уведомления	
					Дата	Отв. лицо		Дата	Имя пользователя
1	Заказ пропусков	многократное	Пропуска для специали...	04.02.2018	09.02.2018	Иванов Андрей	Не выполнено (с...	31.01.2018	Пинк Флойд
2	Подготовка доку...	однократное	Пакет документов (перг...	04.02.2018	05.02.2018	Иванов Андрей	Не выполнено (с...	31.01.2018	Пинк Флойд
3	Подготовка доку...	однократное	Рабочий график и програ...	05.02.2018	06.02.2018	Иванов Андрей	Не выполнено (с...	31.01.2018	Пинк Флойд
4	Подготовка доку...	однократное	Отчеты для МАГАТЭ	06.02.2018	07.02.2018	Иванов Андрей	Не выполнено (с...	31.01.2018	Пинк Флойд
5	Обновление дан...	однократное	Обновить ИС для ТВС 10...	10.02.2018	21.02.2018	Иванов Андрей	Ожидает исполн...	31.01.2018	Пинк Флойд
6	Отправка докум...	однократное	Предварительное уведо...	11.02.2018	12.02.2018	Иванов Андрей	Не выполнено (с...	31.01.2018	Пинк Флойд
7	Иные	однократное	Пересмотреть справоч...	12.02.2018	13.02.2018	Иванов Андрей	Не выполнено (с...	31.01.2018	Пинк Флойд
8	Заказ пропусков	многократное	Пропуска специалистам ...	19.02.2018	24.02.2018	Иванов Андрей	Ожидает исполн...	31.01.2018	Пинк Флойд

One-shot notifications are designed to remind you of an occasional or infrequent upcoming event. An example of a one-time notification could be the need to order passes for representatives of a nuclear fuel supplier or the need to update data on the isotopic composition of spent nuclear fuel before it is sent for reprocessing.

Periodic notifications are designed to remind you of a recurring upcoming event. This type of notification is a template for generating identical one-time notifications at specified time intervals. As an example, we can list: regular physical inventories and inspections by the IAEA, time-limited submission of reporting documents to the state competent authority of the NM accounting and control system, etc.

One-time notifications (either self-generated or based on a periodic notification template) go through specific life cycle stages. Whether a notification is at a particular stage can be determined by its current status. In some cases, the status change occurs automatically, in others - with the participation of the user NM A&C AS . When you create a one-time notification (by any method), it is automatically assigned the status "Pending". Next, there are several options for changing the notification status:

- If the task described in the notification is completed earlier or on the due date, then the NM A&C AS user must explicitly change the status of the notification from "Pending" to "Completed (on time)". The "Completed (on time)" status is the final status for the notification, i.e. changing the notification parameters (including the status) is not supported in the future;

- If the task described in the notification is no longer relevant for any reason, then the NM A&C AS user must explicitly change the status of the notification from Pending to Canceled. The Canceled status is not the end state for the notification, i.e. changing the notification parameters (including the status) is supported;

- if the task described in the notification has not been completed by the due date (i.e. the task has not actually been completed, or the task has been completed, but the NM A&C AS user has not changed the status of the notification to "Completed (on time)"), then NM A&C AS will automatically change the status notifications from "Pending" to "Not completed (expired)". The "Not done (expired)" status is not the final status for the notification, i.e. editing of the notification parameters (including the notification status) is supported).

One-shot notifications with a current status of "Canceled" can be reverted to a status of "Pending". This option is supported for the following reasons: firstly, it retains the ability to correct a user error in case of an incorrect accidental transfer of a notification to the “Cancelled” status; secondly, if the task described in the notification becomes relevant again, the user will not have to spend time creating a new notification.

For one-time notifications with the current status "Not completed (expired)", the following status changes are possible:

- if the overdue task described in the notification is still completed after the “due date”, then the NM A&C AS user must explicitly change the status of the notification from “Not completed (due)” to “Completed (late)”. The "Done (late)" status is the final status for the notification, meaning that changing the notification parameters (including the status) is not supported afterward;

- if the overdue task described in the notification is no longer relevant for any reason, then the NM A&C AS user must explicitly change the status of the notification from Not Done (Due Due) to Canceled. The Canceled status is not a final state for a notification, i.e. changing the notification parameters (including the status) is supported;

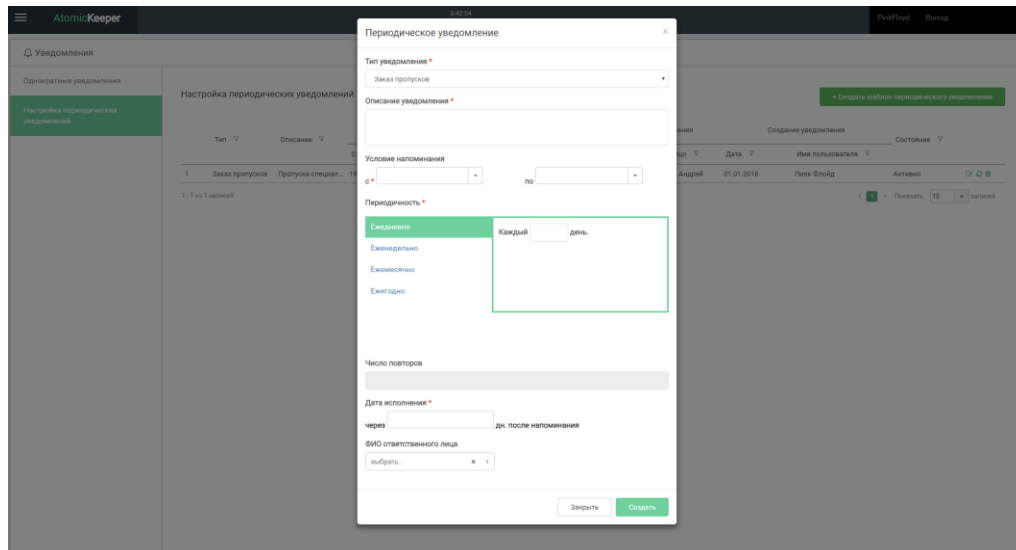
- if the overdue task described in the notification is to be completed with an extension of the due date, then the NM A&C AS user must explicitly change the "Due Date" and the status of the notification from "Not Completed (Due Due)" to "Pending". The "Pending" status is the initial state for a notification with full support for editing notification parameters (including status).

Unlike one-time notifications, periodic notifications do not have statuses. When creating a periodic notification, the conditions for triggering (period from / to, frequency) of a periodic notification are specified, which manifests itself in the automatic creation of a one-time notification (according to the template of a periodic notification). In addition to the automatic termination of the periodic notification triggering that occurs after the end of the specified firing period, it is possible to force the termination of periodic notification firings by the user of NM A&C AS. To do this, the value of the "State" parameter of the notification of interest is changed from "Active" to "Inactive". The reverse translation of the "State" allows you to resume the generation of one-time notifications according to the periodic notification template.

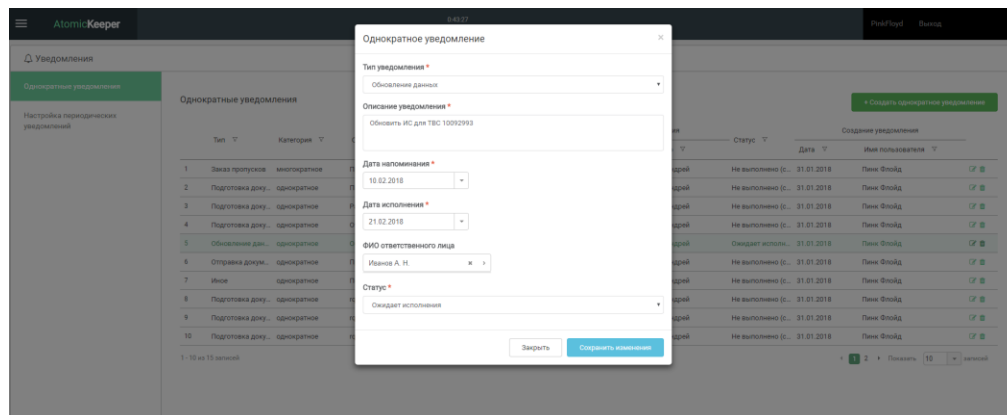
№	Тип	Описание	Условия напоминания		Исполнение уведомления		Создание уведомления		Состояние	
			С	По	Дата	Отв. лицо	Дата	Имя пользователя		
1	Заказ пропусков	Пропуска специал...	19.02.2018	04.02.2018	5	через 5 дн. после...	Иванов Андрей	31.01.2018	Пинк Флойд	Неактивно
2	Подготовка доку...	Отчетные докумен...	19.02.2018	19.02.2019	4	через 15 дн. после...	Петров Василий	19.02.2018	Пинк Флойд	Активно
3	Отправка докум...	Отчетные докумен...	19.02.2018	19.02.2019	4	через 20 дн. после...	Игнатенко Владис...	19.02.2018	Пинк Флойд	Активно

In addition to the ability to view the parameters of one-time and periodic notifications, the following functional options are implemented in the Notifications module:

- creating a notification (by clicking on the buttons of the same name and filling in the required form fields);



- editing the values of the notification parameters (by clicking on the "edit" icon and changing the current values of the notification parameters). One-time notifications with the status "Completed (on time)" and "Completed (late)" are not subject to editing;



- deleting a notification (by clicking on the "delete" icon with confirmation of the action).

When creating or editing a notification, it is supported to check the input values for compliance with validation criteria (for example, a valid date range, the inability to select a reminder / due date in the past, etc.). If the latter are violated, a corresponding warning message is displayed and the ability to save changes is blocked.

To attract the attention of the NM A&C AS user, part of the parameters ("Type", "Description" and "Execution date") of one-time notifications with the

statuses “Pending execution” and “Not fulfilled (expired)” are displayed as a separate block in the NM current state monitoring module. Clicking on the "Details" link in the line with a specific notification displayed in the monitoring module leads to a transition to the "Notifications" module with color highlighting of the notification of interest.

The screenshot displays a monitoring interface with three main sections:

- Уведомления (Notifications):** A table on the left with a red border containing several entries. The last entry, "Пересмотреть справочники на в...", is highlighted with a red background and a red exclamation mark icon.
- Активная зона (Active Zone):** Two hexagonal cell maps showing the status of different zones. The top one is labeled "ЗЕМ 1 / КТРА А" and the bottom one "ЗЕМ 2 / КТРА А".
- Бассейн выдержки (Retention Basin):** A grid of smaller hexagonal cell maps for various sections (Секция М1 through М11) and a "СМР" section.
- Текущее состояние (Current State):** A table on the right with a green header. It shows a list of parameters and their values, with a "Ничего не выбрано" (Nothing selected) message at the top.

4. EMERGENCY ACTIONS

The system must ensure correct handling of emergency situations caused by incorrect actions of the administrator, incorrect format, or invalid input data values. In these cases, the administrator should be given appropriate alarm messages, and then return to the working state that preceded the incorrect (invalid) command or incorrect data entry. Emergencies can occur both due to errors in software products and due to incorrect settings.

The main signs of an emergency are:

1. Absence of the required page on the screen.
2. Windows with messages about an emergency situation.
3. Windows with messages in English.
4. Errors related to the software.

4.1. Actions in case of non-compliance with the technological process conditions, including the case of long-term technical failures

After receiving an error message, you must follow the recommendations indicated in the message, if any, otherwise reload the page, check the network connection. If the error message recurs, please contact the Atomic Keeper developer. When contacting the developer, you must specify the course of action that led to the error, including providing the information entered into the system, if an error occurred while entering it, user action log data.

4.2. Actions to restore programs and / or data in case of the failure of magnetic storage media or detection of errors in data

If magnetic media fails or errors are found in the data, the system administrator must restore the files and data necessary for the correct operation of the system from the latest backup. If the administrator cannot resolve errors in the data, you should contact the Atomic Keeper developer. In this case, it is necessary to specify a list of data containing errors and the correct values of distorted attributes.

4.3. Actions in cases of detection of unauthorized data tampering

In case of detection of unauthorized interference with Atomic Keeper data, the system administrator must restore the files and data necessary for the correct operation of the system from the latest backup. You should also contact the developer of "Atomic Keeper" and describe the signs and the expected nature of the interference, as well as indicate the list of data subjected to interference.

4.4. Actions in other emergencies

If other emergencies occur while working with Atomic Keeper and it is impossible to eliminate them using the administration tools, the database management system or the operating system, you should contact the system developer. In this case, it is necessary to describe the signs of an emergency and the actions that were performed by the user immediately before the occurrence of an emergency. The main possible emergency situations and their solutions are described below.

Emergency situation	Possible loss of information	Method of fixing	Performer
Turn off hardware power	User unsaved data	Re-entering and saving information	User
Hardware failure (excluding hard drive)	User unsaved data	Re-entering and saving information	User
Server operating system failure	All information received by the System since the end of the last data backup.	Restoring data from backup	Administrator
Hard drive failure	All information received by the System since the end of the last data backup.	Restoring data from backup	Administrator
Failed to transfer data	Information transmitted	Resending data to the server	User
Missing page on the screen	User unsaved data	Page reload by the button "Update" in the Internet browser; return to the previous page and click again on the link to the required page	User
Emergency situation message windows	User unsaved data	Follow the instructions in the message, if any. If necessary, contact the administrator	User

Emergency situation	Possible loss of information	Method of fixing	Performer
Windows with messages in English	User unsaved data	Contact the administrator	User
Software related errors	All information received by the System since the end of the last data backup.	Restarting the relevant software, rebooting the server, restoring data from backups	Administrator