FISA 2013

Euratom Research Programme on Reactor Systems Outline and State of Play

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European Commission

8th European conference on Euratom research and training in reactor systems

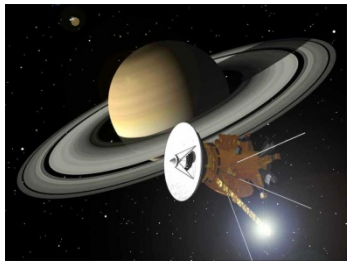
Overview

1. Severe accident management research
2. Numerical simulation tools for LWR
3. Plant life prediction and life-time evaluation
4. Human factors, E&T, safety culture
5. Fukushima follow-up actions
6. EU fora, SNETP, NUGENIA, IGDTP, MELODI TPs

Conclusions and perspectives

FISA 2013

- **Safe and harmonised** management of radioactive waste
- **Enhanced safety** of design and operation of existing and future reactors
- **Lift uncertainty about health risks after low radiation dose** due to industrial and medical applications
- **Ensure transfer of knowledge** to future generation in the field
- **Integration of European research** programming and implementation
- **Challenges need to be addressed worldwide**



Vilnius, 14-16 October 2013

FISA 2013

FP7 | **ETPs** | **ERA** | **INCO** | **H2020**

- Euratom
- WP
- FP Rules
- .....
- TPs
- Vision
- SRA
- DS
- .....
- FP6-7
- Projects
- SET-Plan
- H2020
- Strategy
- INCO
- EU Policy

The EGE recommends to achieve equilibrium between four criteria - access rights, security of supply, safety, and sustainability - in light of social, environmental and economic concerns.

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H2020 Euratom fission budget remains modest ...

~ 20 %	**Geological disposal**
~ 40 %	**Reactor systems** • Safety of existing nuclear installation • Advanced nuclear systems for increased safety • Transmutation and partitioning • Cross-cutting aspects
~ 20 %	**Radiation protection**
~ 20 %	**Research infrastructures** **Training and mobility** **Cross-cutting**

Grand Total:
Euratom Fission ~ 50 Mi€ / Year
Is ~ 10 % EU Public/Private R&D

1. Severe accident management research

- From 1988 to 2010, **PHEBUS FP** (largest severe accident research prog. in the world) with **EC contribution of 40.5 Mi€**
- Since 1992, about 80 shared-cost research projects on severe accidents with **EC contribution around of 66 Mi€**

The PHEBUS FP programme

LACOMECO project

Agence pour l'énergie nucléaire
Nuclear Energy Agency

ASAMPSA 2
SEVENTH FRAMEWORK PROGRAM

ERCOSAM - SAMARA coordinated projects

SARnet

- Severe Accident phenomenology
- Level 2 Probabilistic Safety Assessment
- Containment Thermal Hydraulics
- ASTEC integral SA analysis code
- Large Scale infrastructures
- INCO USA, JP, CA, KR, CH, RU

2. Numerical Simulation tools for LWR

- Simulation tools to perform accurate modelling of physical phenomena, a better qualification of uncertainties and to allow an increased integration of different computer codes
- With an **EC contribution of 22.1 Mi€ towards a European Reactor Safety Simulation Platform and 10 Mi€ for nuclear data measurements**

NURESIM PROJECT

NURISP

NURESAFE

NUCLEAR REACTOR INTEGRATED SIMULATION PROJECT

- Core-Physics modeling
- Multi-scale Thermal Hydraulics
- Multi-Physics, Monte Carlo
- Models validation and calibration
- Integration of simulation codes
- Nuclear data measurements and analysis

HPMC

High performance Monte Carlo reactor core analysis

EFNUDAT

European Facilities for Nuclear Data Measurements

Accurate Nuclear Data for nuclear Energy Sustainability

EUFRAT

ERINDA

European Research Infrastructures for Nuclear Data Applications

3. Plant life prediction and life-time evaluation

- Safety assessment of systems, structures and components residual life-time towards long term operation, improved performances and enhanced safety with an **EC contribution of 16.6 Mi€** towards a **European Gen II-III joint programming research programme and association NUGENIA**

Assessment of Aged piping
Dissimilar MEtal Weld integrity

PERFORM 60
FP7 Project

LONGLIFE FP7

STYLE

HARMONICS

NULIFE

- Integrity assessments metallic and concrete
- Materials performance, corrosion, ageing
- Multi-scale modeling towards 60 years
- Models validation, simulation, calibration, reliability
- Ageing diagnostics and prognostics
- Infrastructures and network of excellence

ADVANCE
Ageing Diagnostics and Prognostics of low-voltage I&C cables

MULTIMETAL
Structural performance of multi-metal component

NUGENIA
NUclear GENeration II & III Association

4. Human factors, E&T, safety culture

- EFTS Euratom Fission Training Schemes, ECVET European Credit system for Vocational Education Training, EU Master programmes, common qualifications, mutual recognition, mobility of trainees/trainers and safety culture with an **EC contribution of 14.5 Mi€** towards a **European Nuclear Education Network ENEN**

- University, R.Org., Reg. Bodies, TSOs, Industry
- Health physics, Safety culture, PWR, VVER
- Radiation protection, ALARA, medical experts
- E&T on waste storage, Nuclear chemistry and fuel cycle, Man-machine interface
- Infrastructures, H.Resources Observatory

CINCH

MMOTION

- European Master
- ENEN PhD Event
- ENEN III (FP7)
- TRASNUSAFE (FP7)
- EUJEP
- ENEN-RU (FP7)
- ECNET (FP7)
- NUSHARE (FP7)

CORONA

EUTEMPE-RX

EHRO-N

ecvet
European Credit system for Vocational Education & Training

enen
european nuclear education network

5. Fukushima follow-up actions

- Nuclear safety priority settings exercises, impact on severe accident management and consequences of combination of extreme external events on the safety of NPP enhanced safety with an **EC contribution of 26.3 Mi€ as an early 2011 reaction and follow-up actions**
- Investigation of passive and active systems on SA
- Upgrade EU SA computer codes
- Update emergency preparedness, rehabilitation
- EU TPs priority settings exercises
- EU Stress tests coordinated by EU/ENSREG
- Nuclear culture sharing
- Ethics and civil society dialogue

European Nuclear Energy Forum
Bratislava - Prague

NEA Nuclear Energy Agency

ENSREG European Nuclear Safety Regulators Group

IAEA.org International Atomic Energy Agency

NUSHARE

CESAM

NURESAFE

PASSAM

PREPARE

Vilnius, 14-16 October 2013

6. EU fora and SNETP, NUGENIA, IGDTP, MELODI TPs

- Under Euratom, EC should promote and facilitate EU Nuclear safety R&D in MS,
- ETPs are industry led to promote R&D and demonstration of EU fission technologies
- EU fora supporting nuclear policy, promoting stakeholders dialogue and safety improvements
- ENEF from 2007 and WG Transparency, risks and opportunities
- ENSREG from 2007, stress tests peer reviews
- SNETP, NUGENIA, SET-Plan ESNII and NC2I pillars
- IGDTP on geological disposal
- MELODI with NERIS-TP and Alliance
- INCO structured dialogue on R&D policy and priorities

Conclusions and perspectives

- Euratom experience with FP is **a consistent success in pursuing excellence** in nuclear science research and technology
- Industry driven ETPs are being capitalised
- **Close collaboration** with ENEF, ENSREG, OECD/NEA and IAEA, INCO
- **Stakeholders structured dialogue** on R&D policy, safety improvements, holistic approach and civil society involvement in decision making

- From severe accident management, numerical simulation tools, residual lifetime evaluation, human factors, E&T, and safety culture within and outside Europe taking into account Fukushima lessons,… launch H2020

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DRAUGE
NUO 1957-ŲJŲ