Intellectual information system for a regulatory authority to ensure nuclear and radiation safety

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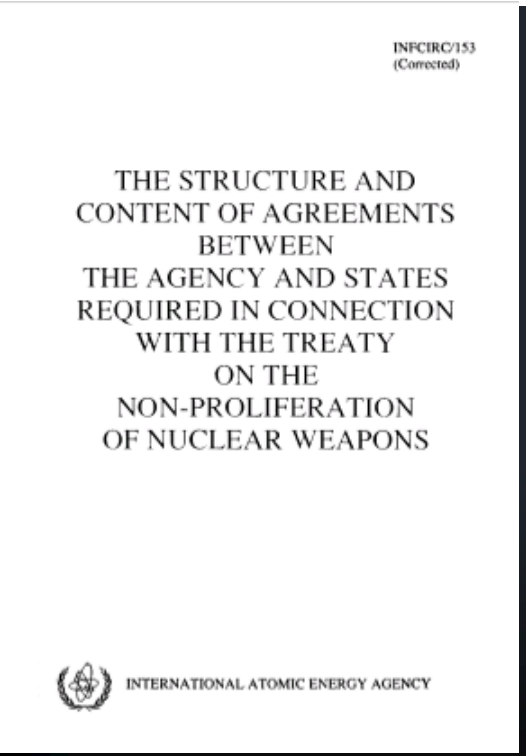
Regulatory Authority Information System

https://www.iaea.org/resources/software/rais-plus

The Regulatory Authority Information System (RAIS+) is a software application developed by the IAEA to assist Member States in managing their regulatory control programmes in accordance with IAEA Safety Standards, as well as the IAEA Code of Conduct on the Safety and Security of Radioactive Sources. The tool helps countries implement regulatory processes for the control of radiation sources using an integrated management system, and to maintain a national register of radiation sources and other safety and security related records.

What about accounting and control of nuclear materials or radioactive waste?
What about supervision of the construction, commissioning and operation of a nuclear power plant or research reactor?
What about licensing process, automation of issuing permits for the import and export of ionizing radiation sources etc.?

Nuclear material accounting and control



INFCIRC/153
(Corrected)

THE STRUCTURE AND CONTENT OF AGREEMENTS BETWEEN THE AGENCY AND STATES REQUIRED IN CONNECTION WITH THE TREATY ON THE NON-PROLIFERATION OF NUCLEAR WEAPONS

INTERNATIONAL ATOMIC ENERGY AGENCY

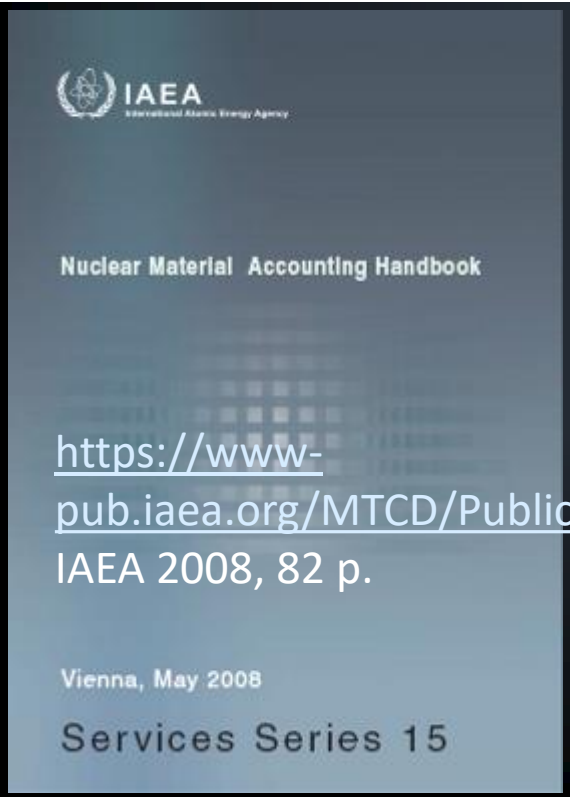
Safeguards Agreements such as INFCIRC / 153 provide a framework for informing the IAEA about all nuclear materials in Member States. The reports to be submitted to the Agency are of three types:

- Nuclear material inventory change report (ICR);
- Material balance report (MBR);
- Physical inventory listing (PIL);

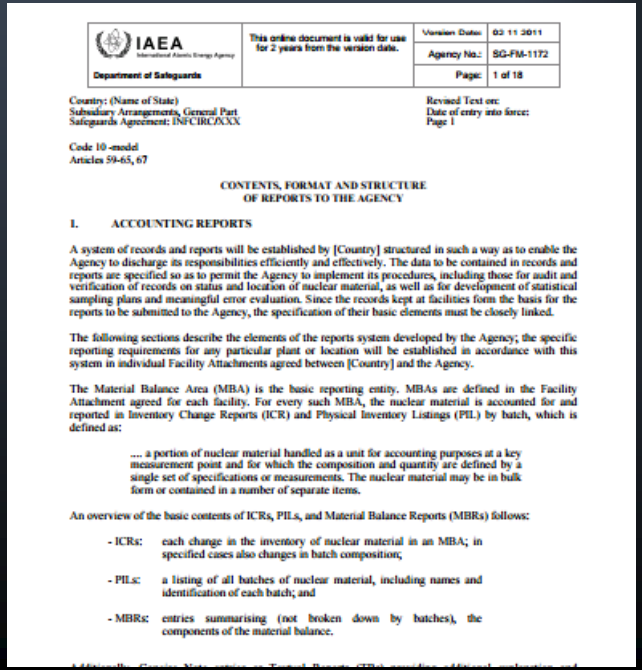
Brief notes may be provided for any of these reports.

https://www.iaea.org/sites/default/files/publications/documents/infcircs/1972/infcirc153.pdf

Nuclear material accounting and control



https://www.iaea.org/sites/default/files/sg-fm-1172_-_model_subsidiary_arrangement_code_10_labelled.pdf
IAEA 2011, 18 p.



IAEA International Atomic Energy Agency
Department of Safeguards

This online document is valid for use for 2 years from the version date.

Version Date:	03 11 2011
Agency No.:	SG-FM-1172
Page:	1 of 18

Country: (Name of State)
Subsidiary Arrangements, General Part
Safeguards Agreement: INFCIRC/XXX

Revised Text on:
Date of entry into force:
Page 1

Code 10 -model
Articles 59-65, 67

CONTENTS, FORMAT AND STRUCTURE OF REPORTS TO THE AGENCY

I. ACCOUNTING REPORTS

A system of records and reports will be established by [Country] structured in such a way as to enable the Agency to discharge its responsibilities efficiently and effectively. The data to be contained in records and reports are specified so as to permit the Agency to implement its procedures, including those for audit and verification of records on status and location of nuclear material, as well as for development of statistical sampling plans and meaningful error evaluation. Since the records kept at facilities form the basis for the reports to be submitted to the Agency, the specification of their basic elements must be closely linked.

The following sections describe the elements of the reports system developed by the Agency; the specific reporting requirements for any particular plant or location will be established in accordance with this system in individual Facility Attachments agreed between [Country] and the Agency.

The Material Balance Area (MBA) is the basic reporting entity. MBAs are defined in the Facility Attachment agreed for each facility. For every such MBA, the nuclear material is accounted for and reported in Inventory Change Reports (ICR) and Physical Inventory Listings (PIL) by batch, which is defined as:

> ... a portion of nuclear material handled as a unit for accounting purposes at a key measurement point and for which the composition and quantity are defined by a single set of specifications or measurements. The nuclear material may be in bulk form or contained in a number of separate items.

An overview of the basic contents of ICRs, PILs, and Material Balance Reports (MBRs) follows:

- ICRs: each change in the inventory of nuclear material in an MBA; in specified cases also changes in batch composition;
- PILs: a listing of all batches of nuclear material, including names and identification of each batch; and
- MBRs: entries summarising (not broken down by batches), the components of the material balance.

https://www-pub.iaea.org/MTCD/Publications/PDF/svs_015_web.pdf
IAEA 2008, 82 p.

The system of legal regulation of radiation safety in Belarus

According to agreements with the IAEA, in the state system of accounting and control of nuclear materials of the Republic of Belarus, all nuclear material weighing more than 0 grams of plutonium, uranium (depleted, enriched, natural) and thorium is subject to accounting and control.

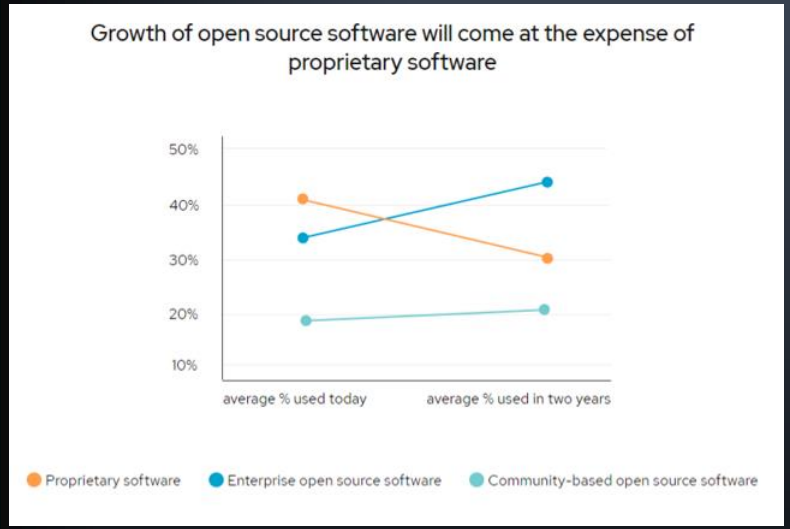
These elements are widely used not only in various nuclear installations and reactors of operating organizations, such as the Belarusian NPP, the State Scientific Institution "JIPNR - Sosny" of the National Academy of Sciences of Belarus, but also in small quantities in various medical devices, transport containers, as a part of control and measuring equipment, radioisotope smoke detectors, etc., used in a large number of enterprises and organizations.

Problems of information support for the system of legal regulation of radiation safety

- Often, the software for accounting for radiation sources, nuclear materials, radioactive waste, even in one organization, is represented by disparate, unrelated software products developed at different times by different manufacturers on different platforms.

- It can be just documentation that appears in the process of work, which is printed by employees in the MS Office applications, and, as practice shows, which can be saved simply in a printed form on paper.

Free software



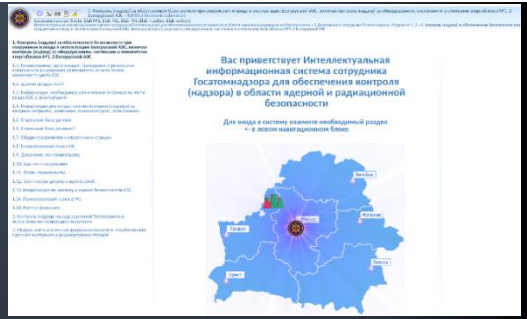
Free software (open source software, also libre software) is a software, the users of which have the rights ("freedom") to install, run, freely use, study, distribute and change (improve), and distribute copies and results of the change. If software has exclusive rights, then freedoms are declared through free licenses.

Proprietary software (non-free software) is a software that is the proprietary property of its

authors or copyright holders and does not meet the criteria for free software.

https://www.redhat.com/cms/managed-files/rh-enterprise-open-source-report-detail-f21756-202002-en.pdf

Intellectual information system of a Gosatomnadzor employee to ensure control (supervision) in the field of nuclear and radiation safety



System contains the following modules:

1. Module of control (supervision) over ensuring safety during the construction, commissioning and operation of the Belarusian NPP, including control (supervision) over the equipment, systems and elements of power units No. 1, 2 of the Belarusian NPP;
2. Module of control (supervision) over radiation safety of ionizing radiation sources, including automation of issuing permits for the import and export of ionizing radiation sources;
3. Module for licensing process;
4. Module for accounting and control of nuclear materials and radioactive waste;
5. Module "General information and auxiliary tools ".

Intellectual information system of a Gosatomnadzor employee to ensure control (supervision) in the field of nuclear and radiation safety

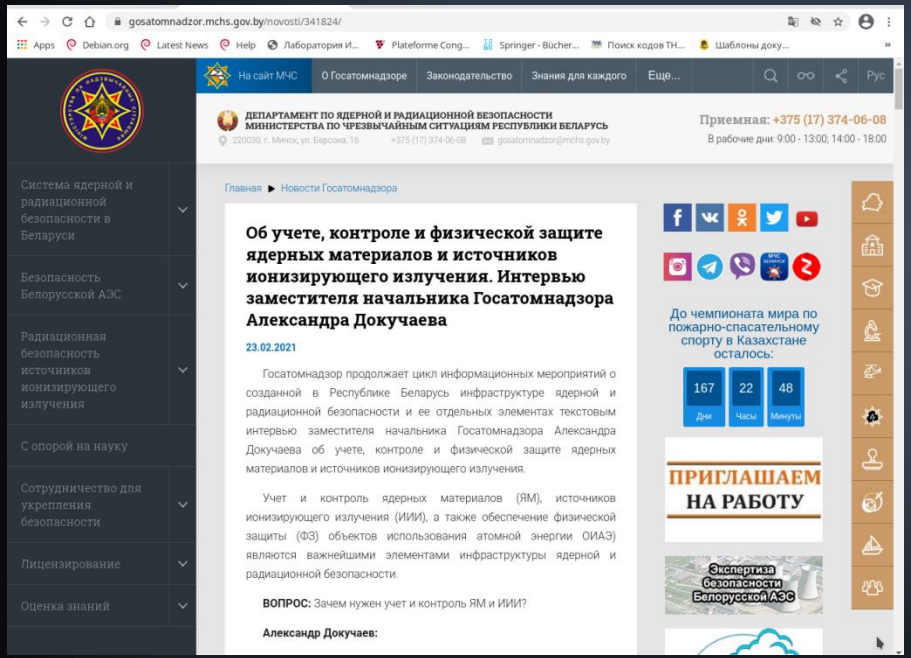
eLab is a client-server architecture system running undo Windows and Linux operating systems, based on free software: Debian GNU / Linux, Apache web-server, Firebird database server, PHP application server.

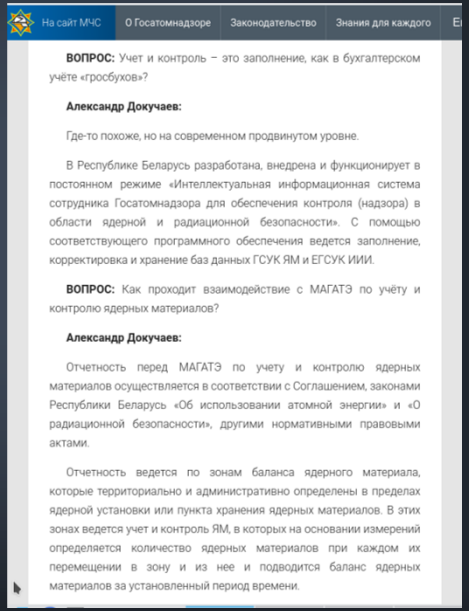
It works through the Web interface in multi-user mode with shared access rights through any browsers: Mozilla Firefox, Google Chrome, Opera, etc.
The system is a web application in the PHP scripting language connected to database with user data and organizing the business logic of the application. The general structure of the system consists of the following components:

- databases (DB), including reference books, technical documentation, etc.
- user authentication system,
- user interface,
- reporting module,
- full-text search module,
- system documentation.

СВИДЕТЕЛЬСТВО
О РЕГИСТРАЦИИ КОМПЬЮТЕРНОЙ ПРОГРАММЫ
№ 1117

Intellectual information system of a Gosatomnadzor employee to ensure control (supervision) in the field of nuclear and radiation safety





https://gosatomnadzor.mchs.gov.by/novosti/341824/

Intellectual information system of a Gosatomnadzor employee to ensure control (supervision) in the field of nuclear and radiation safety

The following algorithms have been developed :

1. An in-depth specification of the kernel code and system databases in order to provide a general systematic approach to retrieving and editing data in the database.
2. Own system of user interface controls, including dedicated buttons, e.g. for sending emails and checking data in the State Internet registries.
3. Several levels of sorting and filtering records.
4. A declarative markup language for importing complex shapes and data from Excel files, text files with special labels and coordinates for dynamic and static data.
5. Module for processing incoming mail and attached files.
6. The system for the formation of final documents according to the established samples with the ability for the user to make changes to templates.
7. "Statistical" reports, notification system, change log.
8. Enterprise tree tool.
9. Full-text search in documents.

Intellectual information system of a Gosatomnadzor employee to ensure control (supervision) in the field of nuclear and radiation safety

Principles of the work in the system are the next:

1. Complete all reference-book, that are small logs referenced from the main data logs (journals).
2. Create, complete and save an entry in the main data log.
3. Load files into the record if necessary.
4. Fill in the entries in the auxiliary logs, information from which is accumulated and displayed in the main journal using ”view”.
5. If there is additional data in the files, import it into the log.
6. Generate a reporting document using the available report templates.
7. If necessary, create an additional report template, create a record for it and upload it to the system.
8. If necessary, export data to files.

Intellectual information system of a Gosatomnadzor employee to ensure control (supervision) in the field of nuclear and radiation safety

Data from the old databases of Gosatomnadzor on accounting for radiation sources and nuclear materials were loaded into the system with the help of special scripts.

The system is connected to the Unified Register of Licenses https://license.gov.by/ and the database of the Ministry of Taxes and Duties of the Republic of Belarus http://nalog.gov.by/ .

At present, in the Republic of Belarus at the level of the regulatory body, ***all accounting*** of sources of ionizing radiation, ***all accounting*** of nuclear material with reporting to the IAEA, and supervision of the construction of the Belarusian NPP are carried out with the help of the system.

Module No. 3 of accounting and control of nuclear materials, radioactive waste, spent nuclear fuel

The main tasks in the field of accounting and control of nuclear materials, spent nuclear fuel and radioactive waste are the next:

- timely determination of the amounts of such substances;
- preparation, registration and maintenance of accounting and reporting documents;
- control of authorized placement and movement of nuclear materials, spent nuclear fuel and radioactive waste.

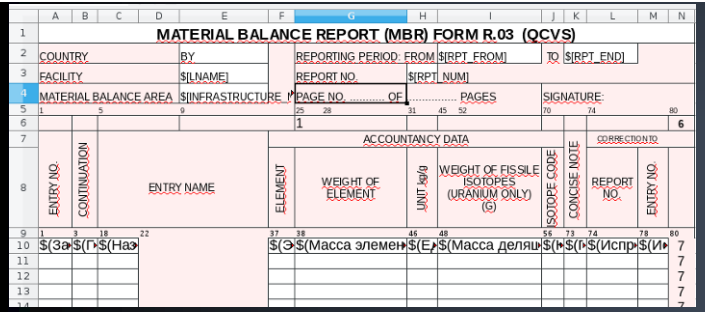
Main documents generated in the module:

- nuclear material inventory change report (ICR);
- material balance report (MBR);
- physical inventory listing (PIL);
- text report (TR);

There are implemented the following processes:

- automatically calculated based on PIL, ICR, MBR, the main ledger (General Ledger).
- preliminary calculation of data for PIL and MBR;
- a process for correcting an entry in accordance with IAEA regulations;
- import / export from / to the system of all types of reports in formats of fixed and labeled code 10.

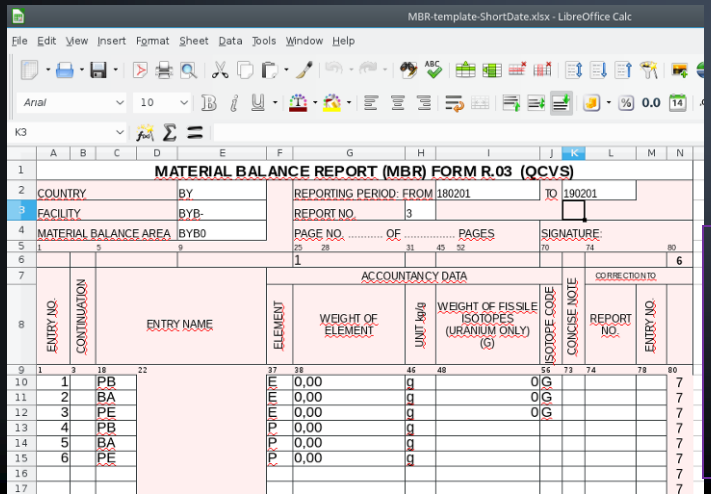
Module No 3 - import / export of reports

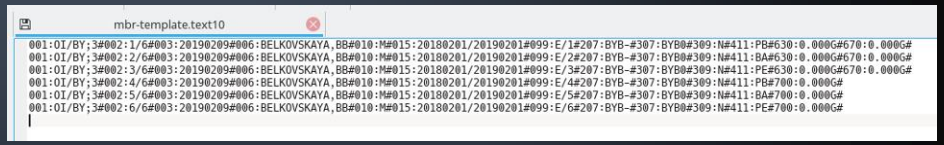


Accounting report templates:

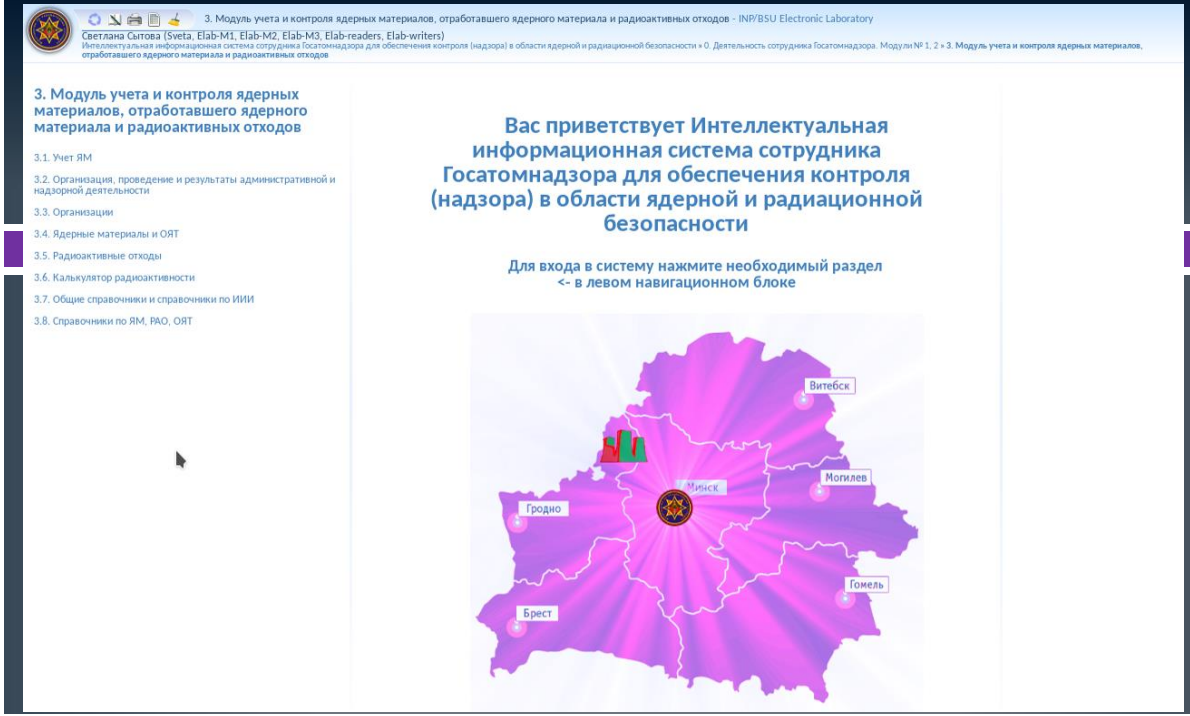
<- Fixed format

Labeled format





A declarative markup language has been developed for importing complex forms and data from Excel files, text files with special labels indicating coordinates for dynamic and static data.



Thank you for attention!

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