

# HORIZON 2020 RESEARCH AND INNOVATION FRAMEWORK PROGRAMME OF THE EUROPEAN ATOMIC ENERGY COMMUNITY

# Nuclear Fission and Radiation Protection 2018 (NFRP-2018-4)

Project acronym:		SANDA			
Project full title:		Solving Challenges in Nuclear Data for the Safety of European Nuclear facilities			
Grant Agreement no.:		H2020 Grant Agreement number: 847552			
Workpackage N°:		WP6			
Identification N°:		D6.5			
Type of document:		Deliverable			
Title:		SANDA - Project "Communication and Dissemination Action Plan"			
Dissemination Level:		PU			
Reference:					
Status:		VERSION 1			
Comments:					
	Name		Partner	Date	Signature
written by:	E. Gonzalez		1	14-08-2020	
WP leader:	E. Gonzalez		1	14-08-2020	
IP Co-ordinator:	E. Gonzalez		1	14-08-2020	

# SANDA - Project "Communication and Dissemination Action Plan"

The SANDA project puts together most of the European nuclear data community, infrastructures and resources to prepare the methodologies, detectors, facilities, interpretation and tools to produce accurate and reliable nuclear data tools including data, codes and methodologies that can be used to simulate, analyse, optimize, exploit and evaluate the safety of nuclear energy and non-energy applications. The project is built taking into account the High Priority Nuclear Data needs list from OECD/NEA and IAEA to provide the final users with immediately usable data and tools for the cases where this is feasible during the project duration.

Special attention is and will be applied to the early and efficient dissemination of the project results to the EU community of nuclear data users, making sure that results and data produced are openly available. The project also plans to contact the Nuclear Data R&D actors, funding agencies and associated stakeholders to prepare instruments that can provide a sustainable framework for the required nuclear data R&D at Horizon Europe and beyond.

Efficient communication and dissemination paths and actions are important for the objectives of SANDA and its impact. The main comunication and dissemination actions proposed for SANDA are based on the succesful experience from the previous EURATOM project ANDES and CHANDA with similar scope, objectives and coordination.

## Types of results to be disseminated and the target comunitties

The project will include different mechanisms to exploit and disseminate its results as a function of the type of results and the target communities.

The main scientific and technical results for the exploitation of the project are of 6 types:

- 1) Raw and analyzed data from differential measurements in EXFOR standard format
- 2) Evaluated data files, either as cross sections, fission yields, or decay data in ENDF6 standard format, or nuclear structure data in ENSDF standard format
- 3) Models and computer codes for the different activities of the nuclear data cycle, including the implementation of the high energy models
- 4) Methodologies for differential and integral experiments and for evaluation processes
- 5) Results and description of integral experiments, ideally in IRPhE-style format
- 6) New designs for detector and experimental setups and possibly the actual detectors or experimental setups themselves.

All the deliverables and results of the types 1, 2, 4, 5 and 6 will be made fully public and free, and will be transferred to international open databases, open web pages or will be accessible from the project web space. The models and computer codes, in many cases, would also be openly available but, in some cases, access restrictions may be imposed on the sources of the codes by the developing teams. Even distribution of the compiled codes might be limited by training and maintenance constraints.

The targeted communities for the dissemination actions are of different types:

- a) nuclear scientists and engineers performing simulations of nuclear reactors or other fuel cycles facilities and activities. This includes applications for evaluation of safety of reactor and other nuclear facilities, validation of processes, reloading and other normal operations in nuclear facilities, dismantling and decommissioning of present reactors, spent fuel storage, waste management and disposal, design of new reactors, etc.
- b) nuclear or health scientists performing simulations of nuclear treatments or diagnostic for medical applications. This includes applications for principal and secondary doses from irradiation treatment,

optimization of the irradiation sequence for treatments, interpretation of nuclear diagnose devices, design and optimization of nuclear medicine devices and procedures, etc.

- c) nuclear physicists developing radiation detectors, nuclear facilities and various methods to measure, evaluate, or validate basic nuclear data
- d) nuclear scientists and engineers performing simulations to optimize isotope production for medical therapy or diagnosis
- e) nuclear scientists in environmental or other industries designing or analyzing results from radiative tools
- f) students and people in training period
- g) research organizations, public organizations, technological platforms and industry using nuclear technologies
- h) international organizations like NEA and IAEA, responsible for the storage and dissemination of nuclear data

Different vehicles will be used to communicate and disseminate the different results of the project to the different communities mentioned above. The main deliverables of the project will be highly specialized data which will be used mainly by expert scientists and engineers for research, industrial, medical and academic purposes. For this reason our dissemination and communication action will take the form of files on international databases, technical papers and reports published in scientific journals, PhD theses or possibly other self-contained recording forms that would ease their utilization and preservation. Still, several other communication paths will be used to attract attention of wider communities and to try to reach all the segments of the society that might be interested in the project activities and results.

In the following sections we describe some of the instruments that will be used by the project to communicate its activities, progress and to disseminate results.

### <u>Dissemination of experimental data and evaluated files/libraries via international</u> <u>organizations</u>

For the nuclear data produced by the project, either experimental or evaluated, the main dissemination path is the well-established international libraries and international nuclear data centers coordinated by IAEA, https://www-nds.iaea.org/, and by the NEA Data bank, https://www.oecd-nea.org/databank/. These organizations maintain on their own resources an infrastructure that receives, tests, archives, stores and distribute both experimental nuclear data in the EXFOR format and evaluated nuclear data libraries in the standard formats of ENDF and ENSDF. This mechanism assures that the project output data will be available broadly and well beyond the end of the project.

The project will communicate all experimental data to the EXFOR nuclear database of the IAEA. The Experimental Nuclear Reaction Data (EXFOR) is an open database maintained and operated by IAEA, https://www-nds.iaea.org/exfor/exfor.htm. It is also a standard format to describe the experimental information which is necessary to analyze the "raw" nuclear data measurements. The transmission of data to EXFOR is the responsibility of each data producer, but the project will stress to its partners the need for early communication to this database and will help liaise with IAEA if special support is needed. Providing the data to EXFOR is the most efficient dissemination method that the project can use to warranty early availability of its experimental data to the evaluators and users.

For most evaluated data (cross sections, decay data, fission yields,...) the project will liaise with the JEFF project (NEA/OECD) to make sure that the results (transmitted in the form of ENDF-formatted evaluated files) received priority consideration for inclusion in the JEFF-4 library. There will then be available from the NEA data Bank and from the IAEA ENDF area https://www-nds.iaea.org/exfor/endf.htm. These are the standard locations any interested user will search for to get the latest versions of the evaluated libraries.

Finally, for the evaluated nuclear structure data the project will update ENSDF files and update them to the IAEA data repository and distribution <u>http://www.nndc.bnl.gov/ensdf/</u>.

All data from IAEA nuclear data databases (EXFOR, ENDF, ENSDF,...) are openly available.

By these mechanisms the project will comply with the with the principles of the Open Research Data Pilot, ORDP. The digital research data generated in the action associated to a number of deliverables whose main results are data will be deposited in the previously described research data repository open for third parties to access, mine, exploit, reproduce and disseminate, free of charge for any user, including associated metadata, and the tools and instruments necessary for accessing and validating the results.

# Dissemination of computer codes for the different activities of the nuclear data cycle and to implement the high energy models

The nuclear data analysis, evaluation and particle transport codes used in the project (such as TALYS, EMPIRE, AMPX, CONRAD, FIFRELIN, MCNP, SCALE, NDaST, GEANT4, etc.) are developed and maintained continuously by various groups and organizations. Most of them are already broadly available and used. To every possible extent, the project will facilitate the inclusion of new models, algorithms and methods in future versions of these codes for improved capabilities. So, for the dissemination of new methods and models via these codes, the responsibility will lie with the developer's teams. Most of the codes have corresponding web pages that provide detailed information of the capacities, details for use and updates. In addition, some of the codes are also archived in and can be retrieved from the NEA Data bank.

In general, the codes are openly available but, in some cases, access restrictions may apply, imposed by the code owners and parent organizations because training and maintenance constraints.

### Scientific journal articles

For the methodologies and detector developments, where there is no pre-organized dissemination structure the main dissemination pathway will be a combination of peer review scientific journal articles, communications to conferences, PhD and Master theses and the project web pages.

Peer-reviewed articles published in scientific journals will be the main mechanism for dissemination and communication of results to the scientific community interested in the project results. These articles are also an efficient way to provide to all the end-users additional details on the quality, scope, range of validity, precision and reliability of the results of the project. The articles will cover reports on:

- methods newly developed,
- description of progress on detector designs and experimental setups,
- improvements of neutron facilities used for measurements,
- validation of nuclear data using integral experiments or pre-existing international benchmarks,
- improvements and uncertainties of high energy models.

Although in principle all the results and development of the project will be ultimately public, in the case that some of the innovations need to be protected (new instrumentation, detector, experimental setup, target fabrication methods,...), the time and scope of publications and public reports will be carefully managed together with the team making the development to allow efficient protection and industrial exploitation of those innovations.

In addition, these scientific journals will also be used to complement the information provided to the international data bases for the data and codes disseminated by international databases, such as:

- results of the differential nuclear data measurements, with detailed information on setup, sources or errors, calibration, background noise, signal corrections, etc,
- evaluated nuclear data files, with details on the methods and approximations used in the data selection, normalization and reduction process,
- computer simulation tools used for modelling nuclear physics phenomena, detectors, experiments, and simultaneously accounting for uncertainties and errors,
- examples of applications of all the above.

The papers will consider journals such as: EUROPEAN PHYSICAL JOURNAL, NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH SECTION A-ACCELERATORS

SPECTROMETERS DETECTORS AND ASSOCIATED EQUIPMENT, PHYSICAL REVIEW C, PHYSICAL REVIEW LETTERS, etc.

The partners of the project have demonstrated in the past an excellent efficiency at stimulating the production of many high-quality journal articles and we also hope for a significant production along the duration of the project. For example, the previous project CHANDA produced more than 125 articles in 54 months.

All the articles published will be by definition open-access, but some publishers sometimes request a fee to provide access to the full text of the article. If such a limitation is deemed unacceptable, the project will either make available a copy of the manuscript to open-access archives, like ARXIV or the CERN archives, for actions and measurements developed in that facility, or establish a link to similar information using the project web space.

#### **PhD and Master theses**

For the scientific and research community, and in particular for the students and academic communities that are a significant part of the nuclear data end-users a complementary method to the scientific journal articles is the preparation of PhD and Master theses. They will cover the same topics but can provide significantly more details on the methodologies used, the range of application and the interpretation of the results.

The partners of the project have also demonstrated in the past a high efficiency in supporting PhD and Master Theses. These Theses are of open access in most universities.

#### Sustainable framework for nuclear data research at Europe

The previous methods are the main dissemination paths, that will be complemented by tools described below both for dissemination and communication of the project results, its progress and to make it known to new end-users.

From the point of view of the exploitation of results, the storage and dissemination of data via reference databases operated by international organizations guarantees long-term availability and excellent visibility. The collaboration of the project members with those organizations also implies support from these international organizations to the exploitation of the project outputs, for mutual benefits.

In addition, the project includes an action to outline and propose a sustainable framework for nuclear data research in Europe beyond the duration of the project. This will be done by seeking support for joint programing at the level of the Member States, including also EURATOM. The main incentive would be to guarantee the continuation of the long-term basic research lines of the project within Europe and an enhancement of the exploitation and impact of the project results.

To reach this objective the project will prepare documentation and perform visits (face to face or videoconference) to Member States (MS) representatives with influence on the EURATOM programs, European technological platforms and other bodies of influence on the EURATOM programs, to explain the ND community, its needs of a long-standing framework for coordination, and the possible instruments to stablish that framework.

In addition, SANDA will prepare, at least, one meeting of the ND community with interested Member States (MS) representatives, European technological platforms (ETIPs) and other relevant stakeholders to present and discuss those documents and the options and feasibility for such a sustainable framework. In the organization of the meeting a face to face version is preferable but the organizers will make sure that remote participation will be possible.

### **Communications to specific conferences**

Communications at specialized conferences in the fields of nuclear data, nuclear instrumentation, nuclear simulations and nuclear data for other applications will be used to inform about the progress made on the same topics as those indicated on the section of the scientific journal articles.

These communications will help to prepare the integration of the project results in a broader framework. In addition, they will also serve to collect early feedback on the methods, solutions and tools developed as part of the project. These conferences will also contribute to the dissemination of the project results.

International nuclear data conferences will be "natural" targets of the project, especially the ND2022 to present results. This is the next edition of the Nuclear Data conference and several members of the project will participate in its organization.

## **Communications to wider conferences**

Communications to wider conferences will include conferences and workshops on general nuclear science and nuclear applications, general discussions on experimental techniques and organization of international experiments and collaborations. This will include global energy conferences like the European Nuclear Conference (ENC) series, the GLOBAL conference series, IAEA and NEA generic conferences, events organized by EC like FISA or EuradWaste, but also workshops and meetings of national nuclear societies and national radioprotection societies with wider participation of non-energy end-users of the project results.

The main purpose is to make professionals and a broad public aware of the project activities and results, explaining how the results can be beneficial to many applications, including nuclear safety, efficiency of energy generation systems, accuracy of nuclear medicine protocols, etc. These meetings also contribute to dissemination of the results to new end-users.

We are also interested in the feedbacks collected at these events for improving the methods used by the project and identifying new nuclear data needs beyond those already considered within the project.

### <u>Communications of activities, plans, progress, methods to international organizations NEA</u> and IAEA

The project members are already deeply involved in international expert groups and organizations responsible for collecting, testing and disseminating nuclear data worldwide within both the OECD/NEA and the IAEA agencies. The project will continually inform these organizations on the activities, plans, progress, methods and results being produced. In the case of the OECD/NEA, the communication will include different working groups, but special attention will be given to the JEFF working groups and to the WPEC high priority nuclear data list. In the case of IAEA special attention will be given to the International Nuclear Data Committee, INDC, the Nuclear Data Section and the EXFOR data base.

To facilitate the communication with the JEFF groups, and to make sure that the project activities remained fully aligned with the JEFF-4 work plan, some of the project general meetings will be organized in conjunction with the JEFF periodic meetings and events.

Regular communication with the above international organizations will facilitate the integration of the project priorities into the international priority lists. It will also shorten the time required to make the data produced by the project adopted in official evaluated nuclear libraries and by the final users.

# <u>Participation in generic events with partners of the technological platforms SNETP and NUGENIA</u>

The meetings organized by or with large participation of the European Nuclear Technological Platforms, SNETP and NUGENIA, are a special forum with many opportunities to make professionals and researchers aware of the project activities and results. Special attention will be devoted to explain how the results can be beneficial for the applications of the professionals and researchers.

#### **Dissemination to health and medical physicists:**

The project will contact reference networks of health and medical physicists, like EURADOS, and the European Federation of Organizations for Medical Physics, EFOMP, to jointly identify nuclear data of relevance for the applications of these research and applied community and also to make sure that these experts are aware of the progress on nuclear data provided by SANDA. For these contacts SANDA will benefit from the participation of health physicists and members of those associations in several teams of the participants in the project.

#### **WEBSite of the project**

A set of web pages has been setup both for the internal communication within the project and as an open window for external researchers and a wider public interested in the activities and publications of the project.

Although working versions of deliverables, publications and other materials might be password protected, all final technical results (compatible with applicable regulations) will be made openly available on the project web pages. The project web will be maintained for at least 5 years after the project end.

The present link to the SANDA web pages is http://win.ciemat.es/sanda/, but a negotiation is ongoing to purchase a dedicated domain independent of any specific institution and to simplify the address to the web.

#### **Dissemination to students**

The project will prepare specific actions to facilitate that the research performed within the project contributes to the education and training of students. The most important action will be to involve students as participants in the research performed within the project in activities that contribute to their PhD and Master theses.

In addition, the project will organize specific E&T courses on topics related to the project research. The courses will be open to students from outside the project.

#### **Broader communication activities**

Several of the tools already described in the previous sections will also be used for the broader communication and promotion of the project. In particular:

- communications to specific conferences,

- communications to wider conferences,
- communications of activities, plans, progress, methods to international organizations NEA and IAEA,
- participation in generic events with partners of the technological platforms SNETP and NUGENIA,
- the WEBSite of the project,
- and also in a certain sense, the PhD and master theses and the Scientific journal articles.

During the development of the project other tools will be considered for dissemination and communication as a function of the opportunities identified for the project, including press releases, non-scientific and nonpeer-reviewed publication, participation in scientific societies events and organization of specific workshops.