FAST Nuclear Emergency Tools (FASTNET project)

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Minutes of the First FASTNET Workshop – November 7th-8th, 2016

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Summary	
These minutes aim at reporting on the first workshop of the FASTNET project which has been held in Bologna, Italy, on the 7th and 8th November 2016.	

Visa grid			
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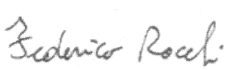
Signatures			

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Content

1 INTRODUCTION

As part of the dissemination activities foreseen for the FASTNET project is the organization of international workshops. On the 7th and 8th of November 2016, at about the end of the first year of the project and as first milestone of WP5, the first FASTNET Workshop has been held in Bologna, Italy. The setup of the scientific program and of the agenda has been realized by CNSC, while the logistics and the practical organization have been arranged by ENEA. The Workshop was held at the Hotel NH De la Gare, Piazza XX Settembre, 2, Bologna.

These minutes are intended to record and document the achievements of the workshop itself. The pdf files of the presentations given at the Workshop will be ultimately uploaded to the password-protected part of the FASTNET website.

2 STRUCTURE OF THE WORKSHOP

The workshop had been conceived as consisting of two principal themes, reflecting the two main components and scientific communities involved: source term estimation, and atmospheric dispersal and consequence evaluation. Twelve presentations have been given, arranged in three technical sessions and followed by a closing session. The detailed agenda is given further below, in Appendix 1 at the end of these minutes. The foreseen presentation by IAEA on the reactor assessment tool has not been given. One presentation was given by a potential member of the EUG (GRS). Each presentation was followed by questions and discussions. A total of 37 participants has been recorded.

3 SESSION 1: OPENING SESSION

The Opening Session, chaired by ENEA, was dedicated to welcome and opening remarks by IRSN, to a description of the present status of the accident scenario database by LEI, and to a review of the methodologies and results obtained in the NEA/CSNI/WGAMA FASTRUN project by CNSC.

The status of development of the accident scenario database was reported, showing the conceived structure of the database itself, which should reflect the various types of accidents involving the many reactor types in Europe, the different plant statuses, and other structures possibly involved, like Spent Fuel Pools, etc. Many questions were raised at the end of the presentation, mainly concerning the types of source terms which are going to be included in the database, especially as regards the grouping into chemical classes or the distinction by isotopes on one hand, and, on the other hand, the way of including or neglecting radioactive decay after the onset of the severe accident. These two types of questions were mainly addressed due to the need of optimizing the utilization of data by those codes which deal with atmospheric dispersion and dose calculation; such codes may need different data according to their specific internal structure and/or models and methods employed to treat the problem. Other comments were put forward concerning the reliability of the source terms included in

the database in accurately describing a real accidental sequence which may be evolving in reality in different ways with respect to those originally in mind when that given sequence was calculated. Replies to these comments were that the aim of the database is not to cover the entirety of possible accidental sequences, but to be a tool which could easily be used for the project and that could serve as reference for order-of-magnitude estimates of the consequences.

The presentation on the results obtained in the NEA/CSNI/WGAMA FASTRUN project was a description of the codes used by the various participants to the benchmark, which was intended as a code-to-code comparison for both rapid source term investigation and rapid dose assessment, and of the results obtained. Five scenarios have been investigated: 2 for PWRs, 2 for BWRs and 1 for CANDU. The main parameters influencing source term, atmospheric dispersion and dose calculation were outlined.

4 SESSION 2: SOURCE TERM MODELS

The Session on Source Term (ST) Models, chaired by CNSC, was split into two parts, and was composed of 6 presentations.
That given by JRC was focused on how STs are evaluated by the use of the MAAP code, versions 4.0.8 and 5.0.2. This second version includes a module which is able to compute the dose in the halls of the reactor building; given the fact that this code version also has the ability to simulate filters, the dose module has been exploited to compute the doses in the environment which was mocked-up with extremely large dummy volumes.
The following presentation was given by IRSN and was dedicated to the presentation of one of the tools under development in the FASTNET project, namely the PERSAN code, which provides with STs starting from the diagnosis and prognosis of the 3 barriers of defense-in-depth. The chain of the analysis was explained, showing how PERSAN calculates the ST starting from the knowledge of some fundamental parameters (like primary circuit break size, predicted dewatering time, kinetic of the fuel degradation, etc.).
The third presentation, by GRS, was a description of the QPRO code, a Bayesian Belief Network code to predict STs. This approach relies on predictions based on Level 2 PSA results and plant specific parameters; a set of possible STs matching some values of certain physical observables is provided by the code together with the associated probabilities. A quick practical demonstration was also given.
This presentation was followed by that by LRC on the RASTEP code, again based on the Bayesian Belief Network methodology, which is another of the tools to be improved within FASTNET; a thorough introduction to this specific method has been given, together with examples.
Next was ABmerit presentation on the codes and approach used in Slovak Republic (Bohunice and Mochovce), Czech Republic (Dukovany and Temelin), and Austria (Austrian Crisis Center). The main code for ST assessment is the ESTE code, which, cycling in real-time on the assessment of the initiating event, makes estimates of the status of core and containment and, using dedicated dispersion and dose calculation modules, produces, using real meteorological data, evaluations of the doses. The prediction of the ST is based upon a pre-calculated database of about 170 STs for VVER-440 and VVER-1000 NPPs. Examples were

given, especially about the modelling of dose-rates in the containment which is based on MCNP calculations of radiation transport.
The last presentation of this session was given by CIEMAT, and was focused in presenting some lessons-learned in the calculation of STs with the MELCOR (version 1.8.6 or 2.1) code for three topics: suppression pools in BWRs, retention in SG secondary side, and iodine chemistry effects. The first topic was related to the Fukushima accident and was intended to better understand the effect of pool scrubbing in reducing the ST. The ARI3SG retention model was used for the second topic to predict the retention efficiency; the reduction of the ST to the environment results to be substantial whenever the aerosols densities were over 1000 kg/m3 and the particle sizes bigger than 1 μm. The specific goal of the third topic was to estimate the quantitative impact of modelling of the iodine chemistry; the results correspond to a confirmation of the need of considering iodine chemistry in PSA-2 studies.

5 SESSION 3: DISPERSION AND DOSE MODELS

The Session on dispersion and dose models, chaired by ENEA, was composed of 4 presentations.
The first one was given by NRPA and was about the ARGOS decision support system. The aim was to show how an ARGOS end-user will utilise the output from the FASTNET project. STs are assessed in ARGOS through recourse to a database of previously published source terms. The atmospheric dispersion models available are the mesoscale model Rimpuff, some external long-range dispersion models, as well as trajectories models. The consequence assessment tools are the AgriCP food chain model and the ERMIN urban dose model which could be used also to simulate short-range “dirty-bombs” scenarios.
The following presentation was given by US-NRC and was dedicated to how NRC deals with nuclear emergencies. The foreseen emergency levels (Unusual event, Alert, Site area emergency, or General emergency) were described, together with the different response modes (Normal, Monitoring, Activation, and Expanded Activation). The main tools used by the technical teams in the emergency centres were also presented; these are divided into tools used by the Reactor Safety Team, and those used by the Protective Measures Team. The main tool for the first team is the Response Technical Tool (RTT), a computerized version of the Response Technical Manual (RTM), which provides, through knowledge of plant data (fed in through the Emergency Response Data System – ERDS), quick but reasonable estimates of physical reactor parameters to be used by the second team, like dewatering time, main release pathways, etc. The main tool for the second team is the well-known RASCAL code, which calculates STs, makes atmospheric dispersion calculations (up to about 160 km from the emission site), and finally estimates doses.
Next was the presentation by KIT on the JRODOS code; a full description of the capabilities was given. The various atmospheric dispersion models available in the code were introduced (Gaussian puff Rimpuff, puff particle DIPCOT, Lagrangian particle model Lasat). For long-range dispersion the ADM model MATCH is used. Numerical Weather Prediction (NWP) data from a national or global provider in several common formats are supported (GRIB1, GRIB2, netCDF).

The last presentation of the Workshop was about the use of the statistical approach to assess the potential consequences of a nuclear accident. The presentation was divided into two parts, the first one by IRSN, to introduce the approach, the methodology, and the specific codes to be used, and a second one by ENEA, to show some results and examples of this method as applied to the Italian case. After having shown the specific preparedness needs for which this approach is necessary for the Italian case, the equivalent 137Cs threshold levels, representative of severe accidents at the French Dampierre NPP, were derived and applied to produce 10-years probabilistic maps of consequences.

6 SESSION 4: CLOSING SESSION

The closing session was mainly dedicated to the participants' feedback. The idea was to determine how effective and successful the workshop had been at disseminating information, what had worked well, what could be improved, and what the participants would expect in the future. This feedback is useful to develop subsequent workshops tailored to the participants needs.

Figure 1: Picture taken during the Workshop.

APPENDIX 1

FASTNET Workshop

7-8 November, 2016

Hotel NH De la Gare – Piazza XX Settembre, 2, 40121 Bologna – Italy

The purpose of this workshop is to share preliminary results under the FASTNET project dedicated to the likely end users of the project deliverables. By the way, this workshop results from the task 5.1 and corresponds to the deliverable 5.1 of the Work Package 5, *Dissemination of Information*.

The workshop allows the consortium members to sum up results achieved so far, and focus in particular on the scenario database and methodologies developed to describe accidents phenomenology.

Organizations identified as participants in Task 5.1 are invited to present their methodologies and tools, briefly summarizing associated theory, application and advantages.

At the end of the workshop, a session is mainly dedicated to the participants' feedback in order to determine how effective and successful the workshop was at disseminating information, what worked well, what can be improved, and what the participants would expect in the future. This feedback will then be useful to develop subsequent workshops tailored to the participants needs.

Agenda of the FASTNET Workshop

7 November 2016, Monday

(Time-schedule includes presentations, demonstrations, and discussions)

Session 1: Opening Session – Chair F. Rocchi

14.00-14.15 Welcome, opening remarks, and workshop overview – IRSN

14.15-15.00 Status of accident scenario database – LEI

15.00-15.30 Methodologies examined in the NEA/CSNI/WGAMA FASTRUN project – CNSC

15.30-15.45 *Coffee break*

Session 2: Source Term Models – Chair N. Mesmous

15.45-16.15 Source term methodology using MAAP 4 (and MAAP 5) – JRC

16.15-16.45 Source term calculation with 3D/3P methodology and PERSAN – IRSN

16.45-17.15 Fast-running code for source term prognosis in case of severe accidents – GRS

17.15-17.45 Presentation on reactor assessment tool – IAEA

17.45-18.00 Wrap-up

18.00 Closing of day 1

20.00 Social Dinner - Restaurant *"C'era una volta"* via d'Azeglio 9

8 November 2016, Tuesday

Session 2:	**Source Term Models (continued) – Chair: N. Mesmous**
9.00-10.00	RASTEP – RApid Source TErm Prediction – LRC
10.00-10.30	Source term and dispersion methodologies – ABmerit
10.30-11.00	Insights on source terms for different accident scenarios – CIEMAT
11.00-11.30	*Coffee break*
Session 3:	**Dispersion and Dose Models – Chair: F. Rocchi**
11.30-12.00	Overview of the ARGOS Decision Support System – NRPA
12.00-12.30	NRC Assessment Tools for Response to Emergencies – US-NRC
12.30-13.00	Atmospheric dispersion and dose modelling in RODOS – KIT
13.00-14.30	*Lunch break*
14.30-15.00	Assessment of the potential consequences of a nuclear accident: statistical approach – IRSN & ENEA
15.00-15.30	Round Table
15.30-16.00	*Coffee break*
Session 4:	**Closing Session – Chair: N. Mesmous**
16.00-16.30	Feedback from workshop participants
16.30-17.00	Next meetings / Closing remarks
17.00	Closing of the workshop

Organizations identified as contributors to task 5.1 of FASTNET agreement

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