Italian National Agency for New Technologies,
Energy and Sustainable Economic Development

International MACCS User Group 2018

ENEA plans for consequence analyses in Italy

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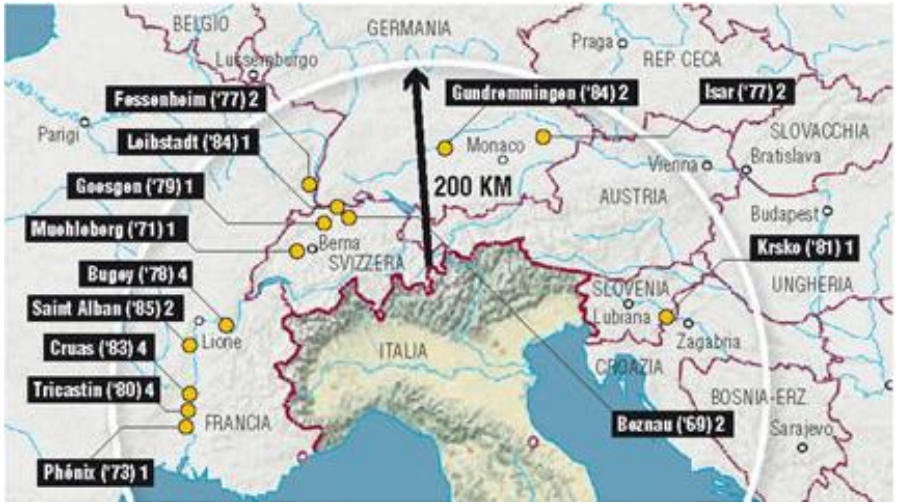
F. Rocchi, A. Guglielmelli, A. Cervone, F. Mascari
ENEA FSN-SICNUC-SIN Bologna - Italy

Contents

- ENEA involvement in EP&R
- ENEA capabilities and code availability for EP&R
- Examples from past/on-going activities
- Plans for WinMaccs studies

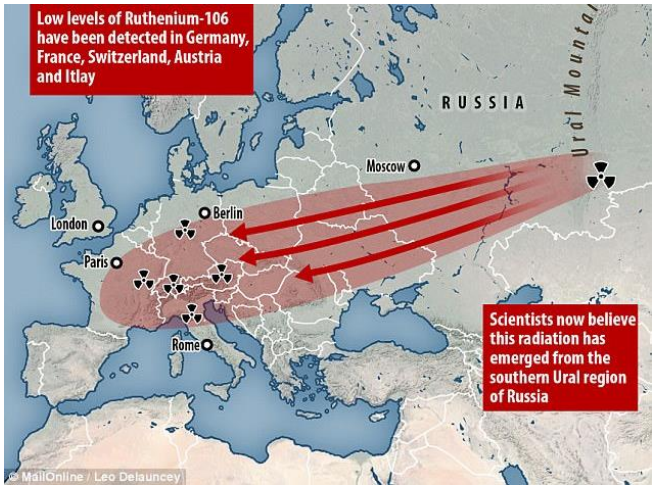
ENEA & EP&R

- In the aftermath of **Fukushima**, and taking into account its **TSO function**, ENEA decided to strengthen its capabilities in the field of EP&R;
- Italy has **not anymore** active NPPs; however…
- …Italy is surrounded at less than 200 km from the borders by **26 foreign NPPs**



ENEA & EP&R

- Moreover, Italy should maintain capabilities to perform **independent judgment** on the consequences of SAs to protect citizens and economic assets **abroad**
- Last but not least, Italy should still be capable to make assessments also of physically non-relevant, but psychologically and **socially relevant** cases…



106Ru recently detected over Europe

ENEA & EP&R

The official mandate of our Division states, inter-alia, that:

«…in cooperation with other Laboratories and Divisions of ENEA, it gives technical support to Competent Authorities for evaluations in the areas of safety and security in the various phases of the fuel cycle, and **it develops and applies previsional models to support the management of emergencies**, also through agreements with Technical Support Organizations (TSOs) and other international organizations…»

«…**it gives support to the National Nuclear Safety Authority** and other institutions dedicated to the **preparedness and response to nuclear and radiological emergencies**…»

Codes and tools

- ldX thanks to a Cooperation Agreement with IRSN, ENEA has access to ldX to perform statistical studies of neighboring NPPs.

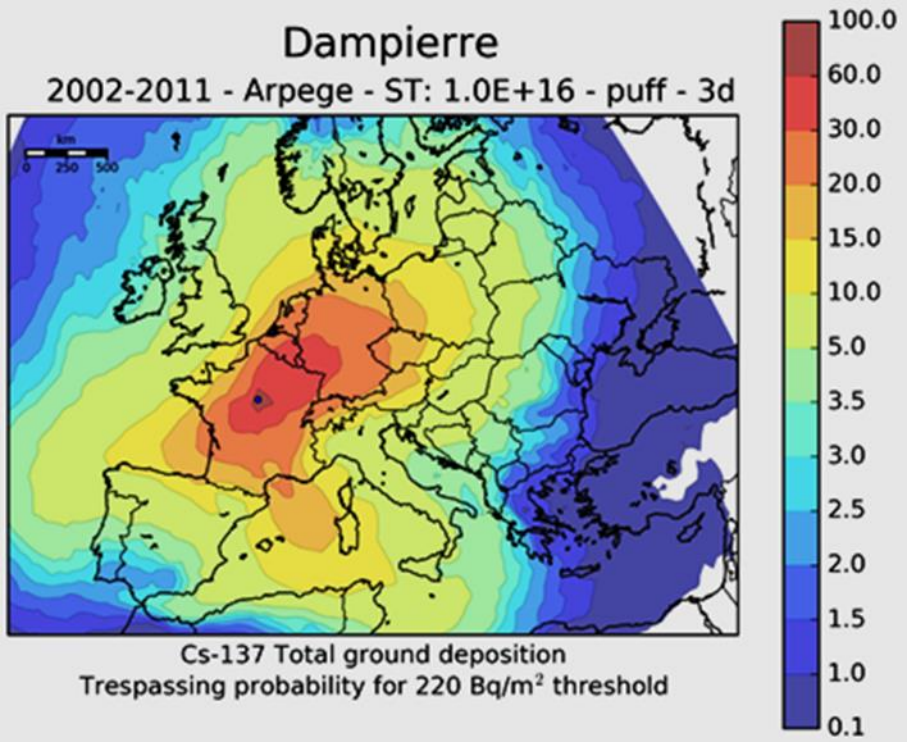
  ldX is an Eulerian atmospheric transport code which uses real 3D weather data (0.1° or 0.5° resolution, over different domain extensions) to compute dispersion of STs.

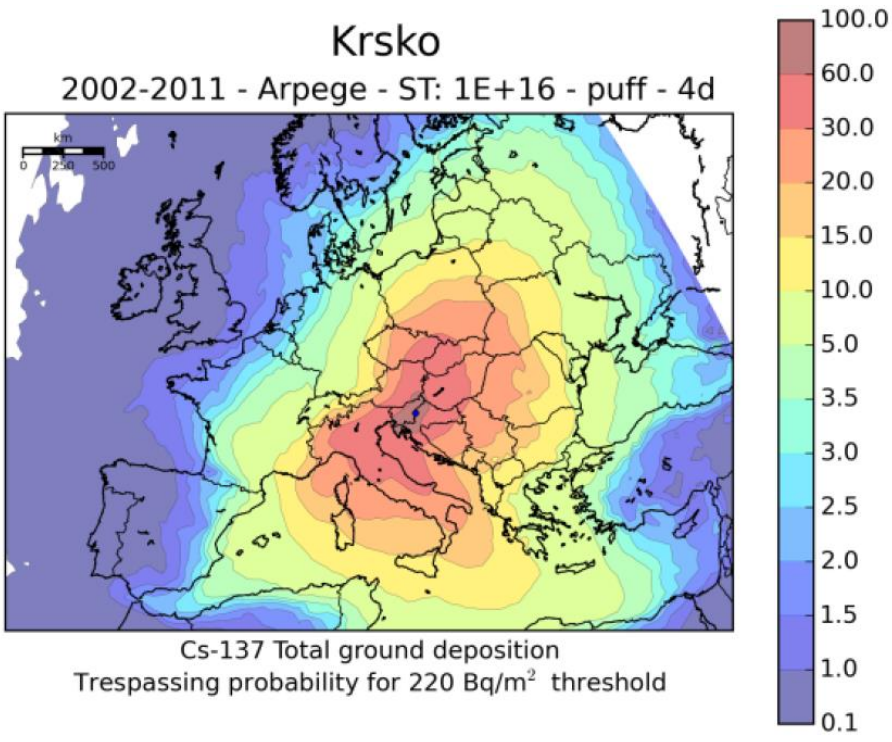
  ENEA uses ldX with historical data (2002-2011, 5980 different emission times) to perform statistical studies of consequences to rank foreign NPPs and to optimize preparedness provisions.

  The ranking criteria are being developed right now.

Codes and tools

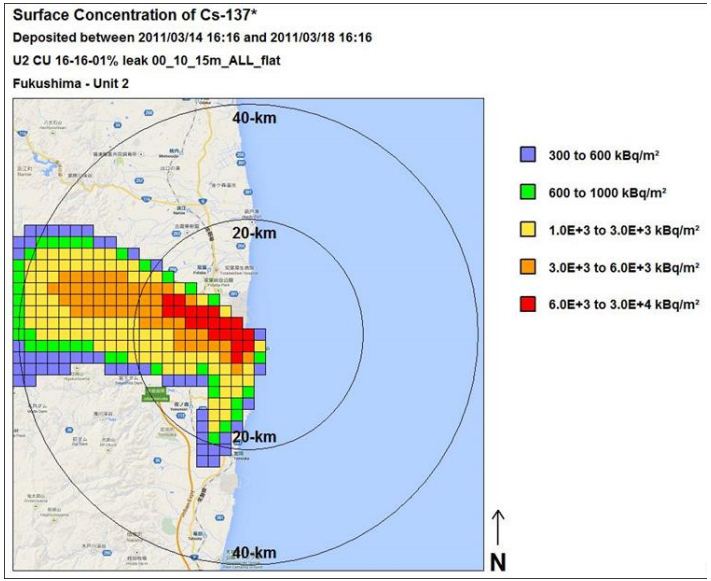
Typical ldX statistical maps





Codes and tools

- RASCAL 4.3 is currently used both to estimate STs and to make consequence analysis.
- Examples: Fukushima analysis (still on-going), TRIGA RC-1 analysis, etc.



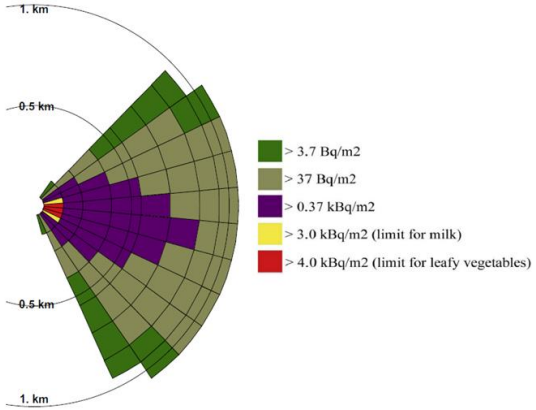
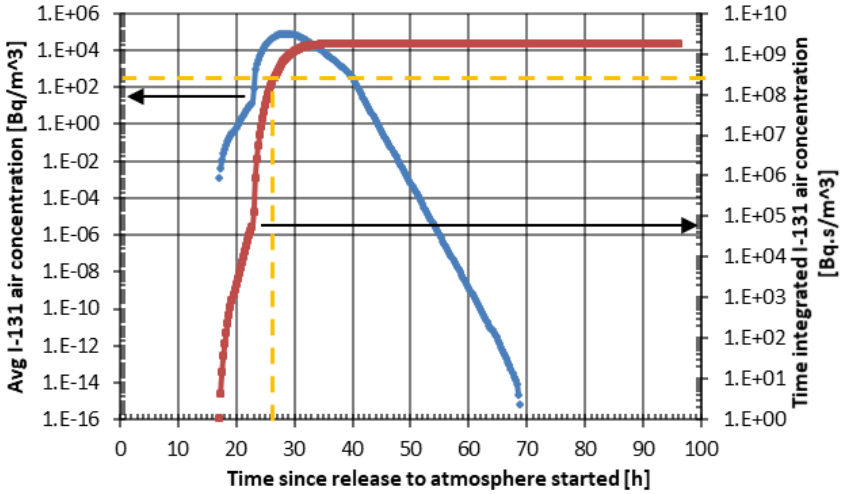


Fig. 17. Surface deposition of ^{131}I within 1 day form the release.

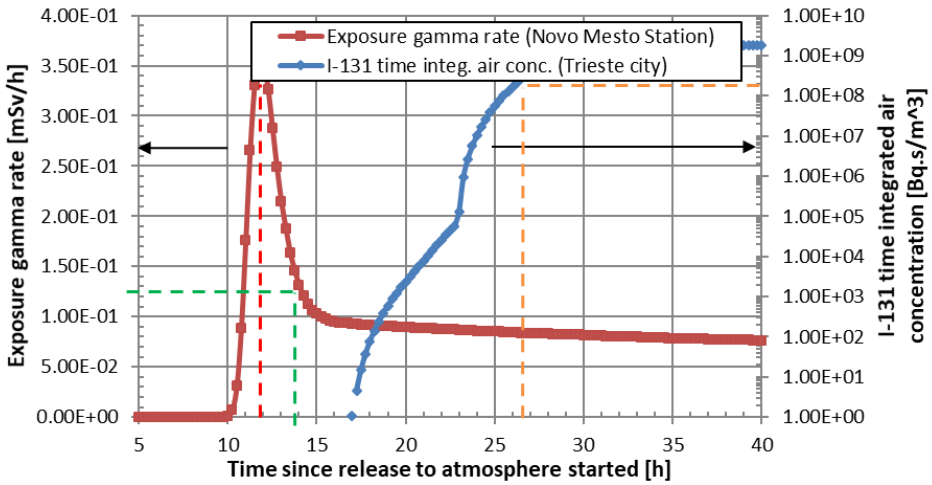
Codes and tools

- RASCAL is also currently in use to develop an **alert methodology** for the NE part of Italy in relation to SAs at Krsko NPP, based on the **EURDEP network** of dose-rate stations

131I air concentration in Trieste area



Relation to Novo Mesto Station Pulse



Codes and tools

- **FLEXPART** is a Lagrangian open-source code which ENEA uses with high-resolution forecast and re-analysis **ECMWF** data (*) to perform both **forward and backward calculations**.
- Between 2020 and 2021, **ECMWF servers** will be based in **Bologna** and more synergies can be imagined in data utilization.
- **JRODOS** is a consequence code which performs medium range ATM and calculation of doses; it is developed and maintained by KIT.

(*) Data are obtained through the Italian Military Aeronautics Weather Service

On-going activities

ENEA is partner of the European H2020 **FASTNET Project**. IRSN coordinates the project. Its main aims are:

- Development of a comprehensive **database** of Source Terms for all types of NPPs in Europe;
- Development of **fast-running** (minutes, not hours) **reference tools** for ST assessment;
- Preparation of exercises targeted at training people in consequence assessment;
- Develop harmonization in Europe about Response to SAs, especially for events that involve more than one country;
- Optimize the European Response Network;
- More than 20 European partners involved;
- Involvement also of IAEA, JRC, US-NRC and CNSC.

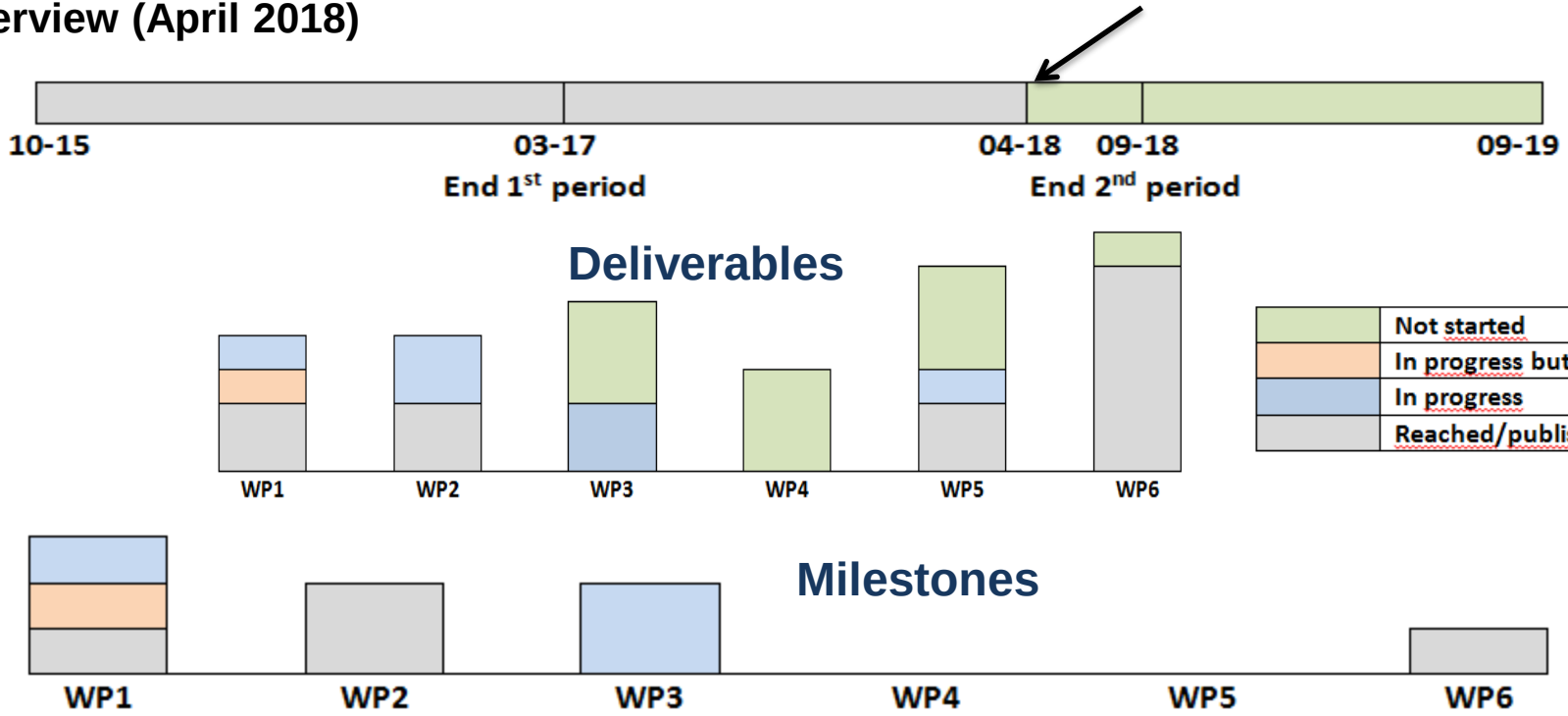
FASTNET Project Structure

WP	Name/Lead	Description
WP1	**Scenarios database** (LEI)	Elaboration of a common database of pre-calculated scenarios on all concepts of existing NPPs in Europe including the SFP facilities
WP2	**Emergency preparedness** (LRC)	Evaluation and improvement of 2 types of existing approaches: the deterministic approach (3D/3P) and approaches based on BBN
WP3	**Emergency response** (IRSN)	Development of specific parameterisations files describing all concepts of existing NPPs in Europe including SFP facilities which will be included with the PERSAN tool to allow the fast calculation of source terms for any situation Improvement of the BBN approaches to foster their implementation in emergency centres
WP4	**Emergency exercises** (NRPA)	Preparation and the realisation of 2 series of emergency exercises: - the best evaluation of the on-going situation, its evolution and its consequences - the population protection
WP5	**Dissemination** (ENEA)	Sharing of knowledge, including a scenarios database and reference methods and tools beyond the Consortium Education and training through workshops
WP6	**Management** (IRSN)	Project overall administrative and financial management

FASTNET CONSORTIUM

FASTNET Project Status

Overview (April 2018)

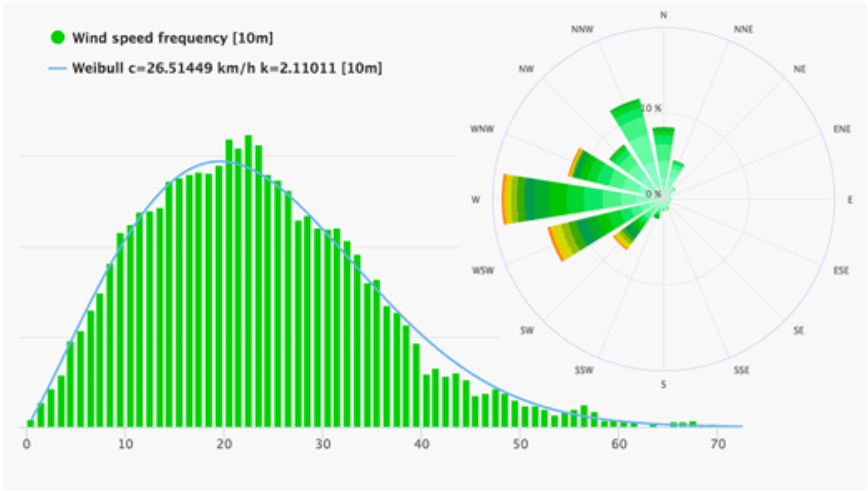


FASTNET End Users Group (up to now…)

ISPRA, Italy : Dr Paolo ZEPPA (paolo.zeppa@isprambiente.it); Dr Silvia SCARPATO (silvia.scarpato@isprambiente.it)
NRPA, Norway : M. Naeem UL SYED (naeem.ul.syed@nrpa.no)
APA, Portugal: M. Luis PORTUGAL (luis.portugal@apambiente.pt) M. Joao Oliveira MARTINS (joao.martins@apambiente.pt)
JSI, Slovenia: Mr. Ivo KLJENAK (Ivo.Kljenak@ijs.si)
PAA, Poland: M. Pawel LIPINSKI (pawel.lipinski@paa.gov.pl) M. Mateusz MALICKI (mateusz.malicki@paa.gov.pl); M. Mateusz WLOSTOWSKI (mateusz.wlostowski@paa.gov.pl); M. Adam JAROSZEK (adam.jaroszek@paa.gov.pl)
NRI-UJV, Czech Republic : M. Jindrich MACHEK (Jindrich.Machek@ujv.cz)
SSM, Sweden : M. Patric LINDAHL (Patric.Lindahl@ssm.se)
GRS, Germany: M. Michael HAGE (Michael.Hage@grs.de)

Plans for WinMACCS

- ENEA intends to develop before the end of the year a model for the Krsko NPP area in order to perform **PSA-3 studies** of the impact over Italy
- Very simplified ST: 131I and 137Cs, single release of 1 hour duration
- 30 years of hourly weather data at NPP obtained through the **History+** service of **Meteoblue** (https://www.meteoblue.com/it/historyplus)
- Distances up to about **150 km** from NPP
- Results may be not too much accurate given the rather long distances, however still useful in relation to dose-rate signals measured at EURDEP stations at shorter distances
- Comparison with RASCAL “single” results



Questions for WinMACCS developers ☺

- Plans to introduce Lagrangian models? When?
- How will this impact running times, especially for statistical studies?
- How will historical weather data be obtained for the Lagrangian models (NOAA? Others?)? Which resolution?
- How will Land Use and Orography will be imported?

Thank you for your attention!

Questions should be addressed to:

Federico Rocchi
federico.rocchi@enea.it