CONTRIBUTION OF MATERIALS INVESTIGATIONS TO IMPROVE THE SAFETY AND PERFORMANCE OF LWRs

Organized by
“Materials Science and Technology, Non Destructive Testing, Chemistry”
SFEN Technical Section

Supported by
AFCEN, AREVA, CEA, EDF, MAI

With the sponsorship of
CEFRACOR, COFREND, ENS
The objective of the symposium is to review the performance of materials in LWRs and, in particular, address the causes of and remedies for in-service failures in order to improve plant safety and operational life.

The meeting is aimed at plant operators, vendors, manufacturers, safety authorities, nuclear plant service engineers and researchers.

Note that the symposium is dealing with the issues related to PWRs and BWRs.

Organized by:

SFEN
French Nuclear Energy Society
“Materials Science and Technology, Non Destructive Testing, Chemistry” Technical Section

Supported by:

With the sponsorship of:

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Gilles PERRIN AREVA
Clarisse POIDEVIN CEA
Cédric POKOR EDF
Mireille RAPIN AREVA
Nathalie RUPA EDF
Agnès STUTZMANN EDF
Yannick THEBAULT EDF
André THOMAS AREVA
Francois VAILLANT EDF

TECHNICAL TRACKS LEADERS

TRACKS LEADERS
1. Pressure Vessel - PV Dominique MOINEREAU - EDF
2. Pressure Vessel Internals - PVI Cédric POKOR - EDF
3. Stainless Steel Corrosion - SSC Emmanuel HERMS - CEA
4. Nickel Alloy Corrosion - NAC Emmanuel LEMAIRE - EDF
5. Piping, Pumps - PP Marc CARNUS - EDF

TRACKS LEADERS
6. Steam Generator - SG Nathalie RUPA - EDF
7. Steam-Water Systems, Valves-SWSV Eric MOLINIE - EDF
8. Turbine, Alternator - TA Frédéric LAMARQUE - ALSTOM
9. Fuel, Control Rod Assembly - FCR A Jean-Paul MARDON - AREVA
10. Civil Engineering - CE Patrick DESGREE - EDF
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AVIGNON, POPES' PALACE, FRANCE

INTERNATIONAL CONGRESS CENTER,
Integrated into the historical monument of the Palace of the Popes
  • plenary assemblies [Conclave]
  • parallel sessions [Conclave, Cellier Benoît XII]
  • poster exhibition [Paneterie]
  • registration [Salle des Gardes, Paneterie]
  • welcome reception [Cloître Benoît XII]
  • coffee breaks [Paneterie, Galerie du Cloître]
  • official dinner [Grand Tinel]

JEANNE LAURENT BUILDING
Located steps away from the Palace in the Rocher des Doms gardens, the building provides panoramic views over the Rhône river and the Rhône valley. Dug into the rock, this character-filled building has 4 naves measuring approximately 200 m² each.
  • lunches

SAINT-BENEZET BRIDGE
Emblematic site in the history of Avignon, the Saint-Benezet bridge built from the twelfth century, was several times destroyed by spates on the Rhône River.
  • wine-tasting session
SUNDAY TO TUESDAY

Sunday 26
Registration
Welcome Reception

Monday 27
Registration
Opening & Welcome
Plenary Lecture

Tuesday 28

FCRA
CE

WEDNESDAY TO THURSDAY

Wednesday 29
PV
SSC
PV
SSC
PV
SSC
PP
TA
PP
SG

Wednesday 30
PV
SSC
PV
SSC
PV
SSC
PP
TA
PP
SG

Thursday 30
PV
SG
PV
SG
PV
SG
Closure

GEN III Reactors session
Poster session
Official Dinner

PV: Pressure Vessel
PVI: Pressure Vessel Internals
SSC: Stainless Steel Corrosion
NAC: Nickel Alloy Corrosion
PP: Piping, Pumps
SG: Steam Generator
SWSV: Steam-Water Systems, Valves
TA: Turbine, Alternator
FCRA: Fuel, Control-Rod Assembly
CE: Civil Engineering
Sunday 26

Registration

"Guards Room"
Popes' Palace from 4:00 to 7:00 pm

Welcome Reception

"Benoit XII Cloister"
Popes' Palace from 7:00 to 8:30 pm

Monday 27

Registration

"Paneterie Room"
Popes' Palace from 8:30 to 10:00 am,

Opening and Welcome

Philippe PRAD EL,
French Nuclear Energy Society Chairman,
Fontevraud 7 Advisory Committee Chairman,
10:00 am Conclave Room

Plenary Lecture

Cécile LAUGIER
Director of CEIDRE (Expertise and Inspection Center for Manufacturing and Operation)
Nuclear Engineering Division - EDF Generation
10:15 am Conclave Room
11:00 am - Conclave Room

Pressure Vessel - PV (1/5)

Chairs: Naoki SONEDA [CRIEPI] - Japan & Stéphane CHAPULIOT [AREVA] - France

A024 T01 Monitoring the aging of pressure vessel steels by TEP measurements: advantages and current limitations of the method
X. KLEBER [INSA Lyon], S. SAILET [EDF] - France

A109 T01 LTO and surveillance specimen programme of RPV
M. BRUMOVSKY, M. KYTKA [NRI Rez] - Czech Republic

A105 T01 Development of a charpy master curve-based embrittlement trend curve
M. ERICKSON [Phoenix Engineering Associates Inc.] - USA

A068 T01 Information about WPS experiments performed in NRI Rez and their evaluation
Czech Republic, B. TANGUY [CEA] - France

Lunch Time 12:30 am - 2:00 pm

Pressure Vessel - PV (2/5)

Chairs: Robert GERARD [GDF Suez] - Belgium & Sébastien SAILLET [EDF] - France

A084 T01 Revision of the irradiation embrittlement correlation used for the EDF RPV fleet
P. TODESCHINI, Y. LEFEBVRE, H. CHURIER-BOSSENNEC, N. RUPA, G. CHAS [EDF], C. BENHAMOU [AREVA-NP] - France

A106 T01 A wide-range trend embrittlement trend curve for western RPV steels
M. KIRK [US NRC] - USA

A080 T01 Flux effect on neutron irradiation embrittlement of reactor pressure vessel steels irradiated to high fluences
N. SONEDA, K. DOHI, K. NISHIDA, A. NOMOTO [CRIEPI], M. IWASAKI [KANSAI EPC], S. TSUNO [HOKKAIDO EPC],
T. AKIYAMA [SHIKOKU EPC], S. WATANABE [KYUSHU EPC], T. OHTA [JAPC] - Japan

A137 T01 Comparison of embrittlement trend curves to high fluence surveillance results
A.-S. BOGAERT, R. GERARD [TRACTEBEL ENGINEERING], R. CHAOUADI [SCK.CEN] - Belgium

A133 T01 Evaluation of fracture toughness from instrumented Charpy impact tests for a Reactor Pressure Vessel steel using
local approach to fracture : an application to the French surveillance program
A. PARROT, A. DAHL, G. CHAS, F. CLEMENDOT [EDF], B. TANGUY [CEA] - France

A145 T01 Assessment of the French and US embrittlement trend curves applied to RPV materials irradiated in the BR2
materials test reactor
R. CHAOUADI [SCK.CEN], R. GERARD, A.S. BOGAERT [GDF-Suez] - Belgium

Coffee Break

Pressure Vessel - PV (3/5)

Chairs: Gilles PERRIN [AREVA] - France & Patrick TODESCHINI [EDF] - France

A009 T01 Assessment of the recovery annealing efficiency for VVER-1000 materials’ structure reset and lifetime extension
B. GUROVICH, E. KULESHOVA, K. PRIKHODKO, S. FEDOTOVA [RRC KURCHATOV INSTITUTE] - Russian Federation

A096 T01 Degradation and recovery of mechanical properties of VVER-1000 pressure vessel materials

A019 T01 What one learns from reactor pressure vessels of decommissioned nuclear power plants

A041 T01 Decommissioned LWR Pressure Vessel Material Properties Study
E. KRASIKOV, A. AMAEV, S. KOTLOV [RRC KURCHATOV INSTITUTE] - Russian Federation

Wine-Tasting Session

Organized from 7:00 to 8:30 pm in “COUR du CHÂTELET” with restricted access for our participants
to “St Benezet Bridge - Pont d’Avignon”.

Paneterie Room

Common social event
11:00 am - Benoit XII Cellar

Stainless Steel Corrosion - SSC (1/3)

Chairs: Peter ANDRESEN [GE] - USA & Genta TAKANO [MHI] - Japan

- A103 T03 Effects of cold work and stress on oxidation and SCC behavior of stainless steels in PWR primary water environments
  T. SHOJI, K. SAKAGUCHI, Z. LU [TOKOHU UNIVERSITY], S. HIRANO, Y. HASEGAWA [KEPCO], T. KOBAYASHI, K. FUJIMOTO, Y. MOMURA [MHI Ltd] - Japan

- A099 T03 Research Programs on SCC of Cold-worked Stainless Steel in Japanese PWR N.P.P.
  N. MATSUBARA, T. KOBAYASHI, Y. NOMURA, K. FUJIMOTO, [MHI], N. CHIGUSA, S. HIRANO [KEPCO] - Japan

- A040 T03 Barrel bolt cracking in a German PWR
  R. KILIAN, G. MAUßNER [AREVA-NP GmbH], G. KÖNIG [EnBW Kernkraft GmbH Kernkraftwerk] - Germany

Lunch Time 12:30 am - 2:00 pm

Stainless Steel Corrosion - SSC (2/3)

Chairs: Toshio YONEZAWA [TOHOKU UNIVERSITY] - Japan & François VAILLANT [EDF] - France

- A076 T03 Chloride-induced TGSCC in austenitic stainless steel valves
  F. HÜTTNER [VATTENFALL EUROPE NUCLEAR ENERGY GmbH], R. KILIAN [AREVA-NP GmbH] - Germany

- A115 T03 SCC of stainless steels under PWR service conditions

- A011 T03 SCC of Stainless Steels in Hot Water
  P. ANDRESEN [GE] - USA

- A042 T03 Degradation of safety injection system and containment spray piping and tank - Fracture toughness analysis
  D. ALEXANDER [NRR], P. DOUBELL, C. WICKER [ Eskom] - South Africa

- A108 T03 On-line leak sealing of safety injection system vessels by laser weld overlays
  P. DOUBELL [Eskom], C. VAN ROOYEN, H. BURGER [CSIR] - South Africa

Coffee Break

Stainless Steel Corrosion - SSC (3/3)

Chairs: Steve FYFITCH [AREVA] - USA & Emmanuel HERMS [CEA] - France

- A092 T03 Effect of chemical compositions and heat treatment on IGSCC resistance for strain hardened low carbon austenitic stainless steels in oxygenated water
  - T. YONEZAWA [TOKOHU UNIVERSITY], H. KANASAKI, K. FUJIMOTO, M. TANEIKE [MHI ltd], S. OOKI, Y. SUEISHI, H. TEZUKA, K. TAKAMORI, S. SUZUKI [TEPCO] - Japan

- A160 T03 Effect of water purity on intergranular Stress Corrosion Cracking of stainless steel and nickel alloys in BWRs
  BM. GORDON [SIA Inc.], S. GARCIA [EPRI] - USA

- A058 T03 Effect of hydrazine, carbonyldrazide and hydrogen injection on noble metal treated stainless steel ECP and IGSCC mitigation during BWR startup
  S.G. SAWOCHKA, A. LEONARD [NWT Corp.], J. GIANNELLI [FINETECH Inc.], A.ODELL [EXELON Corp.], S. GARCIA [EPRI] - USA

- A043 T03 Resin ingress in the primary circuit Doel 1: root cause analysis and consequences for the plant
  W. GEERINCK, C. LAIRE, P. SCHNONGS [LABORELEC], D. MARTENS [ELECTRABEL Doel] - Belgium

- A135 T03 Survey of water chemistry strategies and data of the european BWRs
  A. LAENDNER, S. WEISS, B. STELLWAG [AREVA-NP GmbH], F. HÜTTNER [EUROPEAN BWR FORUM] - Germany

Common social event
8:30 am - Conclave Room

Fuel, Control Rod Assembly - FCRA (1/2)
Chairs: Petra-Britt Hoffmann [AREVA NP GmbH] - Germany & Didier Gilbon [CEA] - France

- A114 T09 AREVA NP approach to fuel reliability using a combination CFD - Fuel deposition modeling
  M. Pop, K. Keheley [AREVA NP Inc.], G. Bhandari [CD-ADAPCO] - USA

- A046 T09 Study on irradiation behavior of MOX fuel used in LWR

- A087 T09 MECAZIR: effect of irradiation on the mechanical behaviour of zirconium alloys

Coffee Break

Fuel, Control Rod Assembly - FCRA (2/2)
Chairs: Petra-Britt Hoffmann [AREVA NP GmbH] - Germany & Didier Gilbon [CEA] - France

- A022 T09 Zirconia thickness measurements for irradiated fuel rods: an approach to better understanding measurement error
  B. Lacroix, L. Fayette, T. Martella, M. Pras, M. Masson-Fauquier [CEA] - France

- A027 T09 Creep-rupture, steam oxidation and recovery behaviours upon dynamic transients up to 1300°C of cold-worked 304 stainless steel tubes dedicated to nuclear core fuel cladding

- A124 T09 Development and mastering of production of dysprosium haf-nate as absorbing material for control rods of promising thermal neutron reactors
  A.V. Zakharov, V.D. Risovery, Y.E. Muraleva, V.F. Sokolov [JSC SSC RIAR] - Russian Federation

Lunch Time 12:30 am - 2:00 pm

Pressure Vessel - PV (4/5)

- A013 T01 Radiation damage and structural changes in reactor pressure vessel steels subjected to neutron irradiation: An X-ray absorption fine structure study
  G. Kuri, S. Cammelli, C. Degueldre, J. Bertsch [PSI] - Switzerland

- A123 T01 Current understandings on the neutron irradiation embrittlement of BWR reactor pressure vessel steels in Japan
  K. Asano, T. Nishiyama [Tokyo EPC], N. Soneda, K. Dohi, K. Nishida, A. Nomoto [CRIEPI], J. Iida [Tohoku EPC], H. Yoneda [Hokuriku EPC], H. Yuya [Chubu EPC], Y. Ishimaru [Chugoku EPC], T. Ohta [JAPC] - Japan

- A015 T01 Experimental data base for assessment of irradiation induced ageing effects in pre-irradiated RPV materials of German PWR
  H. Hein, A. Gundemann, E. Keim, H. Schnabel [AREVA NP GmbH], J. Ganswind [VGB Powertechnik] - Germany

- A073 T01 Evolution of the microstructure of a French Reactor Pressure Vessel steel under neutron irradiation
  H. Huang, B. Radiguet, P. Pareige [Université de Rouen-CNRS], P. Todeschini, G. Chas [EDF] - France

- A055 T01 Irradiation behavior of German PWR RPV steels under operating conditions
  J. May, H. Hein [AREVA-NP GmbH], J. Ganswind [VGB Powertechnik], M. Widera (RWE Power AG) - Germany

- A143 T01 Overview of RPV sub-project of perform 60

Coffee Break
**8:30 am - Benoit XII Cellar**

**Civil Engineering - CE (1/2)**

**Chairs: Alexis COURTOIS [EDF] - France & Jean SALIN [EDF] - France**

- **A012 T10** Durability and safety of concrete structures in the nuclear context: the case of the containment vessel
  J.-M. TORRENTI [LCPC], G. NAHAS [IRSN] - France

- **A088 T10** Modeling and analysis of ageing behavior of concrete structures in nuclear power plants
  J.Y.R. RASHID, R. JAMES, R.S. DUNHAM [ANATEC H] - USA

- **A067 T10** Survey of the future concrete structures lifetime measuring the water content : four types of embedded sensor under checking
  G. MOREAU, B. MASSON, J. SALIN [EDF], P. DUBOIS, [ANDRA], F. AGOSTINI, F. SKOCYLAZ [Ecole Centrale de Lille] - France

- **A078 T10** Potential contribution of materials investigations in reducing the risks of unavailability of nuclear civil engineering infrastructures

*Paneterie Room*

**Coffee Break**

**Civil Engineering - CE (2/2)**

**Chairs: Alexis COURTOIS [EDF] - France & Jean SALIN [EDF] - France**

- **A030 T10** Measurements of resonance frequencies on prestressed concrete beams during post-tensioning
  P. LUNDQVIST, N. RYDEN [LUND UNIVERSITY] - Sweden

- **A158 T10** Gentilly 2 NPP - concrete aging effects on long term pre-stress losses and propagation of concrete cracking due to pressure testing
  V. GOCEVSKI [Hydro-Quebec] - Canada

- **A121 T10** Non destructive characterization of cracks in concrete by ultrasonic auscultation of civil engineering structures
  A. QUIGGER [EDF & UNIVERSITE DE LA MEDITERRANEE], J.-F. CHAIX, V. GARNIER, J.-P. ZARDAN, C. PAYAN [UNIVERSITE DE LA MEDITERRANEE], J. SALIN [EDF] - France

- **A032 T10** Study of the degradations caused by nuclear accidental conditions on a steel coating
  F. AYRINHAC, J.-M. TERRIOl [EDF] - France

*Paneterie Room*

**Coffee Break**

**Lunch Time 12:30 am - 2:00 pm**

**Nickel Alloy Corrosion - NAC (1/3)**

**Chairs: Stephen BRUEMMER [PNNL] - USA & Thierry COUVANT [EDF] - France**

- **A117 T04** Learnings from EDF investigations on SG divider plates and vessel head nozzles. Evidence of prior deformation effect on stress corrosion cracking
  D. DEFORGE, L. DUISABEAU, S. MILOUDI, Y. THEBAULT, T. COUVANT, F. VAILLANT, E. LEMAIRE [EDF] - France

- **A016 T04** Low temperature crack propagation of nickel based weld metals in hydrogenated PWR primary water
  M. AHONEN, LEHRNSTÉN [VTT TECHNICAL RESEARCH CENTRE OF FINLAND], H. HÄNNINEN [HELSINKI UNIVERSITY OF TECHNOLOGY] - Finland

- **A007 T04** IGSCC Growth Behaviors of Alloy 690 in Hydrogenated High Temperature Water
  K. ARIOKA, T. YAMADA, T. MIYAMOTO, T. TERACHI [INSS]- Japan

- **A052 T04** Oxidation of ternary NiCrFe alloys: a comparison between experimental and numerical studies
  E. AUBLANT [AREVA-NP], C. DESGRANGES, F. LEQUIÉN, M. NASTAR [CEA] - France

- **A045 T04** Effects of material factors and test methods on PWSCC initiation susceptibility of Ni-based alloys
  G. NAKAYAMA, Y. SAKAKIBARA, T. HIRANO [IHI Corp.] - Japan

- **A136 T04** Stress corrosion crack initiation of alloy 182 weld metal in primary coolant - influence of chemical composition
  O. CALONNE, M. FOUCAULT, F. STELTZLEN [AREVA-NP], C. AMZALLAG [EDF] - France

*Paneterie Room*

**Coffee Break**
Conclave Room

Pressure Vessel - PV (5/5)

Chairs: David LIDBURY [SERCO] - UK & Mark KIRK [US NRC] - USA

- **A047**  **T01**  Application of the RTNDT- and RTTO- concept for the Borssele RPV considering 60 years of operation

- **A141**  **T01**  WPS criterion proposition based on experimental data base interpretation
  S. CHAPULIOT, J.-P. IZARD [AREVA-NP], D. MOINEREAU [EDF], S. MARIE [CEA] - France

- **A034**  **T01**  Brittle failure assessment of RPV considering loss of constraint from transient LOCA conditions
  D. SIEGELE, I. VARFOLOMEEV, J. HOHE, V. HARDENACKE [Fraunhofer IWM], G. NAGEL [EON Kernkraft] - Germany

- **A049**  **T01**  Results of the TIMES project: experimental outcome and application of a local approach model for fracture mechanics assessment of RPV integrity
  S. HEUßNER, M. HÜMMER, E. KEIM [AREVA NP GmbH], J. GANSWIND [VGB PowerTech] - Germany
Nickel Alloy Corrosion - NAC (2/3)

Chairs: Toshio YONEZAWA [TOHOKU UNIVERSITY] - Japan & Denis BUISINE [EDF] - France

- A070 T04 Stress corrosion cracking in the fusion boundary region of an alloy 182- A533B low alloy steel dissimilar weld joint in high temperature oxygenated water
  Q. PENG, H. XUE, J. HOU, Y. TAKEDA, J. KUNIYA, T. SHOJI [TOHOKU UNIVERSITY] - Japan

- A074 T04 Crack growth rate in the HAZ of alloy 600/ 182
  D. GOMEZ-BRICEÑO, J. LAPEÑA, M. GARCIA-REDONDO, L. CASTRO, F. J. PEROSANZ [CIEMAT] - Spain,
  A. ALHUWALIA [EPRI] - USA, J. HICKLING [ITC] - Cyprus

- A003 T04 Crack growth in heat affected zones at alloy 600/182 and Alloy 690/52M welds
  K. NORRING [STUDSVIK NUCLEAR], P. EFSING [RINGHALS] - Sweden

- A004 T04 PWSCC of steam generator divider plates in alloy 600: coupling field characterizations with R&D studies
  T. COUVANT, S. MILOUDI, F. VAILLANT, D. DEFORGE, Y. THEBAULT [EDF] - France

- A010 T04 SCC of alloy 690 and its weld metals
  P. ANDRESEN, M. MORRA, [GE], A. ALHUWALIA [EPRI] - USA

- A062 T04 Cold rolling effects on grain boundary damage and stress corrosion crack growth in alloy 690
  S.M. BRUEMMER, M. OLSZTA, L. THOMAS [PNNL] - USA

26-30 SEPTEMBER, 2010
AVIGNON, POPES’ PALACE, FRANCE
8:30 am - Conclave Room

Pressure Vessel Internals - PVI (1/4)
Chairs: Anne DEMMA [EPRI] - USA & Jean-Paul MASSOUD [EDF] - France

- A102 T02 Overview of EPRI research on effects of irradiation on LWR internals
  R. PATHANIA, R. CARTER, A. DEMMA [EPRI] - USA

- A095 T02 Effects of dissolved hydrogen on IASCC behavior
  K. FUJII, H. NISHIOKA, K. FUKUYA [INNS], T. TORIMARU [NNFD] - Japan

- A008 T02 Determination of the time to failure curve as a function of stress for a highly irradiated AISI 304 stainless steel after constant load tests in simulated PWR water environment
  - C. POKOR, J.-P. MASSOUD, M. WINTERGERST [EDF] - France

- A057 T02 Destructive investigations of decommissioned guide tubes: characterization of wear

Coffee Break

Pressure Vessel Internals - PVI (2/4)
Chairs: Pal EFSING [VATTENFALL RINGHALS] - Sweden & Benoit TANGUY [CEA] - France

- A053 T02 Results on irradiated austenitic stainless steel bolts of reactor core internals
  M. ERNESTOVA, A. HOJNÁ, E. KEÍLOVA, J. KOCÍK, J. MICHALICKA [NRI Rez] - Czech Republic

- A065 T02 Effect of compressive and tensile stresses on swelling and creep strain of Fe-18Cr-10Ni-Ti austenitic steel

- A060 T02 Fracture Toughness of Austenitic Stainless Steels after BWR Irradiation
  T. TORIMARU, M. KODAMA, [NFD], S. TANAKA [TOSHIBA], T. NAKAMURA [HITACH-GE NUCLEAR ENERGY], K. KUMAGAI, K. ASANO [TEPCO] - Japan

- A100 T02 Examination of highly irradiated stainless steels from BWR and PWR reactor pressure vessel internals
  A. JENSSEN [STUDEVK NUCLEAR AB], P. EFSING, B. FORSSGREN [RINGHALS AB], B. BENGTSSON [OKG AB], M. MOLIN [Forsmarks Kraftgrupp AB] - Sweden

Lunch Time

12:30 am - 2:00 pm

Piping, Pumps - PP (1/2)
Chairs: Armin ROTH [AREVA NP GmbH] - Germany & Marc CARNUS [EDF] - France

- A031 T05 Environmental effects on fatigue - Possible reasons for the apparent mismatch between laboratory test results and operational experience
  A. ROTH, B. DEVRIENDT [AREVA-NP GmbH] - Germany

- A071 T05 Atomic scale study of phase transformation in long term thermally aged duplex stainless steels: relation between microstructure and properties
  P. PAREIGE, S. NOVY, C. PAREIGE [UNIVERSITE DE ROUEN-CNRS], S. SAILLET, M. AKAMATSU [EDF] - France

- A140 T05 Microstructural characterization of thermally-aged duplex stainless steels
  A. NOMOTO, T. HAMAOKA, K. NISHIDA, K. DOHI, N. SONEDA [CRIEPI], K. NAKADE [TEPCO] - Japan

- A168 T05 The mechanical features of isothermally annealed duplex stainless steel
  B. SUSTARSIC, M. GODEC, M. JENKO, J.V. TUMA [IMT] - Slovenia, B. MARINI, C. TOFOLOM ASCLET, P. FORGET [CEA] - France

Coffee Break
8:30 am - Benoit XII Cellar

Valves, Steam-Water Systems - VSWS

Chairs: Charles LAIRE [LABORELEC] - Belgium & Stéphane TREVIN [EDF] - France

- A090 T07 Flow accelerated corrosion mitigation at EDF with BRT-CICERO™. Feedback of version 3 and process of validation
  S. TREVIN, M. PERSOZ, L. DEJOUX, C. MILLER, J.-B. BOUVIER, T. LAMONTRE [EDF] - France

- A146 T07 Impact of preventive and curative remedies for steam generators fouling and tube support plate blockages on secondary circuit materials
  M. ALVES VIEIRA, M. DIJOUX, O. DE BOUVIER, M. MAYOS, N. COQUIO [EDF] - France

- A044 T07 Evolution of the feedback from experience on degradations of French nuclear power plants condensers and fore - seen solutions
  M. MAYOS, F. CHANEL, N. COQUIO, E. CARBAY, E. COPIN, L. CARLIER, C. BASTIAN [EDF] - France

- A128 T07 In-service thermal ageing of martensitic stainless steels
  R. TAMPIGNY, E. MOLINIE, F. FOCT, P. DIGNOCOURT [EDF] - France

- A129 T07 Replacement of Cobalt base alloys hardfacing by NOREM alloy; EDF experience and development, some metallurgical considerations. Valves application (CLAMA, RAMA)
  Marc CARNUS [EDF], Xavier CONFORT [VELAN] - France

Paneterie Room

Coffee Break

Nickel Alloy Corrosion - NAC (3/3)

Chairs: Dolores GOMEZ-BRICENO [CIEMAT] - Spain & Lionel FOURNIER [AREVA] - France

- A085 T04 The environmentally-assisted cracking behaviour in the transition region of Nickel-base alloy/low-alloy steel dissimilar metal weld joints under simulated BWR conditions
  S. RITTER, H.P. SEIFERT, H.J. LEBER [PSI] - Switzerland

- A149 T04 SCC, toughness, and fatigue crack growth in alloy X-750 as a function of temperature and potential
  J. GIBBS, R.G. BALLINGER, P.W. STAHEL [MIT] - USA

- A118 T04 EDF field experience of 182 J-Groove welds on CRDMs and 9G channel head nozzles
  L. DUISABEAU, D. DEFORGE, Y. THEBAUT, M. STINDEL, E. LEMAIRE [EDF] - France

- A125 T04 PWSCC Mitigation of alloy 182: testing of various mitigation processes

Lunch Time 12:30 am - 2:00 pm

Paneterie Room

Turbine, Alternator - TA

Chairs: Rod VANSTONE [ALSTOM] - UK & Frédéric LAMARQUE [ALSTOM] - France

- A142 T08 ARABELLE 1550 MWe units: 10 years of feed back experience in the EdF N4 nuclear power plants
  A. BUGUIN, C. SCHENCK, F.-X. CATELAN, H. GRAFF, R. DEVILLERS, V. JOURDAIN [Alstom] - France

- A014 T08 Design against SCC in steam turbines: concept and case study

- A048 T08 Use of ST103 PH grade material for last stage blades to enhance low pressure steam turbine performance in nuclear power plant applications
  P. PEEL, S. OSGERBY, I. CHILTON [Alstom] - Switzerland

- A050 T08 Ageing of cables and new approaches for the study of polymer ageing
  C. MONCHY-LEROY, P. THEROND [EDF] - France

- A157 T08 Ageing evaluation for low voltage cables with low dose rate gamma ray irradiation accelerated ageing tests
  T. TATSUOKA, Y. IBUSUKI, Y. FURUHASHI, K. TAKAMORI, H. TEZUKA, A. HASHIMOTO [TEPCO] - Japan

Paneterie Room

Coffee Break
### Conclave Room

**Piping, Pumps - PP (2/2)**

**Chairs:** Armin ROTH [AREVA NP GmbH] - Germany & Marc CARNUS [EDF] - France

- **A001 T05** Evaluation of a new approach for the inspection of austenitic dissimilar welds using ultrasonic phased array techniques  
  C. CARPENTIER, C. NAGESWARAN [TWI Ltd], Y.Y. TSE [UNIVERSITY OF BIRMINGHAM] - UK
- **A138 T05** Piping inspection using manual PA in nuclear business  
- **A144 T05** Inspection of austenitic welds with ultrasonic phased array technology  
  A. GARCIA, F. FERNANDEZ [TECNATOM SA] - Spain, R. DUTRUC, R. FERRIERE [METALSCAN] - France
- **A119 T05** Ice plugging of piping: from the theory to the practice. 25 years feedback from EDF PWRs  
  M. CARNUS, J.-M. DETRAZ [EDF] - France

### GEN III Reactors

**Chairs:** Philippe BILLOT [CEA] - France

- **A163 T00** Aging of materials during plant operation: preventive measures in the design of EPR™ reactor  
  A. LEFRANCOIS [AREVA] - France
- **A112 T00** Contribution of service experience with failure investigations and aging management in the materials and manufacturing selection of the AP1000 nuclear power plant  
  G.V. RAO, C. M. PEZZÉ [Westinghouse Electric Co] - USA
- **A134 T00** The AREVA Boiling Water Reactor KERENA™: design features and waterchemistry of an evolutionary generation III+ BWR  
  A. LÄNDNER, B. STELLWAG, T. BORRMANN, S. WEISS [AREVA NP GmbH], S. PANKOW [E.ON Kernkraft GmbH] - Germany

### Poster Session

- Organized in “Paneterie Room” (coffee breaks area) in the Popes’ Palace.
- After GEN III Reactors session
- From 6:00 to 7:30 pm

### Official Dinner

- Organized in "Grand Tinel Hall" in the Popes’ Palace
- From 8:00 to 11:00 pm
**Benoit XII Cellar**

**Steam Generator - SG (1/3)**

**Chairs: Jim BENSON [EPRI] - USA & Patrice PITNER [EDF] - France**

- **A164 T06** French Steam Generator tubes: an overview of degradations  
  D. BUISINE, O. de BOUVIER, N. RUPA, Y. THEBAULT, V. BARBE, P. PITNER [EDF] - France

- **A079 T06** Update of alloy 800 behaviour in secondary side of PWR steam generators  
  D. GOMEZ-BRICEÑO, M.S. GARCIA-REDONDO, F. HERNANDEZ [CIEMAT] - Spain

- **A154 T06** Root cause analysis of SG tube ODSCC indications within the tube sheets of NPP Biblis Unit A  
  R. KILIAN, J. BECK, H. LANG, V. SCHNEIDER [AREVA NP GmbH], T. SCHÖNHERR [RWE POWER AG KRAFTWERK BIBLIS], M. WIDERA [RWE POWER AG] - Germany

- **A126 T06** Stress corrosion cracking of steam generator tubes made of alloy 600 TT: analysis of operating experience  
  I. DE CURIERES, M.-C. MEUNIER [AREVA NP SAS] - France

**GEN III Reactors**

**Chairs: Philippe BILLOT [CEA] - France**

- **A163 T00** Aging of materials during plant operation: preventive measures in the design of EPR™ reactor  
  A. LEFRANCOIS [AREVA] - France

- **A112 T00** Contribution of service experience with failure investigations and aging management in the materials and manufacturing selection of the AP1000 nuclear power plant  
  G.V. RAO, C. M. PEZZE [Westinghouse Electric Co] - USA

- **A134 T00** The AREVA Boiling Water Reactor KERENATM: design features and waterchemistry of an evolutionary generation III+ BWR  
  A. LÄNDNER, B. STELLWAG, T. BORMANN, S. WEISS [AREVA NP GmbH], S. PANKOW [E.ON Kernkraft GmbH] - Germany

**Poster Session**

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**Official Dinner**

Organized in "Grand Tinel Hall" in the Popes’ Palace  
From 8:00 to 11:00 pm
8:30 am - Conclave Room

Pressure Vessel Internals - PVI (3/4)

- A072 T02 Study of irradiation effects in austenitic stainless steels

- A023 T02 Effects of chemical composition, metallurgical state and stress during irradiation on microstructure of neutron-irradiated austenitic stainless steels: comparison of PWR and BOR-60 irradiations
  A. RENAU [J], MALAPLATE, J. GARNIER, P. GAVOILLE [CEA], C. POKOR, J.-P. MASSOU [EDF] - France

- A035 T02 Second-order phenomena in austenitic internal components growing to first order importance at the higher damage levels associated with PWR plant life extension to 60 or 80 years
  F.A. CARNER [RADIATION EFFECTS CONSULTING], L.R. GREENWOOD [PNL] - USA, M. GUSEV, O. P. M. SIMKIN [INSTITUTE OF NUCLEAR PHYSICS] - Kazakhstan

- A15 T02 Influence of post irradiation annealing on the mechanical properties and defect structure of AISI 304 steel
  W. VAN RENTERGHEM, S. VAN DYCK [SCK.CEN] - Belgium, A. AL MAZOUZ [EDF] - France

- A097 T02 FCC-to-BCC phase transformation in austenitic steels for WWER internals with significant swelling
  B. MARGOLIN, A. SOROKIN, I. KURSEVIC [CRISM "Prometey"], V. NEUSTROEV [SSC RIAR] - Russian Federation

Coffee Break

Pressure Vessel Internals - PVI (4/4)
Chairs: Ulla EHRNSTEN [VTT] - Finland & Eric MOLINÉ [EDF] - France

- A150 T02 Relaxation and irradiation creep of PWR baffle bolt materials
  J. GARNIER, P. DUBUISSON [CEA], C. POKOR, E. LEMAIRE, N. MONTEIL, J.-P. MASSOU [EDF] - France

- A132 T02 In-pile creep behavior of type 316 stainless steel at HALDEN reactor
  K. TAKAKURA [JNES], K. SAKIMA, K. FUJIMOTO, N. KUBO [MHI], T. KIDO [NUCLEAR DEVELOPMENT Corp.] - Japan

- A069 T02 Stress evaluation of baffle former Bolt for IASCC failure prediction
  T. MATSUBARA, T. TSUTSUI, Y. KAMEI, M. KITSU [MHI, Ltd] - Japan

- A153 T02 Lessons learned from baffle bolt replacements regarding irradiation-induced creep behaviour
  E. LEMAIRE, N. MONTEIL, J.-P. MASSOU, C. POKOR, N. LIGNEAU, G. COURTEMANCHE [EDF] - France

Closure
8:30 am - Benoit XII Cellar

Steam Generator - SG (2/3)
Chairs: Renate KILIAN [AREVA - NP GmbH] - Germany & Pierre COMBRADÉ [ACXCOR] - France

- A166 T06 Experience of Steam Generator tube examination in the hot laboratory of EDF: analysis of recent events concerning the secondary side
  Y. THEBAULT, O. de BOUVIER, M. BOCCANFUSO, N. COQUIO, V. BARBE, E. MOLINIE [EDF] - France

- A162 T06 Vogtle-1 ODSCC
  E.W. SHAW, T. O’BRIEN, S.G. LE BLANC, T. SMITH, R. MULLINS [Southern Nuclear Operating Company] - USA

- A021 T06 Validation of statistical assessment method for the optimization of the inspection need for nuclear steam generators
  K. WALLIN [ACADEMY OF FINLAND] - Finland, R. VOSKAMP [KERNKRAFTWERK UNTERWESEN], J. SCHMIDBAUER [KERNKRAFTWERK GROHNE], H. OSTERMEYER, [KERNKRAFTWERK BORKDORF], G. NAGEL [EON KERNKRAFT] - Germany

- A165 T06 Steam generator mechanical plug failure: a tribologic problem
  M. BOCCANFUSO, R. FRITZ, Q. DELERABLEE [EDF], J.-M. CARREZ [AREVA NP] - France

Coffee Break

Steam Generator - SG (3/3)
Chairs: Takafumi HIRO [MHI] - Japan & Odile de BOUVIER [EDF] - France

- A159 T06 Verification for PWSCC mitigation technologies
  T. OKABE, T. HIRO, T. INOUE [MHI] - Japan

- A025 T06 Grain boundary network control and its effect on intergranular corrosion resistance of alloy 690
  S. XIA, H. LI, C. HU, T.G. LUI, B. ZHOU, W. CHEN [SHANGHAI UNIVERSITY] - PRC China

- A127 T06 Lead pollution of the secondary side of steam generators: an overview
  I. DE CURIERES, M.-C. MEUNIER [AREVA NP SAS], F. VAILLANT [EDF] - France, B. CYRUS [AREVA NP Inc.] - USA

Closure
Pressure Vessel - PV

A152 T01 Risk-Informed Appendices G and E for Section XI of the ASME Boiler and Pressure Vessel Code
B. CARTER, J. SPANNER [EPRI], W. SERVER [ATI Consulting], R. GAMBLE [Sartrex Corporation], B. BISHOP, N. PALM, C. HEINECKE [Westinghouse Electric Company] - USA

A026 T01 Effect of nickel alloying element on the precipitation of Cu-rich clusters in RPV model steel
B. ZHOU, J-A WANG, Q. LIU, W. LIU, W. WANG, M. LIN [INSTITUTE OF MATERIALS SHANGHAI UNIVERSITY] - PR China

A039 T01 Prerequisites to LWRS surveillance programme improvement
E. KRASIKOV, P. PLATONOV, S. KOTLOV [RRC KURCHATOV INSTITUTE] - Russian Federation

A110 T01 VERLIFE - Unified procedure for lifetime assessment of components and piping in WWER NPPS during operation
Updating and further development
M. BRUMOVSKY [NRI Rez] - Czech Republic

Pressure Vessel Internals - PVI

A036 T02 Radiation-induced densification in 300 series stainless steels during irradiation under PWR-relevant conditions
F.A. GARNER [RADIATION EFFECTS CONSULTING], J. BUSBY [ORNL] - USA

A054 T02 Development of capabilities at Idaho National Laboratory to support the Light Water Reactor Sustainability program
S. TEYSSEYRE, C. TYLER, B.H. SENCER, J.H. JACKSON [IDAHO NATIONAL LABORATORY], F.A. GARNER [RADIATION EFFECTS CONSULTING] - USA

A064 T02 Effect of helium accumulation in austenitic steel on microstructure evolution and radiation damageability of WWER internals materials
S.V. BELOZEROV, V.S. NEUSTROEV, V.K. SHAMARDIN [SSC RIAR] - Russian Federation

A086 T02 Comparison of constitutive models for irradiation-induced swelling of type 304 and 316 stainless steels
J. McKINLEY, E. DEEMER, R. LOTT [Westinghouse Electric Cie] - USA

A089 T02 Irradiated stainless-steel-material constitutive model for use in the performance evaluation of PWR pressure vessel internals
J.Y.R. RASHID, R., S. DUNHAM [ANATECH.], A. DEMMA [EPRI] - USA

A122 T02 IASCC of core internals of PWRs : EDF R&D and engineering program to assess internals lifetime management
C. POKOR, G. COURTEMANCHE, J.L. FLEJOLI, M. TOMMY-MARTIN, I. RUPP, J-P. MASSOUD, N. MONTEIL [EDF], B. TANGUY [CEA] - France

A147 T02 Key factors affecting stress corrosion cracking in irradiated stainless steels
G.S. WAS, Z. JIAO, M. McMURTRAY, E. WEST [UNIVERSITY OF MICHIGAN] - USA

A169 T02 Assessment of thermal aging embrittlement of cast austenitic stainless steel components in the B&W-design PWR reactor internals

A190 T02 Crack initiation testing of highly irradiated stainless steel (thimble tube material with a dose up to 80 dpa) under PWR conditions
R-W BOSH, M. VANKEERBERGHEN, R. CHAOUADI [SCK-CEN], R. GERARD, F. SOMVILLE [GDF-Suez] - Belgium

Stainless Steel Corrosion - SSC

A082 T03 Corrosion fatigue initiation behaviour of wrought austenitic stainless pipe steels under simulated BWR/HWC and PWR conditions
H. J. LEBER, S. RITTER, H.P. SEIFERT [PSI] - Switzerland

A161 T03 Computational multiscale modeling of intergranular cracking
I. SIMONOVSKI, L. CIZEJ [Institut Josef Stefan] - Slovenia

Nickel Alloy Corrosion - NAC

A002 T04 Influence of the surface defects on nickel base alloys corrosion in PWR simulated primary media
H. LEFAIX-JEU LAND, L. MARCHETTI, S. PERRIN [CEA], M. SENNOUR, R. MOLINS [MINES ParisTech], M. PIJOLAT [ENSM-SE] - France

A075 T04 Crack growth rate in the HAZ of alloy 690TT/152
Mitigation of the corrosion of primary circuit components using zinc injection: EDF strategy
D. DEFORGE, A. TIGERAS, J.-L. BRETELLE, E. LEMAIRE [EDF] - France

Improvement of the efficiency of flow accelerated corrosion rates calculation with carbon steel alloy measurements
S. TREVIN, T. KNOOK, H. ADGHAR, P. GUILLOT [EDF] - France

Modeling of residual stresses in valves Norem hard-facing alloys: a material characterization issue
J.-P. MATHIEU, F. ARNOLD, E. GAUTHIER [EDF], G. BEAURIN [EDF & INSA Lyon] - France

Computed radiography + rhythm Software for FAC inspection in nuclear secondary circuit

Lightbridge thorium seed and blanket fuel safety analyses for VVER-1000
M.H. MONTGOMERY, A. MUSHAKOV [Lightbridge Corp.] - USA, A. MOROZOV [Lightbridge Corp.] - Russian Federation

The IRMA gamma irradiation facility
L. BERGER, M. RABOIN, J. CORBIERE [IRSN] - France

Irradiation experiments and materials testing capabilities in High Flux Reactor in Petten
N. LUZGINOVA, D. BLACOYVA, H. HEGEMAN, J. VAN DER LAAN [NRG] - the Netherlands

Irradiation rigs in material testing capacity in France: from OSIRIS to JHR
F. ROZENBLUML, G. BIGNAN, C. GONNIER [CEA] - France

Development of a new test to evaluate the decontaminable aspect of coatings
F. AYRINHAC, J.-M. TERRIOL [EDF] - France