EC-JRC-IET activities to support enhancement of Severe Accident Management Guidelines (SAMGs)

Michel Bieth - Ghislain Pascal,

Nuclear Reactor Safety Assessment Unit

Institute for Energy and Transport, EC-DG Joint Research Center

http://iet.jrc.ec.europa.eu

European Commission

European Court of Auditors

The Council of the European Union or Council

European Court of Justice

European Parliament

European Council

European Central Bank

European Commission
(28 Commission members)

SG ELARG ENTR ENER DEVCO RTD JRC

IRMM IES IPSC IPTS IET IHCP ITU

Joint Research Centre

JRC current Structure

IET - Petten The Netherlands and Ispra

Institute for Energy and Transport

IRMM - Geel Belgium

Institute for Reference Materials and Measurements

ITU - Karlsruhe Germany and Ispra

Institute for Transuranium Elements

IPSC - Ispra Italy

Institute for the Protection and Security of the Citizen

IHCP - Ispra Italy

Institute for Health and Consumer Protection

IES - Ispra Italy

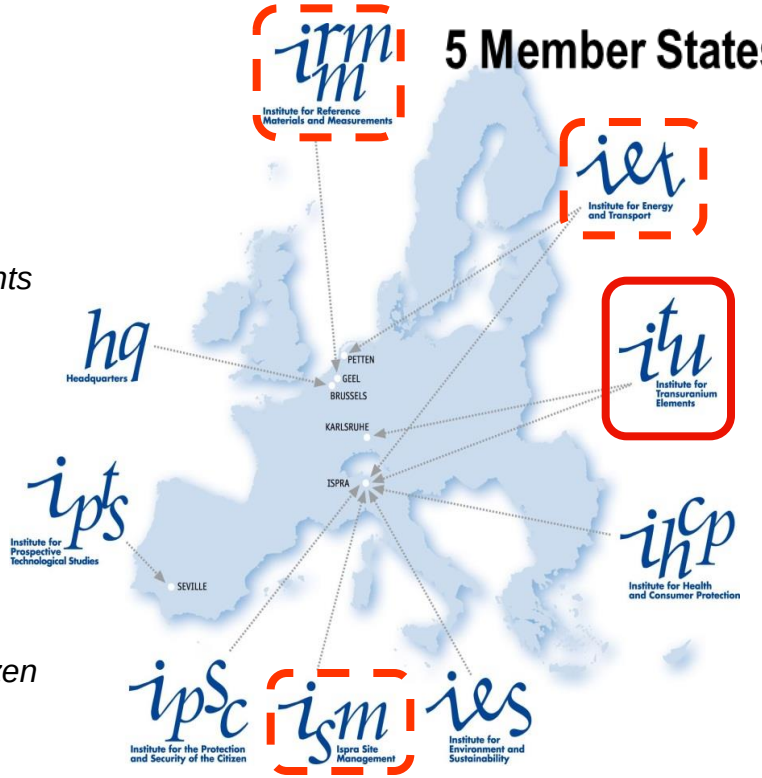
Institute for Environment and Sustainability

IPTS - Seville Spain

Institute for Prospective Technological Studies

7 Institutes in

5 Member States



Approximately 3000 Staff

JRC Nuclear site

JRC Partially Nuclear sites

Joint Research Centre

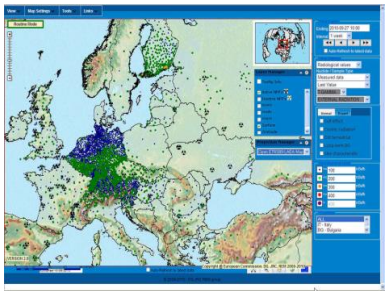
European Commission

JRC Euratom Programme 2014-2020

Safety of Nuclear Fuels and Fuel Cycles

Safety of Nuclear Reactors

Emergency Preparedness and accident modelling



Nuclear Safeguards and Security

Basic Research and Applications

Waste management and decommissioning

Knowledge Management, Training and Education

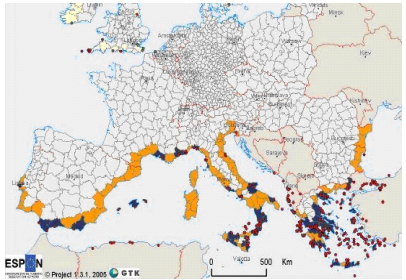
Joint Research Centre

Nuclear reactor safety assessment

- ***Clearinghouse for NPP Operational Experience Feedback***
- Nuclear Reactor **Severe Accident Analysis and Modelling**
- Scientific support to the **EU nuclear safety policies** (DEVCO, ELARG, ENER)
- **Reactor Safety assessment** in the frame of **Generation IV** International Forum

Post- Fukushima EU Stress tests.

- **Stress Test Scientific Secretariat**
- **Significant JRC effort to support the Stress Tests**
- **Provision of 9 experts for the peer reviews**
- **Participation to 3 Topical Peer-Reviews + 17 Country Peer-Reviews + Stress Tests follow-up in 2013**
- **Contributing to the EC report to the Council**
- **Answering 10 EP Questions**
- **3000 pages of National reports reviewed**

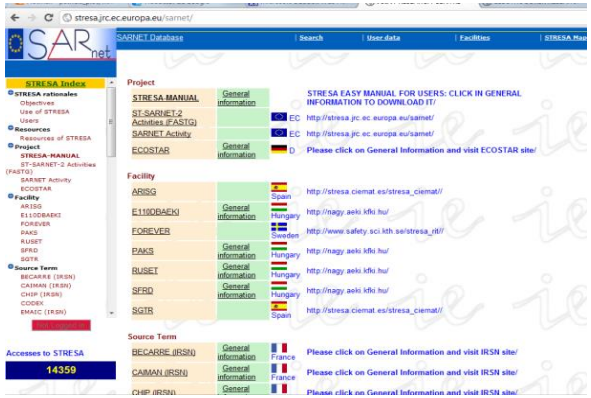


Joint Research Centre

JRC implication in Severe Accident research for LWRs

JRC has a long history in the field of Severe Accident Research for LWRs, through:

- Experimental activities in Severe Accidents (FARO, KROTOS, STORM)
- Contributions to the Phebus FP Project
- Participation in the SARNET Network of Excellence
- Preservation of experimental data at JRC: The STRESA/DATANET Database – New Web portal and database under development in 2014



Nuclear Reactor Accident Analyses and Modelling at EC-JRC-IET objectives:

- Further develop strong capabilities in Severe Accident Analyses and Modelling for Gen II&III and IV reactors
- To work in collaboration with partners (EU TSOs, international organizations, networks such NUGENIA…)* on possible ways to improve Severe Accident Management on EU NPPs

*

IRSN INSTITUT DE RADIOPROTECTION ET DE SÛRETÉ NUCLÉAIRE

GRS Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) mbH

IAEA

OECD NEA

GEN IV International Forum

Severe Accident Research NETwork of excellence

SARnet

NUGENIA NUclear GENeration II & III Association

Joint Research Centre

Nuclear Reactor Accident Analyses and Modelling objectives

1. Severe Accident Analyses for Improved Emergency Preparedness on Gen II&III and Gen IV NPPs

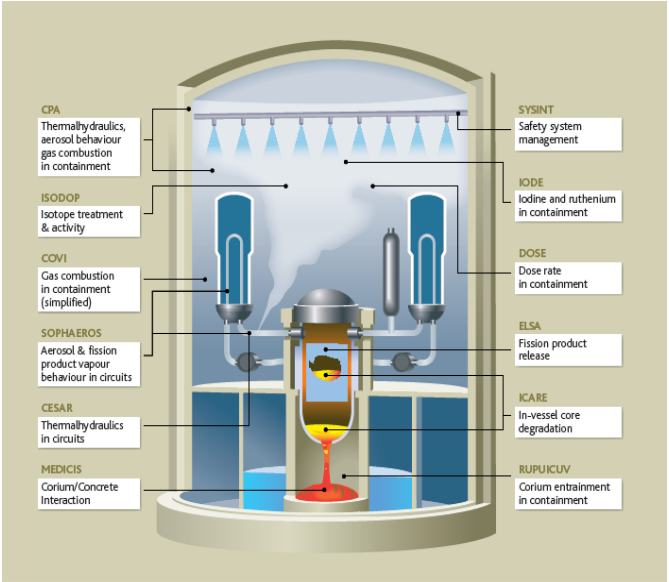
2. Safety Assessment of Innovative Gen III and Gen IV reactors

3. Support to evolving EU legislation and development of highest safety standards in EU;

4. Harmonization with related international activities through cooperation with the IAEA and OECD/NEA in the field of Safety Assessment, Severe Accidents and Emergency Plan Preparedness

EC-JRC-IET institutional work on Severe Accident

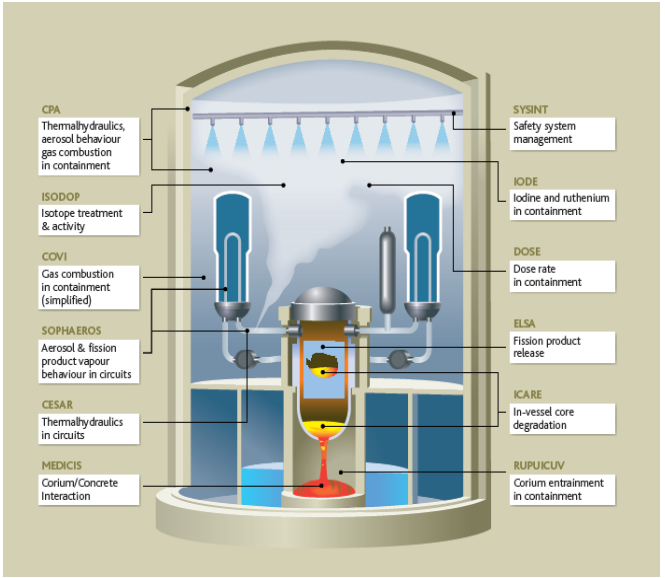
- Work on **ASTEC** (Accident Source Term Evaluation Code) Reference European code developed by IRSN/GRS for Severe Accident Analyses and Source Term evaluation on Light Water Reactors (LWRs)
- Direct collaboration between JRC-IET and IRSN for ASTEC V2 validation ("software agreement in kind contribution")



- Setting up an **International benchmark for modelling In Vessel Retention (IVR) for VVER 1000** (partners from Czech Republic, Slovakia, Bulgaria, the Russian Federation, France, etc…) initiated following IAEA CM in July 2013 on the topic.

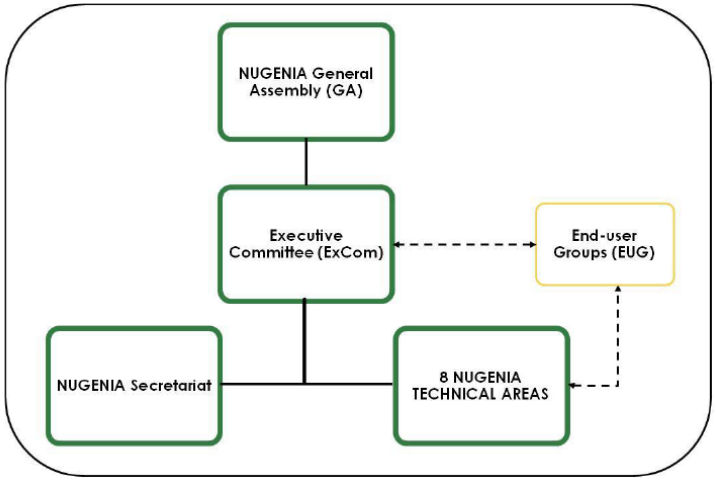
Euratom Projects: ASTEC and SAM

- **2004-2013:** Large development of ASTEC in the frame of the **Euratom SARNET Network of Excellence** to which JRC participated
- **2013-2017 :** in the frame of **Euratom FP 7 CESAM Project** : **Code for European Severe Accident Mangement (LWRs)**
  - Improvement of the ASTEC models (especially for BWRs and CANDU)
  - **WP40: Plant applications and Severe Accident Management (SAM): JRC-IET is Leader of this WP** (Development of a set of ASTEC "reference input deck" for main generic type of NPPs in Europe (PWR, BWR,CANDU) + associated Severe Accident analyses)



- **2013-2015:** Development of an ASTEC version for Sodium cooled Fast Reactors (supported through the **Euratom FP7 JASMIN Project**, JRC-IET participates)

NUGENIA organisation



Portfolio Assessment Group (G8)

Technical Areas

1	Plant safety and risk assessment	ENIQ
2	Severe accidents	
3	Core and Reactor performance	
4	Integrity and ageing of SSC	
5	Fuel, waste and dismantling	
6	Innovative Gen III design	

HARMONISATION

<u>JRC-IET contributes to NUGENIA and in particular in Technical Area 2</u>

2.1 In-vessel corium/debris coolability
2.2 Ex-vessel corium interactions and coolability
2.3 Containment behaviour, including hydrogen behaviour
2.4 Source term (as released from NPP to the environment)
2.5 Severe accident scenarios (modelling, PSA, basis of SAMGs, EPP)

International collaborations (OECD/NEA)

JRC-IET staff are currently participating to the development of several OECD/NEA State Of the Art Reports (SOAR)

- CNRA Task Group on Accident Management (2013-2015)(report accepted by CNRA in December 2013)
- CSNI WGAMA reports under development in 2012-2014:
  - Filtered Containment Venting
  - Spent Fuel Pool and assembly accident phenomenology and mitigation strategies
  - Hydrogen generation, transport and risk management
  - **Recently joined the WGAMA/WPNEM Task Group on the "International benchmarking project on fast-running software tools used to model fission product releases during accidents at nuclear power plants"** (using MAAP4 computer code for benchmarking other tools)

International collaborations (IAEA)

- Contribution to the IAEA Comprehensive Report on Fukushima WG3 : EP&R
- Meetings with IAEA Incident and Emergency Center (IAEA-IEC)
  - JRC/IET – IAEA/IEC meeting in Petten – 22 January 2013
  - Contribution to IAEA Consultancy Meeting on "Assessment and prognosis assistance during NPPs emergencies – June 2013
- Participation to:
  - IAEA CM on In Vessel Retention for VVER1000 (July 2013)
  - IAEA Technical Meeting for Review of the Draft Safety Requirements in Emergency Preparedness and Response

CONCLUSION

Large implication of EC-JRC-IET in the field of Severe Accident especially following the Fukushima accident

- Support to EU Stress Tests
- Establishing a EC-JRC Nuclear Reactor Accident Analyses and Modeling Group
- Euratom FP7 CESAM project, IVR Benchmark for VVER1000, etc..

Key Objectives for EC-JRC-IET development in the area of AM and EP&R (2014-2016):

- Research in accident modelling, accident Source Term evaluation and accident management of NPPs, in support to EP&R, in coordination with EU Member States activities

Thank You for Your Attention