SOTERIA is an on-going H2020 project which proposes a comprehensive research approach in order to enable nuclear power plant operators, as well as regulators, to better understand and thereby predict the ageing phenomena occurring in reactor pressure vessels and internal steels to ultimately ensure a safe long-term operation of existing European nuclear power plants.

The SOTERIA approach is based on an end-user perspective and has planned the set-up of simulation-oriented experiments aiming to validate models at different scales.

*The **second edition of the SOTERIA newsletter** focuses on two important and successful events which took place recently: the second End-Users Group meeting, held in June in Fontainebleau, as well as the first meeting of the Technical Review Committee, held in April at the European Commission in Brussels.*

This issue also presents the publications and presentations prepared by the SOTERIA team members since project start. Further information is available on our public website.

We would also like to remind that the SOTERIA End-User Group is still open to equipment manufacturers, vendors, and operators.

The SOTERIA project partners

2nd SOTERIA End-Users Group meeting

The 2nd meeting of the End-Users Group took place on 19th June 2017 in the R&D centre of EDF in Fontainebleau (France) with participants from EPRI, CRIEPI, ENGIE, PSI, EDF, CEA and Phimeca. During the meeting, a new version of the SOTERIA Platform was presented. This new version is based on industrial case studies for the computation of the following elements:

- The effective dpa from a neutron spectrum (cf. Figure 1)
- The evolution of the hardening due to irradiation
- The evolution of the toughness with the irradiation by the modeling of a CT specimen
- The evolution of the Ductile to Brittle Transition Temperature with the modelling of Charpy specimens. (cf. Figure 2)

The following upgrades were proposed:

- Tool for uncertainties/sensitivity quantification
- Tool for the identification of behavior/fracture parameters
- Parametric tool
- Capability to model mini-CT

Join the SOTERIA End-Users Group!

Interested in testing the SOTERIA platform? Join the SOTERIA End-Users Group!
Please contact Marc BERVEILLER (EDF): marc.berveiller@edf.fr

Abstracts have been submitted to present the numerical platform at the IGRDM conference in Santiago de Compostela (Spain), as well as during the PLIM conference in Lyon (France), both taking place in October this year.

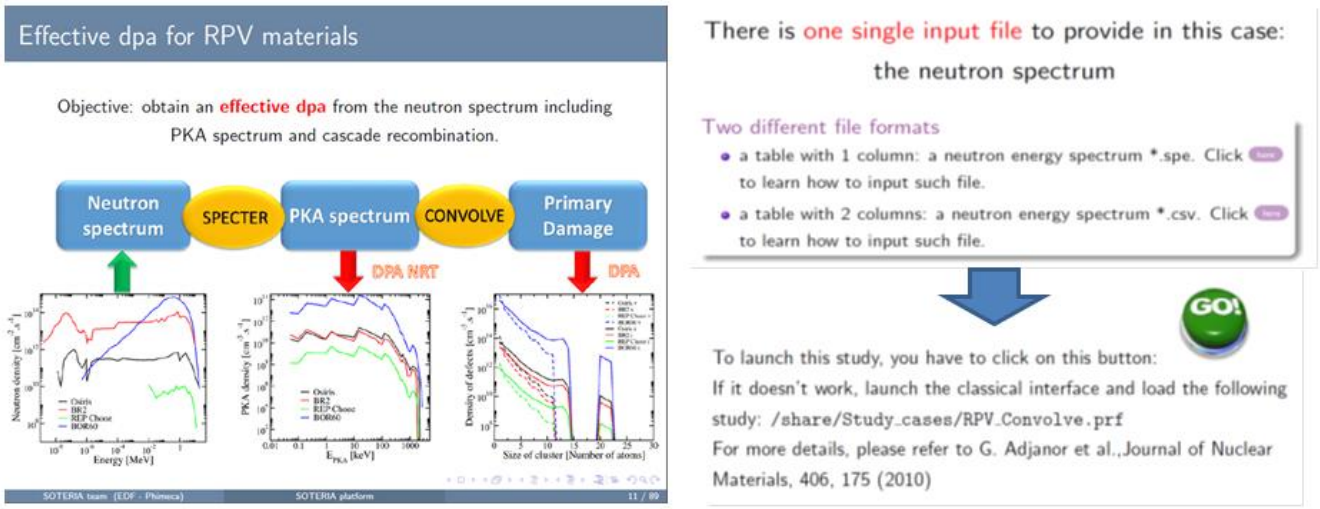


Figure 1 – Computation of the effective dpa

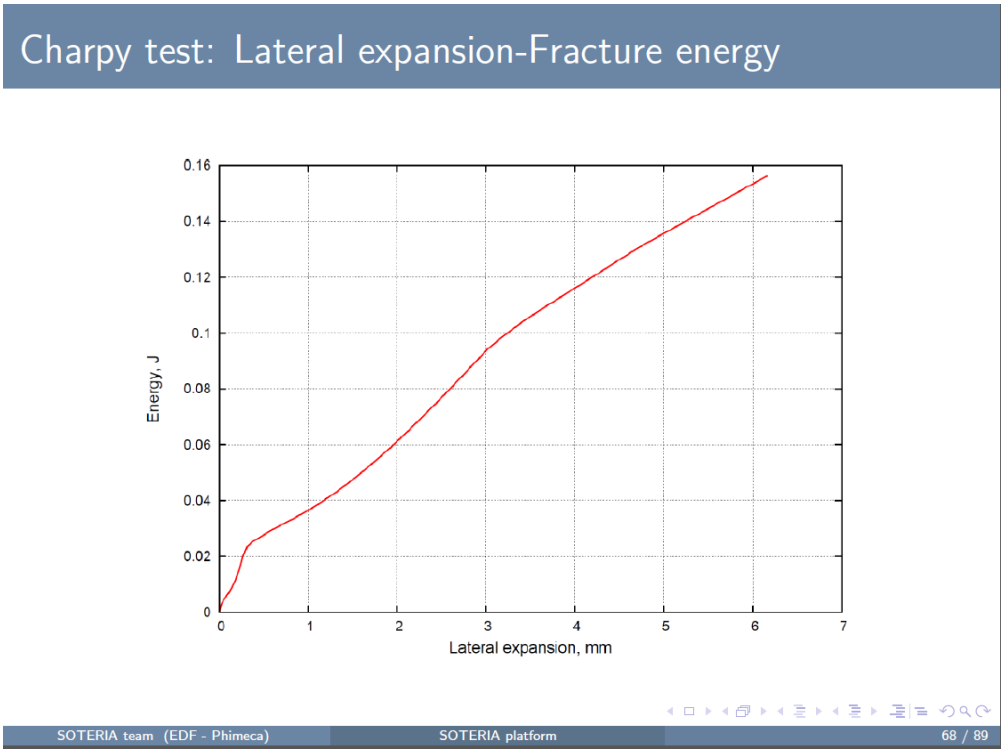


Figure 2 – Computation of the Energy versus the lateral expansion with Charpy model

First meeting of the Technical Review Committee

To achieve its ambitious objectives, the SOTERIA project benefits from the expertise of a so called Technical Review Committee (TRC), composed of six approved independent experts in the fields of numerical modelling, material mechanics, irradiation and corrosion.

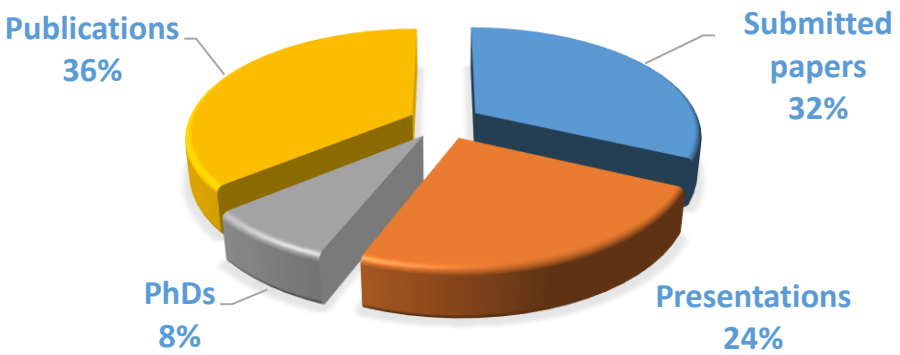
The members of the TRC have committed, on a voluntary basis, to monitor and evaluate the scientific performance of the project, and to provide independent feedback to the project, allowing it to better align the scientific work within the six different Work Packages to the needs of the project's direct stakeholders (modelers, experimentalists) and to create as much added value for them as possible.

On invitation of the SOTERIA Executive Board, the TRC gathered for a first review meeting on 5th April 2017 in Brussels, Belgium. During this meeting, which was kindly hosted by the European Commission, the SOTERIA Executive Board members, which at the same time are the official representatives and main responsible persons of the Work Packages, presented the achievements of the first 18-month period and answered the questions from the TRC.

The meeting was very collaborative with interesting discussions between the project representatives and the TRC. Receipt of the feedback report including potential recommendations from the TRC is expected in early July.

Publications and presentations

23 documents have been prepared since project start, including publications in scientific journals, submitted papers, presentations at conferences and 2 PhD theses. We are happy to present you here after a comprehensive list of the produced documents. To read the abstracts, please go to the Media Centre of the project's public website.



"Quaternion correlation for tracking crystal motions" – *by Q. Shi (CNRS), F. Latourte (EDF R&D), F. Hild and S. Roux (CNRS)*

"Ab initio threshold displacement energies in iron" – *by P. Olsson (KTH), C.S. Becquart (CNRS) and C. Domain (EDF R&D)*

"Introducing ab initio based neural networks for transition-rate prediction in kinetic Monte Carlo simulations" – *by L. Messina (CEA, KTH), N. Castin (SCK·CEN), C. Domain (EDF R&D) and P. Olsson (KTH)*

"A comparison of collective dislocation motion from single slip quantitative topographic analysis during in-Situ {AFM} room temperature tensile tests on Cu and Fe crystals" – *by C. Kahloun (CNRS), G. Monnet (EDF R&D), S. Queyreau, L.T. Le and P. Franciosi (CNRS)*

"Influence of phonon and electron excitations on the free energy of defect clusters in solids: A first-principles study" – *by M. Posselt, D. Murali and M. Schiwarth (HZDR)*

"An object kinetic Monte Carlo model for the microstructure evolution of neutron-irradiated reactor pressure vessel steels" – *by L. Messina (CEA), M. Chiapetto (SCK·CEN), P. Olsson (KTH), C.S. Becquart (CNRS) and L. Malerba (SCK·CEN)*

"Systematic electronic-structure investigation of substitutional impurity diffusion and flux coupling in bcc iron" – *by L. Messina, M. Nastar (CEA), N. Sandberg and P. Olsson (KTH)*

"Multiscale modeling of atomic transport phenomena in ferritic steels" – *by L. Messina (KTH, CEA)*

"Helium Effects on IASCC Susceptibility in As-Implanted Solution Annealed, Cold Worked and Post-Implantation Annealed 316L" – *by I. Villacampa, J.C. Chen, P. Spätig, H.P. Seifert (PSI) and F. Duval (CNRS)*

"Physically-based crystalline law for irradiated steels" – *by G. Monnet (EDF R&D) and L. Vincent (CEA)*

"Edge dislocations as sinks for sub-nanometric radiation induced defects in a-iron" – *by N. Anento, A. Serra (UPC) and L. Malerba (SCK·CEN)*

"Cluster dynamics modelling of the effect of injected interstitials and its correlation with experimental observations" – *by B. Michaut, T. Jourdan, J. Malaplate, A. Renault-Laborne (CEA), F. Sefta (EDF R&D), B. Décamps (CNRS)*

"Effect of Nickel on point defects diffusion in Fe–Ni alloys" – *by N. Anento, A. Serra (UPC) and Y. Osetsky (Oak Ridge National Laboratory)*

"Nanostructure evolution of neutron-irradiated reactor pressure vessel steels: revised object kinetic Monte Carlo model" – *by M. Chiapetto (SCK·CEN), L. Messina (CEA), C.S. Becquart (CNRS), P. Olsson (KTH), L. Malerba (SCK·CEN)*

"Anisotropic coalescence criterion for nanoporous materials" – *by J. Hure, V. Gallican (CEA)*

"Defect formation of ion irradiated RPV steels studied by (S)TEM" – *by F. Röder, F. Bergner, C. Heintze, E. Altstadt (HZDR)*

"Crystal deformation and rotation measurements in bainitic-ferritic steel" – *by Q. Shi, S. Roux, F. Latourte, F. Hild (EDF R&D)*

"Solute effects on edge dislocation pinning in complex alpha-Fe alloys" – *by M.I. Pascuet (CONICET-CNEA), E. Martínez (Los Alamos National Laboratory), G. Monnet (EDF R&D), L. Malerba (SCK·CEN)*

"Effect of strain rate and high temperature water on deformation structure of VVER neutron irradiated core internals steel" – *by A. Hojna, J. Duchon, P. Halodova, H. K. Namburi (CVR)*

"Presentation of the numerical platform SOTERIA used for the assessment of ageing mechanisms in RPV and internals" – *by A. Marchenko, M. Berveiller, F. Latourte, G. Adjanor, S. Munier, A. Parrot (EDF R&D), A. Gosset (Phimeca)*

"Towards the prevision of microstructure evolution under irradiation of model ferritic alloys with an hybrid AKMC-OKMC approach" – *by B. Pannier (CNRS)*

"Distribution of initiation sites and their relationship to microstructure in RPV weld metals" – *by U. Ehrnstén, J. Lydman, K. Wallin, C. Hurley, W. Karlsen (VTT), P. Efsing (KTH) and H. Hein (AREVA)*

"Presentation of SOTERIA: irradiation effects on RPV and internals under LTO conditions" – *by M. Colomer, I. Marcelles (Tecnatom), C. Robertson (CEA) and M. Serrano (CIEMAT)*

The SOTERIA consortium includes the following organisations:

COMMISSARIAT A L'ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES
AMEC FOSTER WHEELER NUCLEAR UK LIMITED
AREVA NP SAS
AREVA GMBH
ARTTIC
CENTRO DE INVESTIGACIONES ENERGETICAS, MEDIOAMBIENTALES Y TECNOLOGICAS-CIEMAT
CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE
CENTRUM VYZKUMU REZ S.R.O.
ELECTRICITE DE FRANCE
HELMHOLTZ-ZENTRUM DRESDEN-ROSSENDORF EV
INSTITUT DE RADIOPROTECTION ET DE SURETE NUCLEAIRE
JRC -JOINT RESEARCH CENTRE- EUROPEAN COMMISSION
INSTITUT JOZEF STEFAN
KUNGLIGA TEKNISKA HOEGSKOLAN
PAUL SCHERRER INSTITUT
PHI-MECA ENGINEERING
CENTRE D'ETUDE DE L'ENERGIE NUCLEAIRE FONDATION D'UTILITE PUBLIQUE
TECNATOM S.A.
UJV REZ, A.S.
THE UNIVERSITY OF MANCHESTER
UNIVERSITAT POLITECNICA DE CATALUNYA
VATTENFALL AB
ECOLE NATIONALE SUPERIEURE D'ARTS ET METIERS
TEKNOLOGIAN TUTKIMUSKESKUS VTT OY

This project received funding from the Euratom research and training programme 2014-2018 under grant agreement no. 661913.

Editorial team: imarcelles@tecnatom.es | graf@arttic.eu| marc.berveiller@edf.fr | christian.robertson@cea.fr