

THE INFORMATION SYSTEM ON
OCCUPATIONAL EXPOSURE IN MEDICINE,
INDUSTRY AND RESEARCH:
INDUSTRIAL RADIOGRAPHY

Annual Report 2019

INTERNATIONAL ATOMIC ENERGY AGENCY
Vienna, 2020

FOREWORD

The International Atomic Energy Agency is the world's central intergovernmental forum for scientific and technical co-operation in the nuclear field. It works for the safe, secure and peaceful uses of nuclear science and technology, contributing to international peace and security and the United Nations' Sustainable Development Goals.

ISEMIR is the acronym for the Information System on Occupational Exposure in Medicine, Industry and Research. Optimization of protection is one of the three general principles of radiation protection. ISEMIR-IR is a tool for radiation protection optimization for non-destructive testing companies carrying out industrial radiography (IR). ISEMIR-IR is developed as a web-based tool for regular data collection and analysis of occupational doses for individuals in IR, and for the use of this information to improve occupational radiation protection. It assists IR facilities in benchmarking their arrangements in radiation protection and safety, and hence in promoting of, implementation of optimization of occupational radiation protection.

In 2019 in the IAEA General Conference Resolution GC(63)/RES/7 [1], Member States requested the Secretariat to promote ISEMIR to strengthen the safety of workers who have a risk of exposure to ionizing radiation in the fields of medicine and non-destructive testing (NDT) services and recommended that Member States provide data on occupational exposure to the ISEMIR programme.

The current report is intended to contain the overall review of the ISEMIR-IR system, the actual status of the database collections and give a summary of activities for the year of 2019. The report will also provide some conclusions and recommendations for the future development of the system.

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1. INTRODUCTION

1.1 Background to ISEMIR

The ISEMIR project was initiated by the IAEA in January 2009 to focus on very specific topical areas where occupational radiation protection needs to address non-trivial occupational exposures and may face unresolved issues and gaps.

In the design phase, the IAEA was assisted by an Advisory Group with representatives of international organizations as well as from the five main world regions - Working Group on Industrial Radiography's (WGIR). The Advisory Group identified two specific areas in radiation use, where non-trivial occupational exposures occur, interventional cardiology and industrial radiography.

For each of these two specific topical areas a working group was set up with experts covering the particular area in a comprehensive way with respect to professions, type of radiation usages, geographical regions and other factors.

The main task of the WGIR was to draw an overview of the situation concerning occupational exposures and radiation protection of staff in IR worldwide. The WGIR was comprised of professionals with experience of working for NDT companies, client companies, NDT societies, technical service organizations, including education, training and inspection, and regulatory bodies.

As a part of its actions, WGIR performed a worldwide survey of occupational radiation protection in IR over a period of about one year, from mid-2010 to mid-2011. Responses were received from 432 industrial radiographers, 95 NDT companies, and 59 regulatory bodies. The data collected were able to demonstrate:

- a clear need for worldwide improved optimization of occupational radiation protection in IR;
- an ability to compare doses for specific occupational roles and conditions, and to assess the impact of radiation protection actions, and to follow dose trends.

The results of the survey, including its comprehensive analysis, have been included in the TECDOC: The Information System on Occupational Exposure in Medicine, Industry and Research (ISEMIR): Industrial Radiography (IAEA-TECDOC-1747)[2].

With regard to the results and following WGIR members' advice, the Agency developed and launched The Information System on Occupational Exposure in Medicine, Industry and Research: Industrial Radiography ([ISEMIR-IR](#)) [3] in 2016.

1.2 Structure and functionality of the database

The current version of the database deals with annual datasets provided by NDT companies (Fig. 1.1). With this, NDT companies are invited to delegate at least one company coordinator (CC), who creates NUCLEUS¹ account to access ISEMIR-IR, completes the company information in the ISEMIR and who is responsible for data input.

¹ IAEA information resource portal

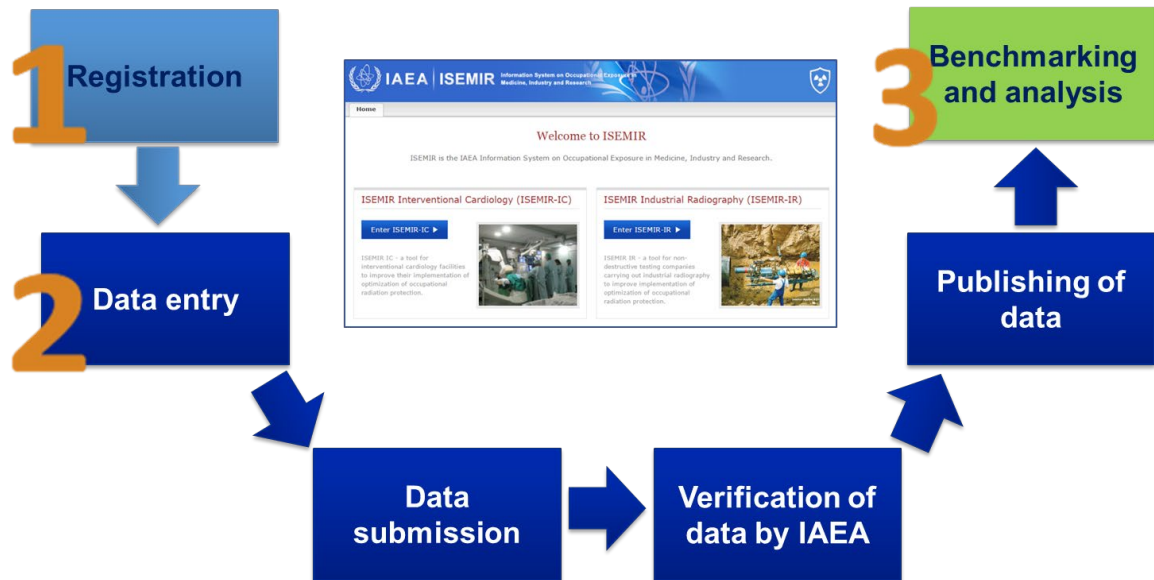


FIG. 1.1. ISEMIR-IR data submission and publication cycle

The participation is free of charge and many parts of the data entry are voluntary.

The dataset to be completed consists of a few sections requested information on (Fig. 1.2):

- radiography sources used in the company;
- company procedures, concerning investigation level established in the company and preventive maintenance performance;
- dose, including questions on number of occupationally exposed workers and number of films;
- company events, mainly focused on the accidents/incidents statistics;
- personnel, including questions on personnel performance, doses and qualification.

IAEA ISEMIR IR Information System on Occupational Exposure in Medicine, Industry and Research - Industrial Radiography		
ISEMIR Home IR Home My Companies My Profile Annual Collections Statistical Reports Statistical User Admin		
Annual Collections		
Search Annual Collections		
Company: TEST Year: 2020		
TEST (2020) - In Progress		
Type of dataset	Summary	Action
Radiography Sources	Input Data Radiography Sources (No data for radiography sources exists)	Input Data
Company Procedures	Company Procedures' data not inputted.	Input Data
Dose Information	Occupational workers' information record not inputted.	Input Data
Company Events	Company events' data not inputted.	Input Data
Personnel Info	Input Data Personnel Info (No data for personnel info exists)	Input Data

FIG. 1.2. Information requested in the ISEMIR-IR annual dataset

Once the annual dataset is completed, the company coordinator is able to submit the data to verification by ISEMIR team. After verification, the information provided will be anonymized and could be displayed in the general statistics within the ISEMIR-IR information system.

Once at least one dataset is submitted and approved by ISEMIR team, the company coordinator is able to take the advantages of the ISEMIR-IR analytic tools such as:

- benchmarking performed against global or regional trends based on any combination of characteristics including professional training, role, workload, use of protective equipment (Fig. 1.3);
- statistical analysis based on occupational doses per radiographic exposure/procedure as a function of personnel and facility attributes (Fig. 1.4);
- trends over time, which represents an effective dose or mean dose per radiographic exposure over successive years (Fig. 1.5);
- and road map tool (Fig. 1.6), which allows assess and evaluate independently the performance of the NDT company in the field of radiation protection.

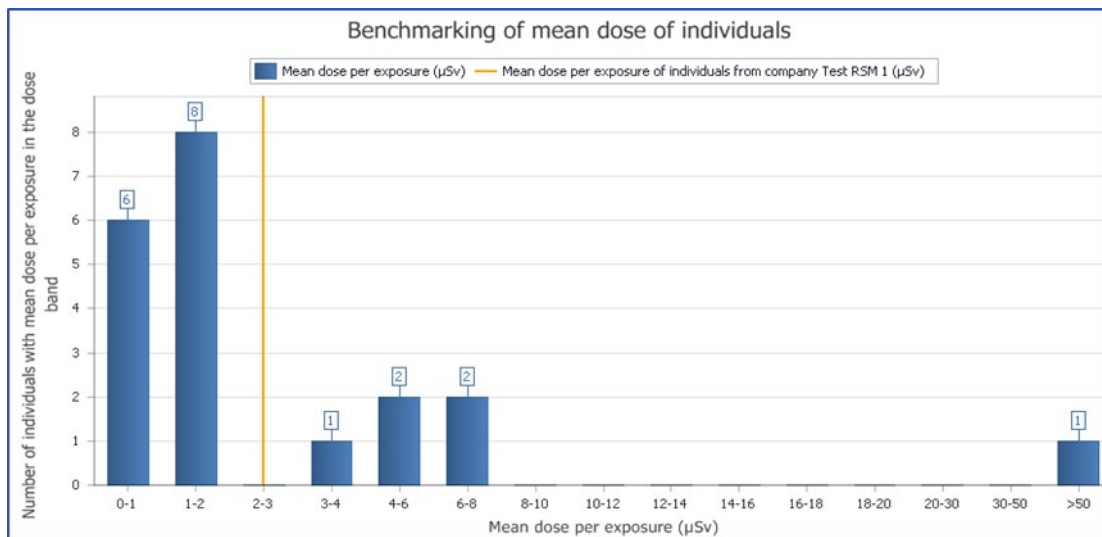


FIG. 1.3. Benchmarking tool

Statistics based on selected filters	
Mean dose per exposure of individuals in Test IR Company 1 (in µSv) based on the selected filters	4.29
Average effective dose of individuals in Test IR Company 1 (mSv)	0.01
Number of all individuals based on the selected filters	5
Mean dose per exposure of all individuals based on the selected filters (in µSv)	4.34
Standard deviation	24.89
Min	2.5
Q1	3.33
Median	5.38
Q3	6.67
Max	60

FIG. 1.4. Example of the tool for statistical analysis

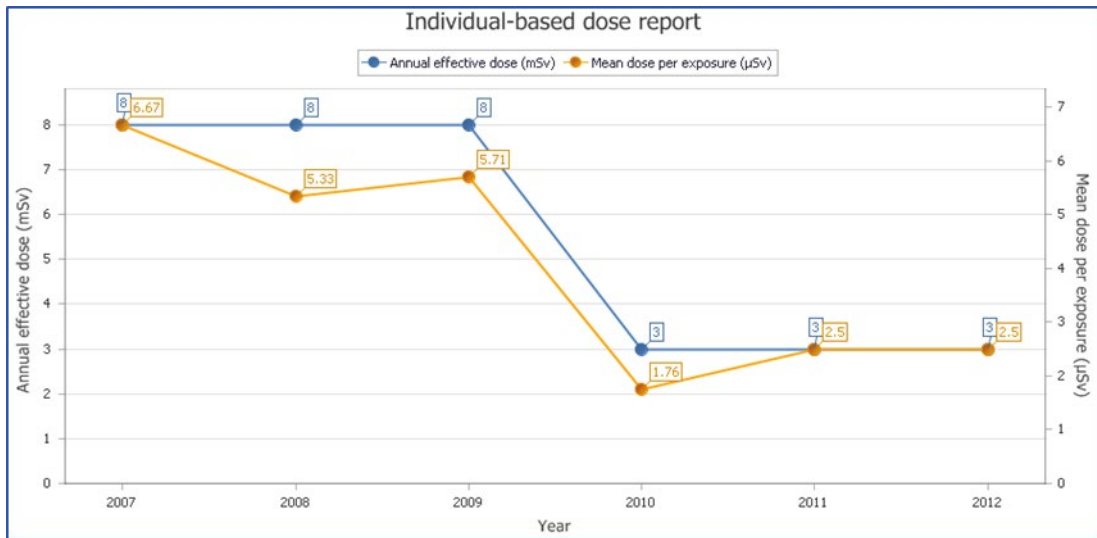


FIG. 1.5. Example of the tool for dose analysis

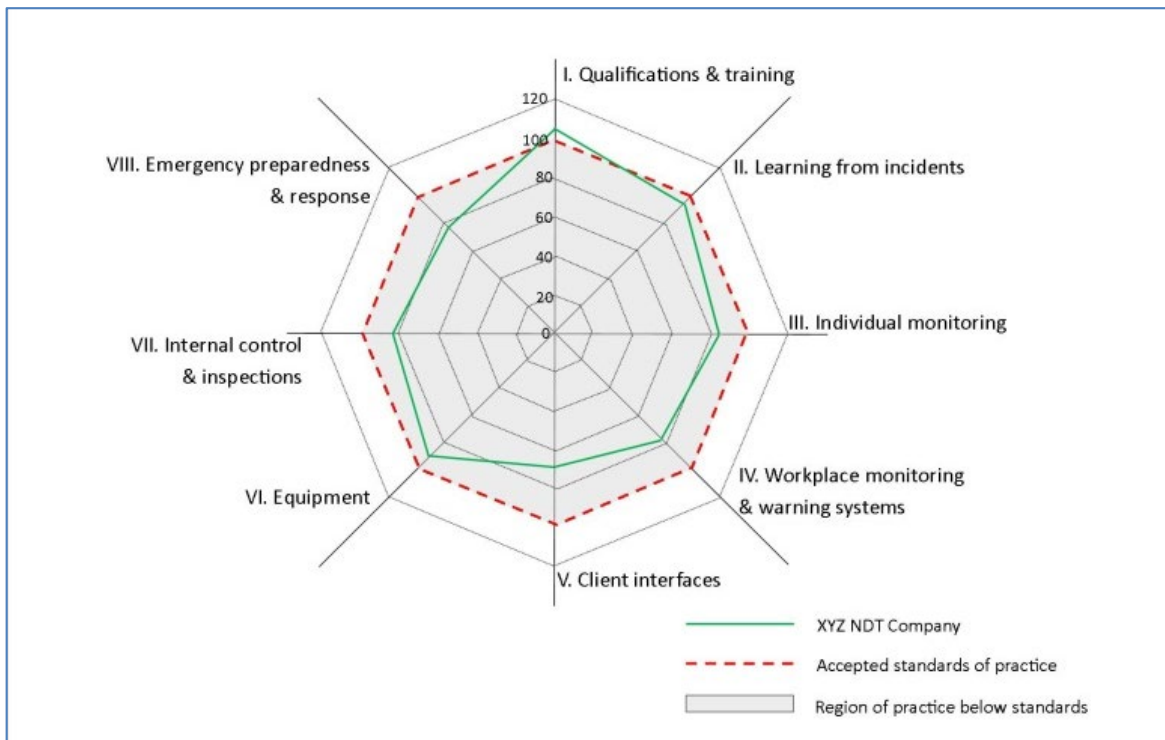


FIG. 1.6. Road-map tool

More detailed information on the process of data input and the use of analytical tools are presented in the ISEMIR-IR user guide on English and Russian languages.

With regard to all collected information, and by utilizing ISEMIR-IR, the NDT companies may also assess the effectiveness of the optimization of radiation protection and identify areas for improvement and corrective actions. As a result, it could lead to an improvement in occupational radiation protection in IR.

2 STATUS OF THE SYSTEM

2.1 Users registration

In the year of 2019, 6 new companies registered with ISEMIR-IR, the number of the users has reached 38 (Fig. 2).

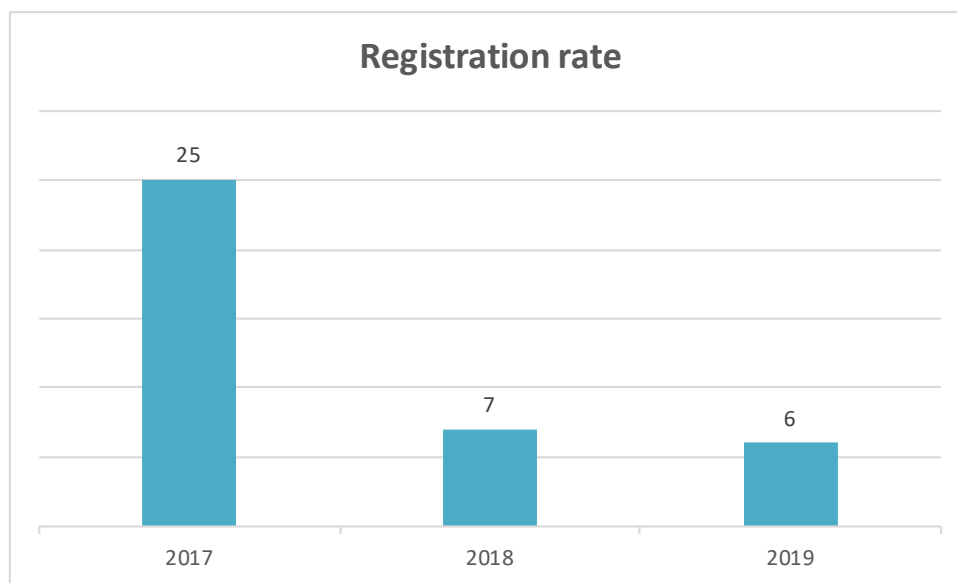


FIG. 2. Annual registration rate

The registered users come from 26 countries that are distributed in Asia, Europe, North American, South American, Africa, Australia.

2.2 Data statistics

The database contains information about 38 companies, comprising 32 datasets. 8 of these are completed but cannot be reflected in the statistics because the submission process was not completed (the final submission button, labelled 'Publish' had not been clicked). Reminder letters for these submissions have been addressed to the corresponding companies annually.

3 ACTIVITIES CARRIED OUT IN 2019

3.1 ISEMIR-IR working group initiative

For the purpose to promote and assist the development of ISEMIR-IR the ISEMIR-IR Working Group (WG) has been established. The WG consists of internationally recognized experts in the relevant area of science.

3.2 Consultancy Meeting

The first Consultancy Meeting of the ISEMIR-IR WG and IAEA staff was held 21-23 January 2019 in the IAEA Headquarters, Vienna, Austria.

3.3 WebEx meetings

Three WG WebEx meetings in April, September and October have been held to discuss the actual status of the actions previewed. The minutes of the meeting have been prepared and addressed to WG members.

3.4 Action list

One of the main outputs from the first Consultancy meeting was the development of the action list to discuss the mechanism for the ISEMIR-IR operation, to name key actions important for proper functioning and approaches to promote the database to the Member States in general and private NDT companies as final users in particular.

The action list contains several blocks of activities to be updated once the new actions are added or a new status for the actions prescribed is available.

3.5 ISEMIR-IR system

As mentioned above, a worldwide survey of occupational radiation protection in industrial radiography was conducted in 2010. Due to the lack of datasets published during the initial period, and also in order to provide users with more comprehensive statistics, the possibility of getting data from the survey to input it to the database was examined. It was found that some of the data required was not available, such as annual collective dose, number of exposures in the year, number of incidents/near misses in the year. Based on the data available, these values have been calculated for 4 datasets. However, the database structure does not allow to input these values without affecting the overall statistics.

A new file-exchange platform for WG was established.

Minor adjustments for field titles have been implemented.

3.6 ISEMIR-IR users

New web page on the iaea.org have been developed. The web page is available on the [link](#). For the previous period of 2019 the number of the ISEMIR-IR website visits is 195.

An ISEMIR-IR web button has been developed. The button is intended to be a form of promotion on external (out with the iaea.org domain) and recognition for registered ISEMIR-IR users. The button has been placed on the British Institute of NDT's [website](#).

3.7 ISEMIR-IR potential users – International promotion

For the promotion of the ISEMIR-IR, a presentation has been developed. The presentation is updated and shared among WG members on a regular basis. During a previous year it was presented at: national workshops in UK, Poland, Czech Republic, Board of Directors of EFNDT, Congress Regional IRPA in Cuba, Regional training course on the ORP in NDT, Tunisia, other regional workshops/meetings on ORP and during 4 ORPAS missions.

During 2019, information on ISEMIR-IR has been presented at following national or international events:

- UK Certification, 28 February 2019, United Kingdom;
- IAEA Regional Meeting on the New Safety Guide on Occupational Radiation Protection, 11 – 15 March 2019, Rio de Janeiro, Brazil;
- PCN Certification, 18-19 March 2019, United Arab Emirates;
- Radiation safety committee of KINT, the Dutch Association for Non-Destructive Testing, 25 March 2019, Netherlands;
- National training in Slovakia, 3 April 2019, Vyhne, Slovakia;
- IAEA ORPAS mission, 1-9 July 2019, Nicaragua;
- IAEA ORPAS mission, 16-18 July 2019, Sri Lanka;
- National Symposium on Radiation Safety in Radiation and Nuclear Applications, 10-12 July 2019, Beijing, China;

- IAEA ORPAS mission, 5-7 August 2019, Nigeria;
- IAEA ORPAS mission, 19-23 August 2019, Ghana;
- BINDT UK national conference, 3-5 September 2019, Telford, United Kingdom;
- Brazilian conference RADIO, 16-20 September 2019, São Paulo, Brazil;
- VII Pan-American Conference on Non-destructive Testing (VII PANNDT), 20-25 October 2019, Mexico,
- IAEA ORPAS mission, 23-25 October 2019, Philippines;
- IAEA ORPAS mission, 9-11 December 2019, Kenya.

The graphs show that most of the events have rather big audiences, however it is considered that the promotion of the ISEMIR should perhaps be more targeted, since the average number of ISEMIR registrations per event is 0.5 (Fig. 3.1 and 3.2). This means that targeted promotion of the ISEMIR-IR, such as regional or companies' seminars, could show the same effectiveness in terms of obtaining new registrations/users.

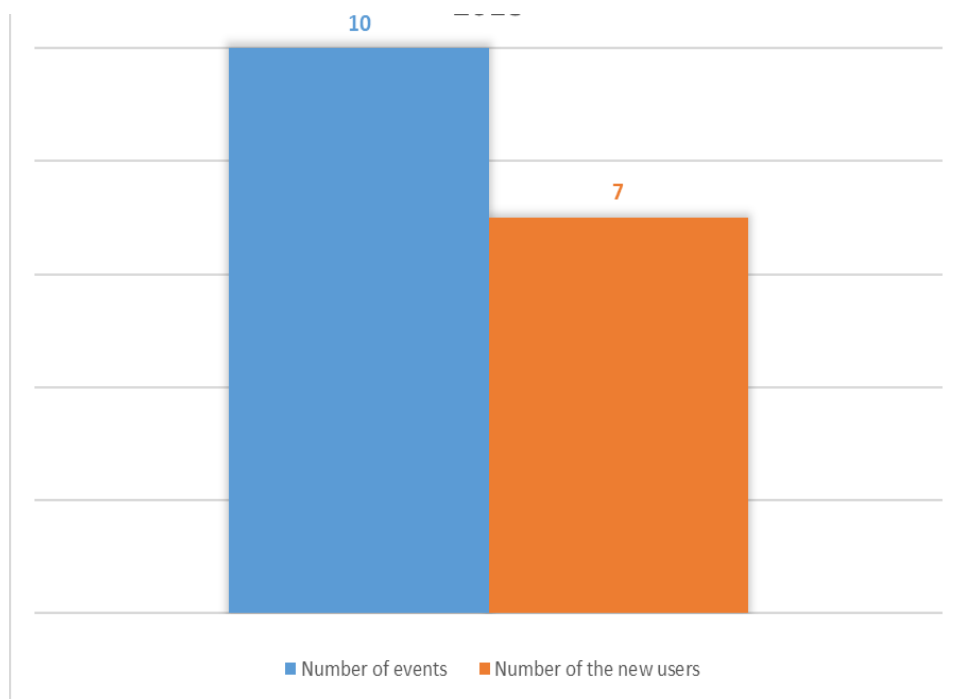


FIG. 3.1. Promotional events impact on the number of new users in 2018

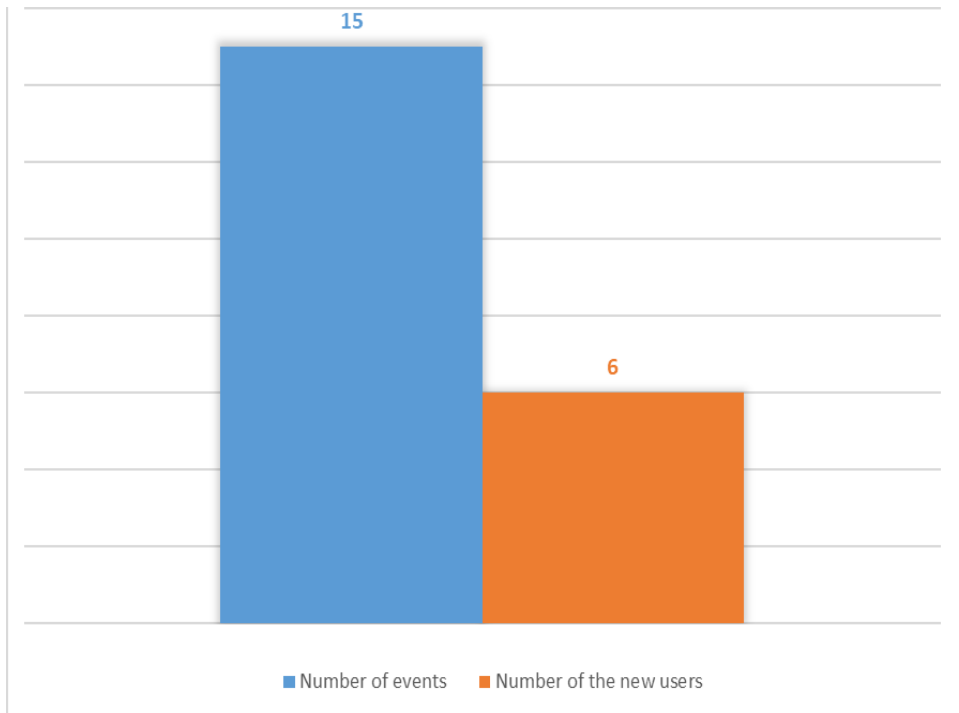


FIG. 3.2. Promotional events impact on the number of new users in 2019

For this purpose, the request to nominate National Contact Persons (NCP) to assist ISEMIR promotion was addressed to the NLOs in September 2019. The Agency received 23 responses from NLOs up to date of publication of this report. Agency will launch a negotiation to conduct regional seminars in those countries whose national contact persons were proposed. The seminars could be conducted on-line and off-line based on the invitation from Member State, related organization or an NDT company. The purpose of a seminar is to provide training for Radiation Protection Officers, promote ISEMIR-IR system, gain new users, identify user's needs and issues to be improved in the system.

4 NEW SURVEY PROPOSAL

In order to increase the number of active users in the system, as well as enhance users' experience, the Agency proposed to launch a new survey. The main purposes of the survey are the following: to adjust ISEMIR-IR functionality to the needs of the users and collect datasets from NDT companies. The Agency is planning to develop two new questionnaires to regulatory bodies and NDT companies accordingly to meet the actual database demands and identify functionality to be improved or added. The questionnaires are to be reviewed by working group members. The final version of the questionnaires will be addressed with a letter to the NCPs, Regulatory Bodies and NDT companies from the previous survey as well as to the companies registered in ISEMIR-IR with a call to complete the questionnaire and assist its dissemination. Agency will accept completed questionnaires for 6 months. The data received will be analysed and a plan for ISEMIR-IR system development will be formulated.

5 CONCLUSIONS

As conclusion, it is necessary to emphasize that ISEMIR-IR is free online tool, designed with a support of group of experts to assist NDT companies to optimize occupational radiation protection and enhance safety culture. In the meantime, since the information system is relatively new, it is also open for future updates. The IAEA ISEMIR-IR team appreciates comments, suggestions and assistance provided by NDT companies and other users of this tool. The Agency respects the needs of NDT companies, that why ISEMIR-IR has been designed as a system with a high level of data security. That means that the third parties, including regulatory bodies, have no access to the data. The anonymized statistics for benchmarking purposes is only available for NDT companies uploaded at least one dataset.

Experts views:

The IAEA ISEMIR-IR team with ISEMIR-IR working group of world-renowned experts continue to work on promotion and development of the Information system. Several experts' reviews on ISEMIR-IR are presented below.

David Gilbert CEng MInstNDT MIET, CEO, British Institute of NDT

“ISEMIR-IR is a free online database for radiation protection optimisation for NDT companies. It collects data relevant to occupational exposures, such as radiation doses received by workers, the number of exposures and details of radiation protection training.

Radiation protection officers can use the information collected to improve occupational radiation protection. They can review dose trends, define follow-up actions and address identified safety gaps.

I heartily recommend all companies carrying out industrial radiography to use ISEMIR-IR. It not only supports the safety of workers who are exposed to ionising radiation, but it can also be a great help to organisations who need a user-friendly yet comprehensive system to record data associated with radiographers and their activities”.

Charlotte Kaps The German Society for Non-Destructive Testing (DGZfP e. V)

“When performing Industrial Radiography, occupational doses cannot be avoided. That’s why personal dosimetry and its documentation are two of the main requirements in radiation protection. One essential tool to enhance optimization is a complex overview of the individual doses compared with other factors, e.g., workload and training. ISEMIR-IR is a tool that provides a platform that helps companies to document and analyse their data for annual reports, yearly instructions and training. ISEMIR-IR, as a web-based platform, can also help to compare data between different companies and even countries. ISEMIR-IR offers key features for optimization and improvement of radiation protection culture.”

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