

**MINUTES OF THE WP4 FALL MEETINGS**  
**HELD IN THE CONGRESS CENTER OF WORLD TRADE CENTER, MOSCOW, RUSSIA**  
**WEDNESDAY, SEPTEMBER 15<sup>TH</sup>, 2010**



**AND IN THE PALAIS DES PAPES, AVIGNON, FRANCE (during "Fontevraud 7")**  
**WEDNESDAY, SEPTEMBER 29<sup>TH</sup>, 2010**



**Written by:**

Damien Féron and Catherine Guerre

**Diffusion:**

Present and apologized participants

Juliet Ippolito (EFC Scientific Secretary and Public Relation Officer)

Ines Honndorf (EFC Website)

**EFC WP4 "NUCLEAR CORROSION"**

|               |                 |            |                        |                  |                               |
|---------------|-----------------|------------|------------------------|------------------|-------------------------------|
| Chairman      | Damien Féron    | CEA/Saclay | DEN/DANS/DPC/SCCME     | Bât. 458 - PC 50 | F-91191 GIF SUR YVETTE Cedex  |
| Vice-Chairman | Thierry Couvant | EDF        | DMMC - Les Renardières | BP46             | F-77818 MORET SUR LOING Cedex |
| Secretary     | Mylène Belgome  | CEA/Saclay | DEN/DANS/DPC/SCCME     | Bât. 458 - PC 50 | F-91191 GIF SUR YVETTE Cedex  |

**Attendance to the Moscow meeting:**

|                    |                                       |
|--------------------|---------------------------------------|
| Mathias Breimesser | PSI, Switzerland                      |
| Bob Cottis         | Manchester University, United Kingdom |
| Nicolas Dulcy      | Vallourec, France                     |
| Damien Féron       | CEA, France                           |
| James Grosvenor    | Rolls-Royce, United Kingdom           |
| Hans Hoffmeister   | Helmut Schmidt University, Germany    |
| Vivekanand Kain    | BARC, India                           |
| Alison Weightman   | Rolls-Royce, United Kingdom           |
| Krzysztof Wolski   | ENSM-SE, France                       |

**Attendance to the Avignon meeting:**

|                  |                    |
|------------------|--------------------|
| Thierry Couvant  | EDF, France        |
| Willem Geerinck  | LABORELEC, Belgium |
| Catherine Guerre | CEA, France        |
| Emmanuel Herms   | CEA, France        |
| Stefan Ritter    | PSI, Switzerland   |
| Johan Stiamsater | Studsvik, Sweden   |

**Apologies for absence received from:**

|                       |                                                   |
|-----------------------|---------------------------------------------------|
| Rik-Wouter Bosch      | SCK-CEN, Belgium                                  |
| Ulla Ehrnsten         | VTT, Finland                                      |
| Miroslava Ernestova   | NRI Rez, Czech Republic                           |
| Dolores Gomez Briceño | CIEMAT, Spain                                     |
| Bruno Kursten         | SCK-CEN, Belgium                                  |
| Marc Le Calvar        | IRSN (France)                                     |
| Christina Lilja       | SKB, Sweden                                       |
| Valérie L'Hostis      | CEA, France                                       |
| Stuart Lyon           | Manchester University, United Kingdom             |
| Anders Molander       | Studsvik, Sweden                                  |
| Cristiano Padovani    | Nuclear Decommissioning Authority, United Kingdom |
| Hans-Peter Seifert    | PSI, Switzerland                                  |
| David R. Tice         | SERCO, United Kingdom                             |
| Marc Vankeerberghen   | SCK-CEN, Belgium                                  |

**EFC WP4 "NUCLEAR CORROSION"**

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**EUROPÄISCHE FÖDERATION KORROSION**  
**FÉDÉRATION EUROPÉENNE DE LA CORROSION**

**Summary:**

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**Enclosures:**

\* Document available only on the private space of the EFC WP4 website, for WP4 Members

- ✓ Annex I: Agenda of the Moscow meeting
- ✓ Annex II: Agenda of the Avignon meeting
- ✓ Annex III: Slides presented at the Moscow meeting\*
- ✓ Annex IV: Slides presented at the Avignon meeting\*

**EFC WP4 "NUCLEAR CORROSION"**

|               |                 |            |                        |                  |                               |
|---------------|-----------------|------------|------------------------|------------------|-------------------------------|
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## 1. OPENING AND APPROVAL OF THE AGENDA

D. Féron in Moscow and Th. Couvant in Avignon opened the meeting and thanked the audience for coming. Agenda was presented and approved, as no comments were made.

## 2. APPROVAL OF THE MINUTES OF THE NICE MEETING

During the Moscow meeting, D. Féron made a review of the previous WP4 Fall meeting in Nice during EUROCORR'2009. These minutes are approved.

## 3. PRESENTATION OF THE NEW 3-YEAR PLAN

Objectives of the next 3-year plan (2011-13) are presented and are the following:

- ✓ providing links between European teams and EU funded programs in nuclear corrosion field, with an opening on to the world;
- ✓ initiating and stimulating opportunities of exchanges on scientific & technical subjects related to nuclear corrosion, particularly on today main nuclear research areas: waste systems, water reactors, generation IV and fusion reactors;
- ✓ promoting corrosion science and technical developments by events such as seminars, workshops, publications, etc.

The following actions are described to reach the objectives:

- ✓ Two WP meetings each year
  - \* Spring meeting (more focus on one or few items)
  - \* Annual general meeting during EUROCORRs
- ✓ Specific seminars/workshops
  - \* During EUROCORRs
  - \* In connection with EU programs
  - \* On specific subjects
- ✓ Re-activation of the task forces (groups)
- ✓ Webpage: active and attractive
- ✓ Publications: In EFC series (one book per year) and Journals
- ✓ Development of links between EFC WP4 and nuclear organisations (Euratom, OECD/NEA, UN/AIEA)
- ✓ Summer School "nuclear corrosion"

Some actions have been underlined as efforts have to be made to progress; they included: relations with Euratom and EU funded programs, re-activation of task groups and the Summer School.

Discussion is raised during the Avignon meeting on the Summer School. It is proposed to link it with the PERFORM program. As this idea has been several times evocated, it becomes urgent to meet the Organising Committee.

During the Moscow meeting, the 3-year plan has been formally approved.

### EFC WP4 "NUCLEAR CORROSION"

|               |                 |            |                        |                  |                               |
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#### 4. EFC WP4 PUBLICATIONS

Two books have been published since the last WP4 Fall meeting:

- ✓ EFC #56: "Corrosion monitoring in nuclear systems: research and applications"  
Editors: Stefan Ritter & Anders Molander  
255 pages - Published June 2010
- ✓ "Long Term Performance of Cementitious Barriers and Reinforced Concrete in Nuclear Power Plants and Waste Management" - EFC event 317  
RILEM editions book (PRO 64, ISBN: 978-2-31158-072-1)  
343 pages - October 2009

Several books are under preparation:

- ✓ EFC #59: "Sulphur Assisted Corrosion in nuclear disposal systems"  
Editors: Bruno Kursten & Rik-Wouter Bosch  
Planned at the beginning of 2011
- ✓ Green book "Corrosion issues in future high temperature nuclear systems"  
EUROCORR'2009 Workshop - WP4 & WP3
- ✓ Green book "50 years of stress corrosion cracking of nickel based alloys"  
From the presentations made at the "Jubilee day" on January 26<sup>th</sup>, 2010
- ✓ A special issue in the International Journal Corrosion Engineering Science and Technology (former British corrosion Journal): "Proceedings of the 4<sup>th</sup> International Workshop on Long Term Prediction"  
Special issue planned in 2011
- ✓ Materials & Corrosion/Journal de physique 4  
Under discussions for the proceedings of the "Ageing Management of Nuclear Structures and Installations" held in November 2010  
Special issue planned in 2011
- ✓ International Workshop on "Coupling mechanisms to improve lifetime prediction of LWRs"  
EDF-MAI publication

#### 5. EFC WP4 FUTURE EVENTS

The year 2010 is particularly rich in WP4 events as 3 have been already held:

- ✓ Jubilee day: Stress Corrosion Cracking of nickel base alloys at CEA - Coriou effect/50 ans de corrosion sous contrainte au CEA - Effet Coriou  
January 26, 2010 at CEA/Saclay - 130 participants
- ✓ International workshop on "Coupling mechanisms to improve lifetime prediction of LWRs"  
EFC event 331  
8-9 April 2010, Les Renardières (France), EDF (Material Ageing Institute) -50 participants
- ✓ 4<sup>th</sup> International Workshop on "Prediction of Long Term Corrosion Behaviour in Nuclear Waste Systems"  
EFC event 329  
28 June - 2 July 2010, Bruges, Belgium, SCK-CEN - 65 participants

#### EFC WP4 "NUCLEAR CORROSION"

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And another event is planned next autumn:

- ✓ International workshop "Ageing Management of Nuclear Structures and Installations"  
EFC event 334 (with AECL and RILEM)  
November 8-13, 2010, Toronto, Canada

Two events are planned during 2011:

- ✓ 7<sup>th</sup> annual meeting of the ECG-COMON  
June 20-21, 2011, Finland
- ✓ 2<sup>nd</sup> Int. Workshop on "Corrosion Monitoring in Nuclear Systems (Research and Applications)"  
Special WS during EUROCORR 2011  
September 5-8, 2011, Stockholm, Sweden  
Organised by Stefan Ritter and Anders Molander in collaboration with the ECG-COMON  
(deadline for abstracts: 31 January 2011)

Dr. Eng. Asano Hidekazu, Radioactive Waste Management Funding and Research Center Pacific Marks, Tsukishima, Japan proposes by E-mail to organise the 5<sup>th</sup> International Workshop on "Prediction of Long Term Corrosion Behaviour in Nuclear Waste Systems (LongTermCor2013)". After a short discussion, the principle of this workshop in Japan is accepted during the Moscow meeting.

## 6. EFC WP4 WEBSITE

The WP 4 website is described and shown. It is updated frequently thanks to Stefan Ritter. The audience is encouraged to pass by from time to time and/or feel free to send events or any other useful information to [stefan.ritter@psi.ch](mailto:stefan.ritter@psi.ch).

The address is: [http://www.efcweb.org/Working\\_Parties-p-104085/WP\\_4.html](http://www.efcweb.org/Working_Parties-p-104085/WP_4.html).

A restricted area (for members only) has been added to the WP 4 website. The password will be provided only to members.

Damien Féron and Thierry Couvant expressed their thanks to Stefan Ritter for taking care of the WP4 website.

## 7. EUROCORRs

Next EUROCORRs are listed. The subject of the special workshop has to be decided for EUROCORR'2012

- ✓ EUROCORR'2011, 5-8 September, Stockholm, Sweden  
Workshop "Corrosion monitoring in nuclear systems" (S. Ritter - ECG-COMON)
- ✓ EUROCORR'2012, 9-13 September, Istanbul, Turkey
- ✓ EUROCORR'2013, 1-4 September, Lisbon, Portugal

## 8. MISSING ITEMS, CONCLUSION AND CLOSURE

A short discussion has been raised during the Avignon meeting on the attractiveness of the WP4 Spring meeting and how to increase the attendance of these meetings. A proposal is made for holding the Spring meeting in connection with the ECC-COMON meeting (June 2011).

The next Fall meeting of the EFC WP4 will be in Stockholm during EUROCORR'2011.

The meetings are closed as no other points were raised.

### EFC WP4 "NUCLEAR CORROSION"

|               |                 |            |                        |                  |                               |
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**Enclosure 1:**

- ✓ Annex I: Agenda of the Moscow meeting

**EFC WP4 "NUCLEAR CORROSION"**

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|---------------|-----------------|------------|------------------------|------------------|-------------------------------|
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## Fall meeting of the Nuclear Corrosion Working Party (EFC WP4)

Wednesday, 15 September 2010 (16h15-19h30)

Congress Center of World Trade Center Moscow (WTC), Room 4  
Krasnopresnnskaya nab., 12  
123610 MOSCOW, RUSSIA

(Information are given on the Eurocorr website <http://www.eurocorr.org/EUROCORN+2010.html> )

The proposed agenda is the following:

1. Opening and Approval of the agenda
2. Approval of the minutes of the Nice 2009 fall meeting
3. EFC WP4 internal matters
  - Short presentation of the EFC WP4
  - Proposal of a new 3 years plan (2011-2013)
4. EFC WP4 Publications
  - Books & special issues already published
  - Future publications in EFC Series
  - "Nuclear corrosion" books in other series
  - Publications in Journals and Special issues
5. EFC WP4 past events (2010)
6. EFC WP4 future events
7. EFC WP4 website
8. EUROCORR's
9. Missing items
10. Closure



**EUROPEAN FEDERATION OF CORROSION  
EUROPÄISCHE FÖDERATION KORROSION  
FÉDÉRATION EUROPÉENNE DE LA CORROSION**

**Enclosure 2:**

- ✓ Annex II: Agenda of the Avignon meeting

**EFC WP4 "NUCLEAR CORROSION"**

|               |                 |            |                        |                  |                               |
|---------------|-----------------|------------|------------------------|------------------|-------------------------------|
| Chairman      | Damien Féron    | CEA/Saclay | DEN/DANS/DPC/SCCME     | Bât. 458 - PC 50 | F-91191 GIF SUR YVETTE Cedex  |
| Vice-Chairman | Thierry Couvant | EDF        | DMMC - Les Renardières | BP46             | F-77818 MORET SUR LOING Cedex |
| Secretary     | Mylène Belgome  | CEA/Saclay | DEN/DANS/DPC/SCCME     | Bât. 458 - PC 50 | F-91191 GIF SUR YVETTE Cedex  |



## **Second fall meeting of the Nuclear Corrosion Working Party (EFC WP4)**

Wednesday, 29 September 2010 (17h30-19h30)  
"salle du Cubiculaire", the Popes Palace, Avignon, France

The proposed agenda is the following:

1. Opening and Approval of the agenda
2. EFC WP4 internal matters
  - Short presentation of the EFC WP4
  - Proposal of a new 3 years plan (2011-2013)
3. EFC WP4 Publications
  - Books & special issues already published
  - Future publications
4. EFC WP4 events
5. EFC WP4 website
6. EUROCORR's
7. Missing items
8. Closure



**EUROPEAN FEDERATION OF CORROSION  
EUROPÄISCHE FÖDERATION KORROSION  
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**Enclosure 3:**

Document available only on the private space of the EFC WP4 website, for WP4 Members

- ✓ Annex III: Slides presented at the Moscow meeting

**EFC WP4 "NUCLEAR CORROSION"**

|               |                 |            |                        |                  |                               |
|---------------|-----------------|------------|------------------------|------------------|-------------------------------|
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| Secretary     | Mylène Belgome  | CEA/Saclay | DEN/DANS/DPC/SCCME     | Bât. 458 - PC 50 | F-91191 GIF SUR YVETTE Cedex  |

# Welcome

to the

## EFC WP4 "Nuclear Corrosion" Fall Meeting

Damien Féron, Chairman of the WP4  
Thierry Couvant, Vice-Chairman of the WP4

Mylène Belgome, secretariat

## Apologies for absence received from:

- \* Mylène Belgome (CEA, France)
- \* Thierry Couvant (EDF, France)
- \* Bruno Kursten (SCK-CEN, Belgium)
- \* Christina Lilja (Svensk Kärnbränslehantering AB, Sweden)
- \* Ulla Ehrnstén (VTT, Finland)
- \* Seifert Hans-Peter (PSI, Switzerland)
- \* Stefan Ritter (PSI, Switzerland)
- \* Miroslava Ernestova (NRI Rez, Czech Republic)
- \* Cristiano Padovani (NDA, UK)
- \* Anders Molander (Studsvik, Sweden)
- \* Gomez Briceño Dolores (CIEMAT, Spain)
- \* Jens Ganswind (VGB, PowerTech e.V Germany)
- \* Stuart Lyon (Un. Manchester, UK)
- \* David Tice (SERCO, UK)
- \* Valérie L'Hostis (CEA, France)
- \* Marc Vankeerberghen (SCK-CEN, Belgium)
- \* Catherine Guerre (CEA, France)

## 1. Opening and approval of the agenda

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1. Opening and Approval of the agenda
2. Approval of the minutes of the Nice 2009 meeting
3. EFC WP4 internal matters
  - Short presentation of the EFC WP4
  - Proposal of the new 3 years plan (2011-13)
4. EFC WP4 Publications
  - Books & special issues already published
  - Futures publications
5. EFC WP4 future events
6. EFC WP4 future events
7. EFC WP4 Website
8. EUROCORR's
9. Missing items
10. Closure

## 2. Approval of the minutes of the Nice Meeting

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[Minutes of the Nice meeting](#)

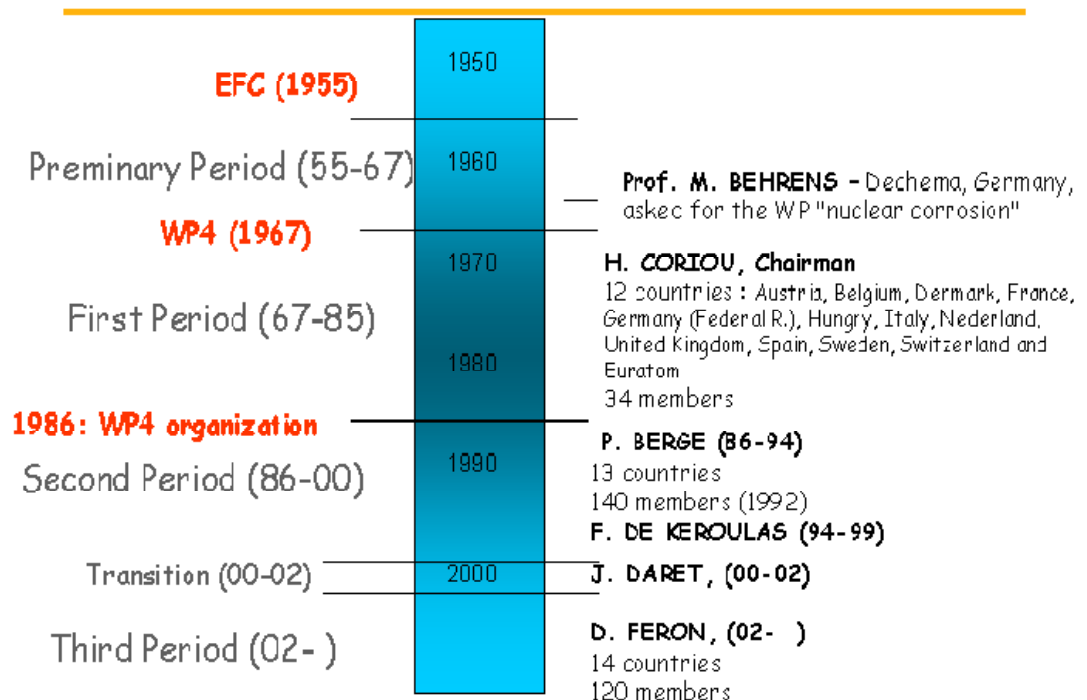


## Objectives of the WP4 "nuclear corrosion"

- To provide links between European teams in nuclear corrosion field, with an opening on to the world
- To initiate and stimulate opportunities of exchanges on scientific & technical subjects related to nuclear corrosion, particularly on today main nuclear research areas: waste systems, water reactors, generation Iv and fusion reactors
- To promote corrosion science and technical developments by events such as seminars, workshops, publications, ...



## Timeline of the WP4 "nuclear corrosion"





## Organisation of the WP4 "nuclear corrosion"

- A Chairman (Damien Féron, CEA - France)
- A vice-Chairman (Thierry Couvant, EDF - France)
- Members : "In addition to delegates proposed by the Member Societies, the Chairman may propose and approve with the consent of the WP, the nomination and re-election of WP members;

NOTE: Each period of office for WP members is of three years. At the end of each such period, re-election for further periods of three years may be allowed at the discretion of the WP chairman."

- 120 members, 30 active members
- Two meetings: "Eurocorr meeting" & "Spring meeting"
- Active Groups
- Publications

- webpage: <http://www.efcweb.org/Working+Parties/WP+4.html> -



### • Recall: **Duties of members** (§4.4)

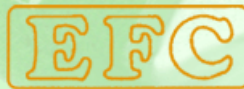
1. Members are expected to attend meetings of the WP on notification from the Chairman or Secretary;
2. Members should participate in the technical and scientific activities of the WP by providing reports and, wherever possible, by participating in collaborative experimental work;
3. Members are required to give full support, notably by submission of high quality papers, to the annual EUROCORR conference of the EFC.



## EFC WP4 tasks forces

### Active groups

1. *Management (chairman, vice-chairman, secretary)*
2. Corrosion and extension of life time of existing power plants
3. *Prediction of long term corrosion in nuclear waste repositories*
4. *Concrete behaviour in NPP and waste facilities*
5. *Electrochemistry at high temperature*
6. *Corrosion monitoring (ECG-COMON)*
7. *Corrosion of Internals in LWR (NULIFE)*
8. Generation IV
9. Corrosion issues in fusion facilities
10. *Education - Summer School(s)*

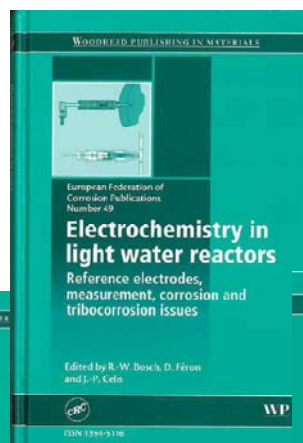
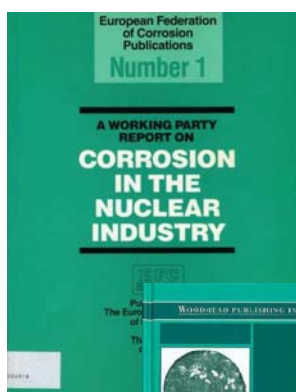


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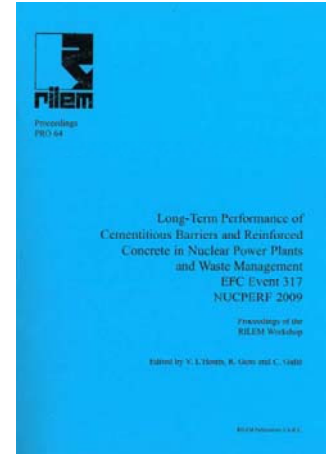
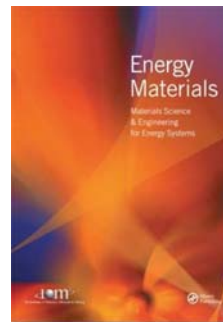
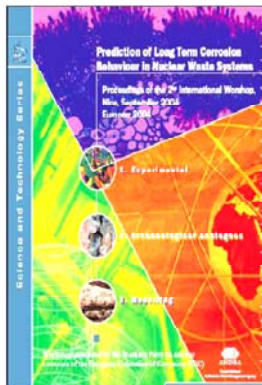
## EFC WP4 publications

In EFC series  
(green books)





## Other books & issues published by EFC WP4



### Corrosion monitoring in nuclear power plants



## Previous 3-year plan (2008-10)

- Session(s) during Eurocorr's
- Specific seminars /workshops (at least one each year)
- Two WP4 meetings each year
- Publications
  - EFC series (one per year)
  - With international journals (JNM)
- Links with Nuclear international organisations
  - OECD/NEA & AIEA
- Summer school on "nuclear corrosion"
- Webpage: active and attractive

Done / partly done / Not done / Done (not planned in the plan)



## Objectives of the next 3-year plan (2011-13)

### Proposal

- To provide links between European teams and EU funded programs in nuclear corrosion field, with an opening on to the world
- To initiate and stimulate opportunities of exchanges on scientific & technical subjects related to nuclear corrosion, particularly on today main nuclear research areas: waste systems, water reactors, generation Iv and fusion reactors
- To promote corrosion science and technical developments by events such as seminars, workshops, publications, ...

- *Same objectives than the previous plan (08-10)*



## Actions of the next 3-year plan (2011-13)

### Proposal

- Two WP meetings each year
  - Spring meeting (more focus on one or few items)
  - Annual general meeting during Eurocorr
- Specific seminars /workshops
  - During Eurocorr
  - In connection with EU programs
  - On specific subjects
- **Re-activation** of the task forces (groups)
- **Webpage: active and attractive**
- Publications: In EFC series (one book per year) and Journals
- Development of links between EFC WP4 and nuclear organisations (**Euratom**, OECD/NEA, UN/AIEA)
- **Summer School "nuclear corrosion"**



## New EFC Series (Green Book)

### EFC #56: "Corrosion monitoring in nuclear systems: research and applications" (Editors: Stefan Ritter & Anders Molander)



Section 1: Corrosion monitoring-what's the point? (Bob Cottis)

Section 2: research on corrosion monitoring for nuclear systems (8 chapters)

Section 3: corrosion monitoring applications in nuclear power plants (6 chapters)

255 pages - Published June 2010

### Other publication

- Long Term Performance of Cementitious Barriers and Reinforced Concrete in Nuclear Power Plants and Waste Management - EFC event 317, RILEM editions book (PRO 64, ISBN: 978-2-31158-072-1, **October 2009**)  
Proceedings -30 papers; 343 pages

## 4. EFC WP4 future Publications



**Cancelled:** Green book with the papers presented during the **workshop "Computer modelling of corrosion"** at EUROCORR 2008 & EUROCORR 2009 (Marc Vankeerberghen) -

### • Publications (EFC Series) - work in progress

→ **EFC #59:** "Sulphur Assisted Corrosion in nuclear disposal systems" (Editors: Bruno Kursten & ...) : all papers received and reviewed.

### • Other publications (EFC series) in preparation

→ Green book "Corrosion issues in future high temperature nuclear systems" (Eurocorr 2009 Workshop - WP4 & WP3)

→ Green book "50 years of stress corrosion cracking of nickel based alloys" (from the presentations made at the "Jubilee day - January 26, 2010)

#### 4. Publication of workshop papers

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- **International workshop on "Coupling mechanisms to improve lifetime prediction of LWRs"**, - EDF-MAI publication
- **Corrosion Engineering Science and Technology (former British corrosion Journal)**  
Proceedings of the 4th international workshop on long term prediction ... June 2010 (special issue planned in 2011)
- **Materials & Corrosion / "Journal de physique 4"**  
Under discussions for the proceedings of the "Ageing Management of Nuclear Structures and Installations", November 2010 (special issue, planned in 2011)
- **Other publication (?)**  
"Corrosion issues in nuclear industry today", Springer Publishing, (Thierry Couvant - Stefan Ritter & Bruno Kursten. « Degradation, modelling and mitigation of SCC in LWRs »

#### 5. EFC WP4 past events (2010)

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- **Jubilee day: Stress Corrosion Cracking of nickel base alloys at CEA - 50 ans de corrosion sous contrainte au CEA - Effet Coriou effect**- January 26, 2010 at CEA-Saclay  
130 participants
- **International workshop on "Coupling mechanisms to improve lifetime prediction of LWRs"**, EFC event 331, 8-9 April 2010, Les Renardières (France), EDF (Material Ageing Institute)  
50 participants
- **4<sup>th</sup> International Workshop on "Prediction of Long Term Corrosion Behaviour in Nuclear Waste Systems"**, EFC event 329, Bruges, Belgium, SCK-CEN, 28 June - 2 July 2010  
65 participants



130 people (70 French)

A "green" book planned

The CD-Rom available only for attendees and WP4 members

*Jubilee day: Stress Corrosion Cracking of nickel base alloys at CEA  
50 ans de corrosion sous contrainte des alliages de nickel au CEA*

- Effet Coriou Effect -

CEA-INSTN, Saclay (near Paris), France  
Mardi 26 janvier 2010 - Tuesday January 26, 2010

Agenda provisoire / Preliminary agenda

**Matin / Morning**

Bienvenue et ouverture de la Journée / Welcome and opening

Gérard Pinard Legry : La saga de l'Alliage 600 au CEA (Alloy 600 saga at CEA)

Roger Staehle : "Historical views on the stress corrosion cracking of Ni base alloys."  
(Histoire de la corrosion sous contrainte des alliages de nickel)

Philippe Beige : Histoire et petites histoires de la corrosion sous contrainte des alliages de nickel  
(History and small novels of the SCC of Nickel base alloys)

**Après-midi / Afternoon**

Pete L. Andresen : Understanding and prediction of Stress Corrosion Cracking (Derniers développements de la Corrosion sous contrainte des bases nickel)

Emmanuel Herms : Amorgage de la Corrosion sous contrainte au CEA : derniers résultats et développements (R&D on initiation of stress corrosion cracking at CEA)

Toshio Yonezawa : Coriou's crack experience in Japanese PWRs and its mitigation (L'effet Coriou dans les centrales à eau pressurisée au Japon et son atténuation)

Catherine Gaerem : Propagation de la corrosion sous contrainte : derniers résultats et développements au CEA (R&D on crack propagation of stress corrosion cracking at CEA)

Digby Macdonald : Stress corrosion cracking and electrochemistry (corrosion sous contrainte et électrochimie)

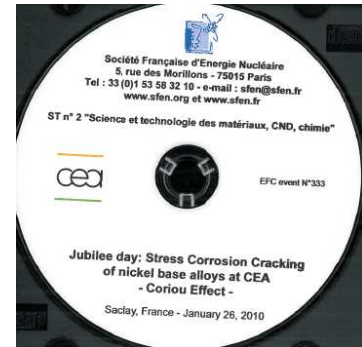
Jacques Chêne : Corrosion sous contrainte et fragilisation par l'hydrogène (Stress corrosion cracking and hydrogen embrittlement)

Philippe Bovis : Moyens d'essais de CSC au CEA (SCC test facilities at CEA)

Clostrac : Closures

A simultaneous translation French-English is planned the whole day for all the conferences

Mercredi : Visite des laboratoires de corrosion du CEA-Saclay - nombre limité de personnes  
Wednesday: Visit of CEA-Saclay corrosion facilities - limited number of participants



The MAI is a research facility created by EDF, EPRI (USA) and TEPCO (Japan) to carry out a R&D program in order to better understand and anticipate how materials in power plants age and contribute to plant component degradation. Scientific findings from the MAI help power companies to optimize the operations and lifetimes of existing plants and support the design of future plants.

### Venue

The workshop will be held at the Materials Ageing Institute (EDF R&D center) Moret-sur-Loing, France. The R&D center is located in the southeast of Paris (75 km), 10 km from Fontainebleau. The MAI is easily accessible by car or by train (50 min from Paris).

### Registration and Accommodation

Registration to the workshop is only valid by completing and sending the registration form before 28 February 2010 to the conference office. The registration form is available on the website. The registration fee will include the list of participants, the proceedings of presented papers, lunches, coffee breaks and conference dinner. Expenses for travel and hotel accommodation are not included in the registration fee. Travel and accommodation arrangements should be made by each participant personally. A list of hotels is available on the website



## International workshop on

## Coupling Mechanisms to improve lifetime prediction of LWRs



8 - 9 April 2010

Les Renardières, Moret-sur-Loing (France)

EFC Event N°331





## Scope and Objectives of the Workshop

Environmentally-assisted cracking is a limited factor for the lifetime of light water reactors. Many cases of stress corrosion cracking and corrosion fatigue were reported for Ni-based alloys, stainless steels, zirconium alloys... However, lifetime extension to 60 year are expected. In this context, it is necessary to improve our understanding of degradations usually based on complex coupling between material, loading and environment. Many works are in progress in order to characterize, to model and to simulate degradations in representative operating conditions. Tools are being developed to improve safety and operating conditions of nuclear plants.

The main objective of the Workshop is to draw experts from various countries who are contributing to predict and to understand interactions leading to cracking

This event is organized by the Materials Ageing Institute of EDF R&D. The event is also sponsored by the European Federation of Corrosion (EFC); Nuclear Corrosion Working Party (WP4).

## Topics

The workshop will address the main items related to the coupling of mechanisms in order to improve lifetime prediction in light water reactors where environmentally-assisted cracking can occur:

- Cross characterizations
  - Deformation
  - Oxidation
  - Microstructure
  - Water chemistry
  - Environmentally-assisted cracking
- Modeling interactions
  - At the scale of the components
  - At the scale of the mechanism of cracking
- Simulating interactions

## Key Dates

|                   |                                  |
|-------------------|----------------------------------|
| September 2009    | Announcement and call for papers |
| 1st December 2010 | Deadline for abstracts           |
| 1st January 2010  | Notification of paper acceptance |
| 28 February 2010  | Deadline for registration        |
| 8-9 April 2010    | Workshop                         |

## Local Organizing Committee

Thierry COUVANT MAI, EDF R&D, France  
Veronique BORDIER-VINERON MAI, EDF R&D, France

## Scientific Committee

Georges CAILLETAUD ENSMP, France  
Thierry COUVANT EDF R&D, France  
David DELAFOSSE ENSMSE, France  
Damien FERON CEA, France  
Gabriel LEVBARE EPRI, California  
Sylvain LECLERCQ EDF R&D, France  
Philippe Marcus ENSCP, France  
Tetsuo SHOJI Tohoku University, Japan

## Conference Office

Thierry COUVANT

EDF R&D  
Materials Ageing Institute  
Avenue des Renardières  
77818 Moret-sur-Loing

☎: +33 1 60 73 62 92  
☎: +33 1 60 73 68 89  
✉: thierry.couvant@edf.fr



## Website

Registration form, hotel information and program are available on the website: <http://www.themai.org>



## Registration and Accommodation

Registration to the workshop is only valid by completing and sending the registration form before 31 May 2010 to the conference office. The registration form is available on the website.

- The registration fee will include the list of participants, book of abstracts, lunches, coffee breaks, welcome cocktail and conference dinner.
- Expenses for travel and hotel accommodation are not included in the registration fee.
- Travel and accommodation arrangements should be made by each participant personally.
- A limited number of rooms have been reserved at the Hotel 'Novotel Brugge Centrum' at a special rate of 113€/night (single room) or 132€/night (double room). Breakfast is included in the rate ([www.novotel.com](http://www.novotel.com)). The Novotel Brugge Centrum is a 3 ★ hotel situated in the historic center of Bruges (only 5 minutes walk from the conference center). Reservations can only be made by fulfilling the reservation request, available at the website of the workshop, and sending it by fax to +32(0)50 33 65 56. To have advantage of the special rate, the reference 'LongTermCor2010' should be mentioned on the reservation request form.



Hotel Novotel Brugge Centrum

<http://www.sckcen.be/LongTermCor2010>



EFC Event N° 329



## 4<sup>th</sup> International Workshop on Long-Term Prediction of Corrosion Damage in Nuclear Waste Systems

28 June – 2 July 2010  
Bruges, Belgium

Organized by



- experimentation
- corrosion behaviour of steel reinforcements in concrete
- archaeological artefacts
- modelling

The 4<sup>th</sup> International Workshop on Long-Term Prediction of Corrosion Damage in Nuclear Waste Systems was organised jointly between the Belgian Nuclear Research Centre (SCK-CEN) and the Belgian Agency for Radioactive Waste and Enriched Fissile Materials (ONDRAF/NIRAS) under the auspices of the European Federation of Corrosion (EFC Event N° 329). It also takes part of the RILEM Technical Committee "Concrete in the context of the nuclear management" (TC 226-CNM). The workshop was held at the Conference Centre 'Oud Sint-Jan' in Bruges (Belgium) from June 28 to July 2, 2010. Bruges is often called 'the Venice of the North' due to its picturesque canals which are found throughout the city centre. The conference centre (see photograph) is located in a historic building: an old hospital from the 19<sup>th</sup> century. On this site, in the Middle Ages, there was already one of the first hospitals in Europe.



*Photograph 1 - View of the conference centre 'Oud Sint-Jan' (Bruges, Belgium).*

The main objective of the Workshop is to bring together scientists and engineers from various countries who are developing high level nuclear waste disposal technologies, with the goal of promoting scientific and technical exchanges concerning long term behavior of metallic containment materials and engineered barrier systems. In particular, the workshop will compare the approaches that are being developed worldwide for predicting long term corrosion phenomena, including corrosion strategies for interim storage and geological disposal.

The workshop addressed the main items related to the long-term corrosion behaviour, which were divided into five areas:

- overview of the national programmes

This workshop was the follow-up of the three previous events, which is organised every 3 years: Cadarache - France (2001); Nice - France (2004) and Pennsylvania State University - USA (2007). A total of 65 participants registered for the workshop (of which, finally, two did not show up) (see photograph 2). The participants came from 16 different countries from 3 continents: North- and South-America (USA, Canada, Argentina), Europe (Belgium, the Netherlands, UK, France, Spain, Italy, Slovenia, Sweden, Finland, Switzerland) and Asia (Japan, India, Republic of Korea). The speakers originated from 12 different countries (Belgium, UK, Spain, France, Finland, Sweden, USA, Argentina, Canada, India, Republic of Korea and Japan). This makes it the most successful workshop in the series. Also, it was the first time that Japan was represented by as many as six papers.

The workshop was opened by Philippe Lalioux (Long Term Managing Director of ONDRAF/NIRAS), Eric van Walle (General Manager of SCK-CEN) and Damien Féron (Chairman of the EFC Working Party 4 - Nuclear Corrosion).



*Photograph 2 - Group photo of the attendants of the LongTermCor2010 Workshop.*

## 6. EFC WP4 future events

- **International workshop "Ageing Management of Nuclear Structures and Installations"** Toronto, Canada, November 8-13, 2010 - EFC event 334 -
- **International workshop "Stress corrosion cracking of weld metals in LWRs"** EDF-Mai France, March-April 2011 - in preparation
- **7<sup>th</sup> annual meeting of the ECG-COMON in 2011, June 20-21, 2011, Finland**
- **2<sup>nd</sup> Int. Workshop on 'Corrosion Monitoring in Nuclear Systems (Research and Applications)'** Special WS during EUROCORR 2011, 5 - 8 September 2011, Stockholm, Sweden  
*Organised by Stefan Ritter and Anders Molander in collaboration with the ECG-COMON* (deadline for abstracts: 31 January 2011)
- **5<sup>th</sup> International Workshop on "Prediction of Long Term Corrosion Behaviour in Nuclear Waste Systems (LongTermCor2013)"**,  
Proposal: 2013-Japan
- **Summer School on "Nuclear Corrosion"**



### “Ageing Management of Nuclear Structures and Installations”

In the frame of the RILEM TC-226-CNM (Concrete in the context of Nuclear Waste Management) needs have been identified in the area of ageing management of Nuclear Installations. As a result of the two **NUCPERF (2006&2009) Workshops**, the following topics of interest were clearly identified:

- **Ageing Management Program Strategy** for reinforced concrete structures
- **Development of instrumentation and NDE techniques** such as :
  - To detect, measure and monitor parameters impacting ageing,
  - To measure parameters to meet the operating license requirements of nuclear installations,
  - To validate NDE techniques to detect and monitor ageing of NPP structures to meet regulator/user/owner requirements.
- Upscaling/validation of **new developments in NDA techniques** (from laboratory to field applications)
- **Implementation of inspection and monitoring survey strategy** for long-term structural integrity
- Interpretation of the raw measurement data (reliability, uncertainties, appropriateness), **treatment of field measurement data** (codes/models)
- Integration of model simulation outputs in **reassessment of service life**
- **Probabilistic tools for managing uncertainties** resulting e.g. from randomness in structure loads, time-dependent material properties changes etc ...



### “Ageing Management of Nuclear Structures and Installations”

- **Financial sponsors:**

- AECL and COG (Canada)
- CEA (France)



- **Scientific sponsors**

- RILEM (TC CNM – Concrete for Nuclear waste Management)
- EFC - WP4 (Nuclear corrosion) and WP11 (Corrosion in Concrete)
- OECD/NEA (Committee for Safety of Nuclear Installations)



## 7<sup>th</sup> annual meeting of the ECG-COMON in 2011



- Date: June 20 and 21, 2011
- Location: Finland (probably in Lahti, Espoo or Turku)
- What: Presentations on corrosion monitoring techniques, discussions, round-robins, "networking", etc. *(for members and invited guests only)*
- Fun: "Adventure" or sightseeing tour (Sat./Sun., June 18/19), welcome reception (Sunday evening), conference dinner (Monday evening), etc.
- More info: See [www.ecg-comon.org/meeting2011](http://www.ecg-comon.org/meeting2011) (available soon)



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## 2<sup>nd</sup> int. workshop on corrosion monitoring in nuclear systems



- Date: September 5 - 8, 2011 (during EUROCORR 2011)
- Location: Stockholm, Sweden
- What: Contributions are invited covering research on or the application of any kind of corrosion monitoring or related techniques for all types of fission reactors, nuclear waste disposal or other industrial nuclear systems.  
Papers presenting more basic research on corrosion monitoring techniques are also very welcome.
- Deadline: Abstracts should be submitted to the EUROCORR website until January 31, 2011
- More info: See flyer (also available on the WP 4 website) or contact Anders Molander ([anders.molander@studsvik.se](mailto:anders.molander@studsvik.se)) or Stefan Ritter ([stefan.ritter@psi.ch](mailto:stefan.ritter@psi.ch))



First announcement of the

### "2<sup>nd</sup> International Workshop on Corrosion Monitoring in Nuclear Systems (Research and Applications)"

during EUROCORR'2011 (Stockholm, Sweden, 5-8 September 2011).

#### Scope and objectives

Even if the plant availability of nuclear power plants has increased and the radiation build-up has been effectively mitigated, corrosion continues to influence plant performance and availability. Recent examples are stress corrosion cracking attacks on type 316L stainless steel in boiling water reactors, attacks on nickel-base alloys in pressurised water reactors and irradiation-assisted stress corrosion cracking incidents in both types of reactors. Therefore, reliable observation or prediction of the corrosion behaviour of given materials is considered important for the safe and economic future operation of existing plants, which commonly are subject to life-time extension and power uprating. In addition, managing corrosion problems in future nuclear waste disposal systems is another task where reliable corrosion monitoring techniques could help to further increase safety.

After a successful workshop on "Corrosion Monitoring in Nuclear Systems" during EUROCORR'2007 in Freiburg (Germany) and publication of a "Green Book" of the EFC (EFC Publication No. 56), a 2<sup>nd</sup> workshop will be organised during EUROCORR'2011 in Stockholm (Sweden). This workshop is arranged to reveal the progress in corrosion monitoring research and applications reached during the last 4 years and to gather new insights in this topic. Contributions are invited covering research on or the application of any kind of corrosion monitoring or related techniques (e.g., electrochemical noise, ACPD/DCPD methods, acoustic emission, electrochemical impedance spectroscopy, monitoring corrosion potentials, activity monitoring, etc.) for all types of fission reactors (incl. secondary side), nuclear waste disposal or other industrial nuclear systems (e.g., reprocessing plants). Papers presenting more basic research on corrosion monitoring techniques are also very welcome.

Organiser: EFC WP 4 "Nuclear Corrosion" in co-operation with the ECG-COMON  
Chairmen: Stefan Ritter (stefan.ritter@psi.ch) and Anders Molander (anders.molander@studsvik.se)

Abstracts should be submitted to the EUROCORR'2011 website  
(<http://www.eurocorr.org>) by **January 31, 2011!**

The papers presented at this workshop will be published in the **proceedings** of EUROCORR'2011 (CD-ROM). In addition, it is planned to submit selected papers (after a review process) in a special issue of a journal or an EFC Publication ("Green Book")



### 5<sup>th</sup> International Workshop on "Prediction of Long Term Corrosion Behaviour in Nuclear Waste Systems (LongTermCor2013)"

- Discussions with Dr.Eng. ASANO Hidekazu, Radioactive Waste Management Funding and Research Center Pacific Marks, Tsukishima, Japan
- Response received on August 26 by Email: «... we told about a possibility to have a next workshop in Japan and today I would like to inform you of our acceptance of it. Although there are still some choices for place and time, it can be held in Japan in 2013... »
- Support from CRIEPI (Central Research Institute of Electric Power Industry)



### Summer School "nuclear corrosion"

- Proposed in Maastricht (2006)
- WP4 Spring Meeting 2008 decisions
  - Target: young scientists and engineers
  - Topics: 3-days general session + 2-days focus on specific item (NPP, Gen IV, Nuclear Waste, ...)
  - The event will be organised in relation with others (ENEN / European Nuclear Education Network)
  - Task Force "Summer School": B. Kursten (Chair), B. Cottis, D. Féron, A. Legat, St. Ritter, D. Tice, P. Wood, M. Le Calvar
  - It is planned to have one event every (x) year(s)
- Planned initially in Belgium, SCK-CEN resigns (Spring meeting 2009)
- Andraz Legat (Slovenia) offered to organise the 2<sup>nd</sup> summer school -> the first edition (?)



### • EFC WP4 page (on the EFC website)

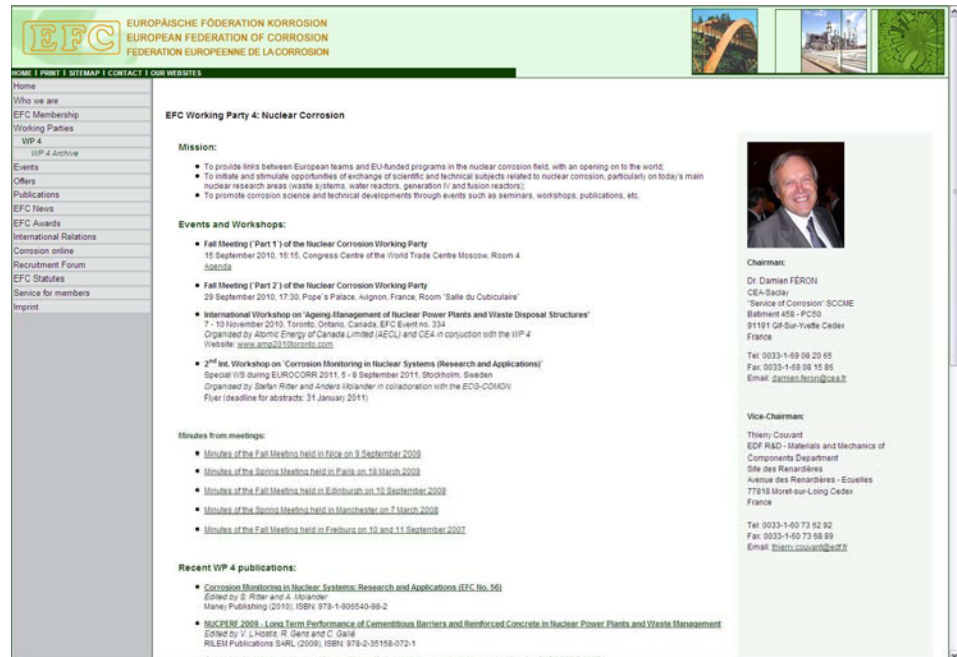
[http://www.efcweb.org/Working\\_Parties-p104085/WP\\_4.html](http://www.efcweb.org/Working_Parties-p104085/WP_4.html)

- Items on the web site:
  - ✓ **WP4 activities:** reports on WP4 activities and presentation of the WP4 at OCDE/NEA
  - ✓ **WP4 groups:** ECG-COMON
  - ✓ **Minutes of the WP4 meetings** (without overheads)
  - ✓ **Future events/workshops of the WP4**
  - ✓ **WP4 recent publications**
    - EFC series
    - Other publications
- **EFC website has been "renewed"**  
New presentation - easier to use
- **Stefan Ritter** in charge of the WP4 web page: many thanks for the work done
- New : a "private domain"



## Status of EFC WP 4 website ([www.efcweb.org](http://www.efcweb.org))

The WP 4 website is updated frequently! Please pass by from time to time and/or feel free to send events or any other useful infos to [stefan.ritter@psi.ch](mailto:stefan.ritter@psi.ch) !



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D. Féron

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## Status of EFC WP 4 website ([www.efcweb.org](http://www.efcweb.org))

A restricted area (for members only) has been added to the WP 4 website. The password will be provided with the minutes of the meeting.



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- **EUROCORR 2010 "from the Earth's Depths to Space Heights"**  
13-17 September, Moscow, Russia  
Session "nuclear corrosion" : one day session / 11 papers
- **EUROCORR 2011**  
5-8 September, Stockholm, Sweden  
Workshop "corrosion monitoring in nuclear systems" (S. Ritter - ECG-COMON)
- **EUROCORR 2012**  
9-13 September, Istanbul, Turkey  
Common session with WP5 (Environmental sensitive fracture) on initiation of Stress Corrosion Cracking (under discussion with C. Wolski)
- **EUROCORR 2013**  
1-5 September, Estoril, Portugal

## 9. Missing items

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### Some points to discuss?

How the Spring Meeting can be more attractive?

- including scientific and technical presentations
- visiting laboratories, workshops, plants, ...

Date and place of the next EFC WP4 Spring meeting



## Upcoming events

- International workshop "Ageing Management of Nuclear Structures and Installations" Toronto, Canada, November 8-13, 2010 (with AECL)



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**Thank you**  
**for your participation**  
**to the**  
**EFC WP4 "Nuclear Corrosion" Meeting**  
**Moscow, 2010**



**EUROPEAN FEDERATION OF CORROSION  
EUROPÄISCHE FÖDERATION KORROSION  
FÉDÉRATION EUROPÉENNE DE LA CORROSION**

**Enclosure 4:**

Document available only on the private space of the EFC WP4 website, for WP4 Members

- ✓ Annex IV: Slides presented at the Avignon meeting

**EFC WP4 "NUCLEAR CORROSION"**

|               |                 |            |                        |                  |                               |
|---------------|-----------------|------------|------------------------|------------------|-------------------------------|
| Chairman      | Damien Féron    | CEA/Saclay | DEN/DANS/DPC/SCCME     | Bât. 458 - PC 50 | F-91191 GIF SUR YVETTE Cedex  |
| Vice-Chairman | Thierry Couvant | EDF        | DMMC - Les Renardières | BP46             | F-77818 MORET SUR LOING Cedex |
| Secretary     | Mylène Belgome  | CEA/Saclay | DEN/DANS/DPC/SCCME     | Bât. 458 - PC 50 | F-91191 GIF SUR YVETTE Cedex  |



EUROPÄISCHE FÖDERATION KORROSION  
EUROPEAN FEDERATION OF CORROSION  
FÉDÉRATION EUROPÉENNE DE LA CORROSION



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# Welcome

to the

## EFC WP4 "Nuclear Corrosion" Second 2010 Fall Meeting

Damien Féron, Chairman of the WP4  
Thierry Couvant, Vice-Chairman of the WP4

Mylène Belgome, secretariat

Avignon, France - September 29, 2010

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WP4 Meeting - September 15, 2010 - Moscow, Russia



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## Apologies for absence received for the Moscow meeting:

- \* Mylène Belgome (CEA, France)
- \* Thierry Couvant (EDF, France)
- \* Bruno Kursten (SCK-CEN, Belgium)
- \* Christina Lilja (Svensk Kärnbränslehantering AB, Sweden)
- \* Ulla Ehrnstén (VTT, Finland)
- \* Seifert Hans-Peter (PSI, Switzerland)
- \* Stefan Ritter (PSI, Switzerland)
- \* Miroslava Ernestova (NRI Rez, Czech Republic)
- \* Cristiano Padovani (NDA, UK)
- \* Anders Molander (Studsvik, Sweden)
- \* Gomez Briceño Dolores (CIEMAT, Spain)
- \* Jens Ganswind (VGB, PowerTech e.V Germany)
- \* Stuart Lyon (Un. Manchester, UK)
- \* David Tice (SERCO, UK)
- \* Valérie L'Hostis (CEA, France)
- \* Marc Vankeerberghen (SCK-CEN, Belgium)
- \* Catherine Guerre (CEA, France)

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WP4 Meeting - September 15, 2010 - Moscow, Russia

## 1. Opening and approval of the agenda

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1. Opening and Approval of the agenda
2. EFC WP4 internal matters
  - Short presentation of the EFC WP4
  - Proposal of the new 3 years plan (2011-13)
3. EFC WP4 Publications
  - Books & special issues already published
  - Futures publications
4. EFC WP4 events
5. EFC WP4 Website
6. EUROCORR's
7. Missing items
8. Closure

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WP4 Meeting - September 15, 2010 - Moscow, Russia

## 2. Internal matters: Short presentation of the EFC WP4

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### Objectives of the WP4 "nuclear corrosion"

- To provide links between European teams in nuclear corrosion field, with an opening on to the world
- To initiate and stimulate opportunities of exchanges on scientific & technical subjects related to nuclear corrosion, particularly on today main nuclear research areas: waste systems, water reactors, generation Iv and fusion reactors
- To promote corrosion science and technical developments by events such as seminars, workshops, publications, ...



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FEDERATION EUROPEENNE DE LA CORROSION

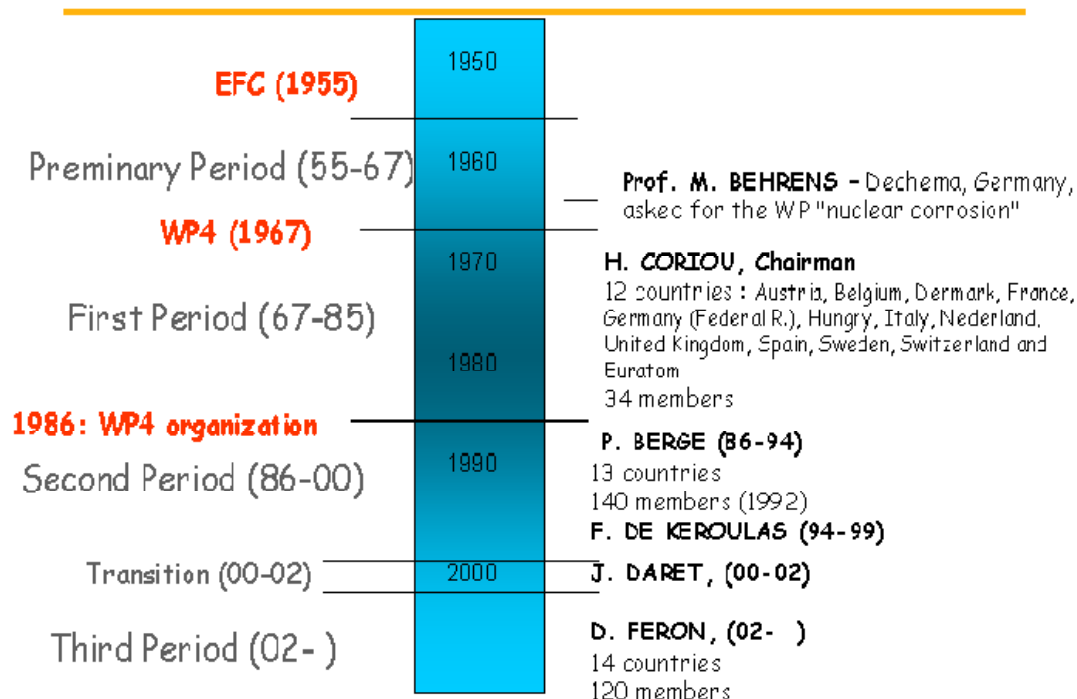
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WP4 Meeting - September 15, 2010 - Moscow, Russia

## 2. Internal matters: Short presentation of the EFC WP4



### Timeline of the WP4 "nuclear corrosion"



WP4 Meeting - September 15, 2010 - Moscow, Russia

## 2. Internal matters: Short presentation of the EFC WP4



### Organisation of the WP4 "nuclear corrosion"

- A Chairman (Damien Féron, CEA - France)
- A vice-Chairman (Thierry Couvant, EDF - France)
- Members : "In addition to delegates proposed by the Member Societies, the Chairman may propose and approve with the consent of the WP, the nomination and re-election of WP members;

NOTE: Each period of office for WP members is of three years. At the end of each such period, re-election for further periods of three years may be allowed at the discretion of the WP chairman."

- 120 members, 30 active members
- Two meetings: "Eurocorr meeting" & "Spring meeting"
- Active Groups
- Publications

- webpage: <http://www.efcweb.org/Working+Parties/WP+4.html> -

## 2. Internal matters: Short presentation of the EFC WP4



### EFC WP4 tasks forces

#### Active groups

1. *Management (chairman, vice-chairman, secretary)*
2. Corrosion and extension of life time of existing power plants
3. *Prediction of long term corrosion in nuclear waste repositories*
4. *Concrete behaviour in NPP and waste facilities*
5. *Electrochemistry at high temperature*
6. *Corrosion monitoring (ECG-COMON)*
7. *Corrosion of Internals in LWR (NULIFE)*
8. Generation IV
9. Corrosion issues in fusion facilities
10. *Education - Summer School(s)*



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EUROPEAN FEDERATION OF CORROSION  
FEDERATION EUROPEENNE DE LA CORROSION

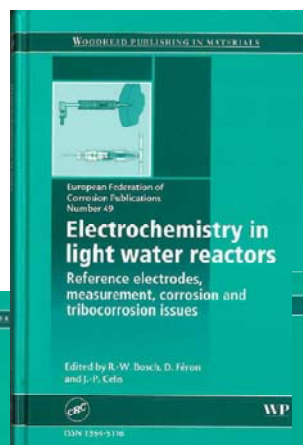
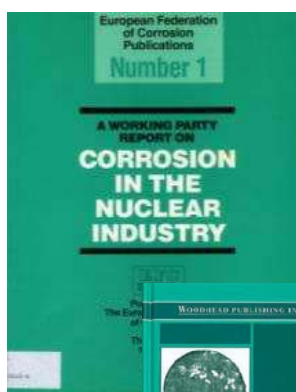
WP4 Meeting - September 15, 2010 - Moscow, Russia

## 2. Internal matters: Short presentation of the EFC WP4



### EFC WP4 publications

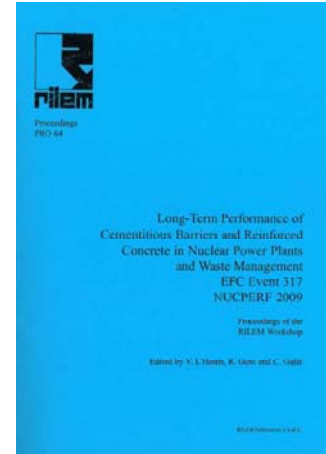
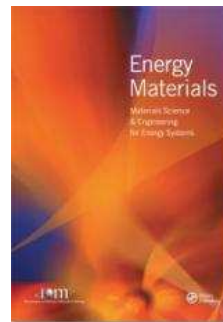
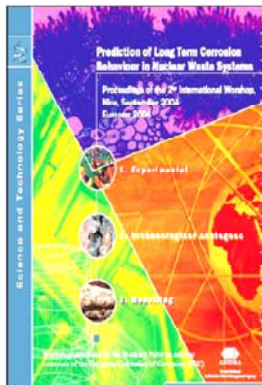
In EFC series  
(green books)



WP4 Meeting - September 15, 2010 - Moscow, Russia



### Other books & issues published by EFC WP4



### Corrosion monitoring in nuclear power plants



### Previous 3-year plan (2008-10)

- Session(s) during Eurocorr's
- Specific seminars /workshops (at least one each year)
- Two WP4 meetings each year
- Publications
  - EFC series (one per year)
  - With international journals (JNM)
- Links with Nuclear international organisations
  - OECD/NEA & AIEA
- Summer school on "nuclear corrosion"
- Webpage: active and attractive

Done / partly done / Not done / Done (not planned in the plan)



## Objectives of the next 3-year plan (2011-13)

### Proposal

- To provide links between European teams and EU funded programs in nuclear corrosion field, with an opening on to the world
- To initiate and stimulate opportunities of exchanges on scientific & technical subjects related to nuclear corrosion, particularly on today main nuclear research areas: waste systems, water reactors, generation Iv and fusion reactors
- To promote corrosion science and technical developments by events such as seminars, workshops, publications, ...

- *Same objectives than the previous plan (08-10)*

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## Actions of the next 3-year plan (2011-13)

### Proposal

- Two WP meetings each year
  - Spring meeting (more focus on one or few items)
  - Annual general meeting during Eurocorr
- Specific seminars /workshops
  - During Eurocorr
  - In connection with EU programs
  - On specific subjects
- **Re-activation** of the task forces (groups)
- **Webpage: active and attractive**
- Publications: In EFC series (one book per year) and Journals
- Development of links between EFC WP4 and nuclear organisations (**Euratom**, OECD/NEA, UN/AIEA)
- **Summer School "nuclear corrosion"**

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## New EFC Series (Green Book)

**EFC #56:** "Corrosion monitoring in nuclear systems: research and applications" (Editors: Stefan Ritter & Anders Molander)



Section 1: Corrosion monitoring-what's the point? (Bob Cottis)

Section 2: research on corrosion monitoring for nuclear systems (8 chapters)

Section 3: corrosion monitoring applications in nuclear power plants (6 chapters)

255 pages - Published June 2010

## Other publication

- Long Term Performance of Cementitious Barriers and Reinforced Concrete in Nuclear Power Plants and Waste Management - EFC event 317, RILEM editions book (PRO 64, ISBN: 978-2-31158-072-1, **October 2009**)  
Proceedings -30 papers; 343 pages

### 3. EFC WP4 future Publications

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**Cancelled:** Green book with the papers presented during the **workshop "Computer modelling of corrosion"** at EUROCORR 2008 & EUROCORR 2009 (Marc Vankeerberghen) -

- **Publications (EFC Series) - work in progress**

- **EFC #59:** "Sulphur Assisted Corrosion in nuclear disposal systems" (Editors: Bruno Kursten & ...) : all papers received and reviewed.

- **Other publications (EFC series) in preparation**

- Green book "Corrosion issues in future high temperature nuclear systems" (Eurocorr 2009 Workshop - WP4 & WP3)

- Green book "50 years of stress corrosion cracking of nickel based alloys" (from the presentations made at the "Jubilee day - January 26, 2010)

### 3. Publication of workshop papers

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- **International workshop on "Coupling mechanisms to improve lifetime prediction of LWRs"**, - EDF-MAI publication
- **Corrosion Engineering Science and Technology (former British corrosion Journal)**  
Proceedings of the 4th international workshop on long term prediction ... June 2010 (special issue planned in 2011)
- **Materials & Corrosion / "Journal de physique 4"**  
Under discussions for the proceedings of the "Ageing Management of Nuclear Structures and Installations", November 2010 (special issue, planned in 2011)
- **Other publication**  
"Corrosion issues in nuclear industry today", Springer Publishing, (Thierry Couvant - Stefan Ritter & Bruno Kursten. « Degradation, modelling and mitigation of SCC in LWRs »

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### 4. EFC WP4 past events (2010)

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- **Jubilee day: Stress Corrosion Cracking of nickel base alloys at CEA - 50 ans de corrosion sous contrainte au CEA - Effet Coriou effect-** January 26, 2010 at CEA-Saclay  
130 participants
- **International workshop on "Coupling mechanisms to improve lifetime prediction of LWRs"**, EFC event 331, 8-9 April 2010, Les Renardières (France), EDF (Material Ageing Institute)  
50 participants
- **4<sup>th</sup> International Workshop on "Prediction of Long Term Corrosion Behaviour in Nuclear Waste Systems"**, EFC event 329, Bruges, Belgium, SCK-CEN, 28 June - 2 July 2010  
65 participants

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130 people (70 French)

A "green" book planned

The CD-Rom available only for attendees and WP4 members

*Jubilee day: Stress Corrosion Cracking of nickel base alloys at CEA  
50 ans de corrosion sous contrainte des alliages de nickel au CEA*

- Effet Coriou Effect -

CEA-INSTN, Saclay (near Paris), France  
Mardi 26 janvier 2010 - Tuesday January 26, 2010

Agenda provisoire / Preliminary agenda

**Matin / Morning**

Bienvenue et ouverture de la Journée / Welcome and opening

Gérard Pinard Legry : La saga de l'Alliage 600 au CEA (Alloy 600 saga at CEA)

Roger Staehle : "Historical views on the stress corrosion cracking of Ni base alloys."  
(Histoire de la corrosion sous contrainte des alliages de nickel)

Philippe Beige : Histoire et petites histoires de la corrosion sous contrainte des alliages de nickel (History and small novels of the SCC of Nickel base alloys)

**Après-midi / Afternoon**

Pete L. Andresen : Understanding and prediction of Stress Corrosion Cracking (Derniers développements de la Corrosion sous contrainte des bases nickel)

Emmanuel Herms : Amorgage de la Corrosion sous contrainte au CEA : derniers résultats et développements (R&D on initiation of stress corrosion cracking at CEA)

Toshio Yonezawa : Coriou's crack experience in Japanese PWRs and its mitigation (L'effet Coriou dans les centrales à eau pressurisée au Japon et son contrôle)

Catherine Gaerem : Propagation de la corrosion sous contrainte : derniers résultats et développements au CEA (R&D on crack propagation of stress corrosion cracking at CEA)

Digby Macdonald : Stress corrosion cracking and electrochemistry (corrosion sous contrainte et électrochimie)

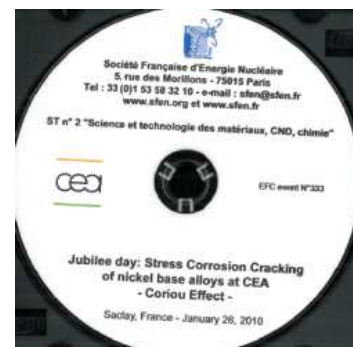
Jacques Chêne : Corrosion sous contrainte et fragilisation par l'hydrogène (Stress corrosion cracking and hydrogen embrittlement)

Philippe Boissat : Moyens d'essais de CSC au CEA (SCC test facilities at CEA)

Clostrac : Closures

A simultaneous translation French-English is planned the whole day for all the conferences

Mercredi : Visite des laboratoires de corrosion du CEA-Saclay - nombre limité de personnes  
Wednesday: Visit of CEA-Saclay corrosion facilities - limited number of participants



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The MAI is a research facility created by EDF, EPRI (USA) and TEPCO (Japan) to carry out a R&D program in order to better understand and anticipate how materials in power plants age and contribute to plant component degradation. Scientific findings from the MAI help power companies to optimize the operations and lifetimes of existing plants and support the design of future plants.

### Venue

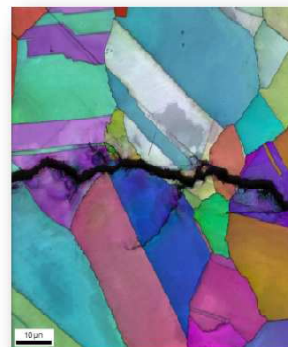
The workshop will be held at the Materials Ageing Institute (EDF R&D center) Moret-sur-Loing, France. The R&D center is located in the southeast of Paris (75 km), 10 km from Fontainebleau. The MAI is easily accessible by car or by train (50 min from Paris).

### Registration and Accommodation

Registration to the workshop is only valid by completing and sending the registration form before 28 February 2010 to the conference office. The registration form is available on the website. The registration fee will include the list of participants, the proceedings of presented papers, lunches, coffee breaks and conference dinner. Expenses for travel and hotel accommodation are not included in the registration fee. Travel and accommodation arrangements should be made by each participant personally. A list of hotels is available on the website

## International workshop on

## Coupling Mechanisms to improve lifetime prediction of LWRs



8 - 9 April 2010

Les Renardières, Moret-sur-Loing (France)

EFC Event N°331



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## Scope and Objectives of the Workshop

Environmentally-assisted cracking is a limited factor for the lifetime of light water reactors. Many cases of stress corrosion cracking and corrosion fatigue were reported for Ni-based alloys, stainless steels, zirconium alloys... However, lifetime extension to 60 year are expected. In this context, it is necessary to improve our understanding of degradations usually based on complex coupling between material, loading and environment. Many works are in progress in order to characterize, to model and to simulate degradations in representative operating conditions. Tools are being developed to improve safety and operating conditions of nuclear plants.

The main objective of the Workshop is to draw experts from various countries who are contributing to predict and to understand interactions leading to cracking

This event is organized by the Materials Ageing Institute of EDF R&D. The event is also sponsored by the European Federation of Corrosion (EFC); Nuclear Corrosion Working Party (WP4).

## Topics

The workshop will address the main items related to the coupling of mechanisms in order to improve lifetime prediction in light water reactors where environmentally-assisted cracking can occur:

- Cross characterizations
  - Deformation
  - Oxidation
  - Microstructure
  - Water chemistry
  - Environmentally-assisted cracking
- Modeling interactions
  - At the scale of the components
  - At the scale of the mechanism of cracking
- Simulating interactions

## Key Dates

|                   |                                  |
|-------------------|----------------------------------|
| September 2009    | Announcement and call for papers |
| 1st December 2010 | Deadline for abstracts           |
| 1st January 2010  | Notification of paper acceptance |
| 28 February 2010  | Deadline for registration        |
| 8-9 April 2010    | Workshop                         |

## Local Organizing Committee

Thierry COUVANT MAI, EDF R&D, France  
Veronique BORDIER-VINERON MAI, EDF R&D, France

## Scientific Committee

Georges CAILLETAUD ENSMP, France  
Thierry COUVANT EDF R&D, France  
David DELAFOSSE ENSMSE, France  
Damien FERON CEA, France  
Gabriel LEVBARE EPRI, California  
Sylvain LECLERCQ EDF R&D, France  
Philippe Marcus ENSCP, France  
Tetsuo SHOJI Tohoku University, Japan

## Conference Office

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## Website

Registration form, hotel information and program are available on the website: <http://www.themai.org>

WP4 Meeting - September 15, 2010 - Moscow, Russia

## Registration and Accommodation

Registration to the workshop is only valid by completing and sending the registration form before 31 May 2010 to the conference office. The registration form is available on the website.

- The registration fee will include the list of participants, book of abstracts, lunches, coffee breaks, welcome cocktail and conference dinner.
- Expenses for travel and hotel accommodation are not included in the registration fee.
- Travel and accommodation arrangements should be made by each participant personally.
- A limited number of rooms have been reserved at the Hotel 'Novotel Brugge Centrum' at a special rate of 113€/night (single room) or 132€/night (double room). Breakfast is included in the rate ([www.novotel.com](http://www.novotel.com)). The Novotel Brugge Centrum is a 3 ★ hotel situated in the historic center of Bruges (only 5 minutes walk from the conference center). Reservations can only be made by fulfilling the reservation request, available at the website of the workshop, and sending it by fax to +32(0)50 33 65 56. To have advantage of the special rate, the reference 'LongTermCor2010' should be mentioned on the reservation request form.



Hotel Novotel Brugge Centrum

<http://www.sckcen.be/LongTermCor2010>

EFC Event N° 329



## 4<sup>th</sup> International Workshop on Long-Term Prediction of Corrosion Damage in Nuclear Waste Systems

28 June – 2 July 2010  
Bruges, Belgium

Organized by



WP4 Meeting - September 15, 2010 - Moscow, Russia

**4<sup>th</sup> International Workshop on Long-Term Prediction of Corrosion Damage in Nuclear Waste Systems (LongTermCor2010)**  
June 28 - July 2, 2010  
Conference Centre 'Oud Sint-Jan', Bruges, Belgium

- experimentation
- corrosion behaviour of steel reinforcements in concrete
- archaeological artefacts
- modelling

The 4<sup>th</sup> International Workshop on Long-Term Prediction of Corrosion Damage in Nuclear Waste Systems was organised jointly between the Belgian Nuclear Research Centre (SCK-CEN) and the Belgian Agency for Radioactive Waste and Enriched Fissile Materials (ONDRAF/NIRAS) under the auspices of the European Federation of Corrosion (EFC Event N° 329). It also takes part of the RILEM Technical Committee "Concrete in the context of the nuclear management" (TC 226-CNM). The workshop was held at the Conference Centre 'Oud Sint-Jan' in Bruges (Belgium) from June 28 to July 2, 2010. Bruges is often called 'the Venice of the North' due to its picturesque canals which are found throughout the city centre. The conference centre (see photograph) is located in a historic building: an old hospital from the 19<sup>th</sup> century. On this site, in the Middle Ages, there was already one of the first hospitals in Europe.



*Photograph 1 - View of the conference centre 'Oud Sint-Jan' (Bruges, Belgium).*

The main objective of the Workshop is to bring together scientists and engineers from various countries who are developing high level nuclear waste disposal technologies, with the goal of promoting scientific and technical exchanges concerning long term behavior of metallic containment materials and engineered barrier systems. In particular, the workshop will compare the approaches that are being developed worldwide for predicting long term corrosion phenomena, including corrosion strategies for interim storage and geological disposal.

The workshop addressed the main items related to the long-term corrosion behaviour, which were divided into five areas:

- overview of the national programmes

This workshop was the follow-up of the three previous events, which is organised every 3 years: Cadarache - France (2001); Nice - France (2004) and Pennsylvania State University - USA (2007). A total of 65 participants registered for the workshop (of which, finally, two did not show up) (see photograph 2). The participants came from 16 different countries from 3 continents: North- and South-America (USA, Canada, Argentina), Europe (Belgium, the Netherlands, UK, France, Spain, Italy, Slovenia, Sweden, Finland, Switzerland) and Asia (Japan, India, Republic of Korea). The speakers originated from 12 different countries (Belgium, UK, Spain, France, Finland, Sweden, USA, Argentina, Canada, India, Republic of Korea and Japan). This makes it the most successful workshop in the series. Also, it was the first time that Japan was represented by as many as six papers.

The workshop was opened by Philippe Lalioux (Long Term Managing Director of ONDRAF/NIRAS), Eric van Walle (General Manager of SCK-CEN) and Damien Féron (Chairman of the EFC Working Party 4 - Nuclear Corrosion).



*Photograph 2 - Group photo of the attendants of the LongTermCor2010 Workshop.*

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#### 4. EFC WP4 future events

- **International workshop "Ageing Management of Nuclear Structures and Installations"** Toronto, Canada, November 8-13, 2010 - EFC event 334 -
- **International workshop "Stress corrosion cracking of weld metals in LWRs"** EDF-Mai France, March-April 2011 - in preparation
- **7<sup>th</sup> annual meeting of the ECG-COMON in 2011, June 20-21, 2011, Finland**
- **2<sup>nd</sup> Int. Workshop on 'Corrosion Monitoring in Nuclear Systems (Research and Applications)'** Special WS during EUROCORR 2011, 5 - 8 September 2011, Stockholm, Sweden  
*Organised by Stefan Ritter and Anders Molander in collaboration with the ECG-COMON* (deadline for abstracts: 31 January 2011)
- **5<sup>th</sup> International Workshop on "Prediction of Long Term Corrosion Behaviour in Nuclear Waste Systems (LongTermCor2013)"**,  
Proposal: 2013-Japan
- **Summer School on "Nuclear Corrosion"**

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#### 4. EFC WP4 future events



### “Ageing Management of Nuclear Structures and Installations”

In the frame of the RILEM TC-226-CNM (Concrete in the context of Nuclear Waste Management) needs have been identified in the area of ageing management of Nuclear Installations. As a result of the two **NUCPERF (2006&2009) Workshops**, the following topics of interest were clearly identified:

- **Ageing Management Program Strategy** for reinforced concrete structures
- **Development of instrumentation and NDE techniques** such as :
  - To detect, measure and monitor parameters impacting ageing,
  - To measure parameters to meet the operating license requirements of nuclear installations,
  - To validate NDE techniques to detect and monitor ageing of NPP structures to meet regulator/user/owner requirements.
- Upscaling/validation of **new developments in NDA techniques** (from laboratory to field applications)
- **Implementation of inspection and monitoring survey strategy** for long-term structural integrity
- Interpretation of the raw measurement data (reliability, uncertainties, appropriateness), **treatment of field measurement data** (codes/models)
- Integration of model simulation outputs in **reassessment of service life**
- **Probabilistic tools for managing uncertainties** resulting e.g. from randomness in structure loads, time-dependent material properties changes etc ...

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#### 4. EFC WP4 future events



### “Ageing Management of Nuclear Structures and Installations”

#### • Financial sponsors:

- AECL and COG (Canada)
- CEA (France)



#### • Scientific sponsors

- RILEM (TC CNM – Concrete for Nuclear waste Management)
- EFC - WP4 (Nuclear corrosion) and WP11 (Corrosion in Concrete)
- OECD/NEA (Committee for Safety of Nuclear Installations)



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#### 4. EFC WP4 future events

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### 7<sup>th</sup> annual meeting of the ECG-COMON in 2011



- Date: June 20 and 21, 2011
- Location: Finland (probably in Lahti, Espoo or Turku)
- What: Presentations on corrosion monitoring techniques, discussions, round-robins, "networking", etc. *(for members and invited guests only)*
- Fun: "Adventure" or sightseeing tour (Sat./Sun., June 18/19), welcome reception (Sunday evening), conference dinner (Monday evening), etc.
- More info: See [www.ecg-comon.org/meeting2011](http://www.ecg-comon.org/meeting2011) (available soon)



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#### 4. EFC WP4 future events

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### 2<sup>nd</sup> int. workshop on corrosion monitoring in nuclear systems



- Date: September 5 - 8, 2011 (during EUROCORR 2011)
- Location: Stockholm, Sweden
- What: Contributions are invited covering research on or the application of any kind of corrosion monitoring or related techniques for all types of fission reactors, nuclear waste disposal or other industrial nuclear systems.  
Papers presenting more basic research on corrosion monitoring techniques are also very welcome.
- Deadline: Abstracts should be submitted to the EUROCORR website until January 31, 2011
- More info: See flyer (also available on the WP 4 website) or contact Anders Molander ([anders.molander@studsvik.se](mailto:anders.molander@studsvik.se)) or Stefan Ritter ([stefan.ritter@psi.ch](mailto:stefan.ritter@psi.ch))

#### 4. EFC WP4 future events

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First announcement of the  
**"2<sup>nd</sup> International Workshop on  
Corrosion Monitoring in Nuclear Systems  
(Research and Applications)"**

during EUROCORR'2011 (Stockholm, Sweden, 5-8 September 2011).

**Scope and objectives**

Even if the plant availability of nuclear power plants has increased and the radiation build-up has been effectively mitigated, corrosion continues to influence plant performance and availability. Recent examples are stress corrosion cracking attacks on type 316L stainless steel in boiling water reactors, attacks on nickel-base alloys in pressurised water reactors and irradiation-assisted stress corrosion cracking incidents in both types of reactors. Therefore, reliable observation or prediction of the corrosion behaviour of given materials is considered important for the safe and economic future operation of existing plants, which commonly are subject to life-time extension and power upgrading. In addition, managing corrosion problems in future nuclear waste disposal systems is another task where reliable corrosion monitoring techniques could help to further increase safety.

After a successful workshop on "Corrosion Monitoring in Nuclear Systems" during EUROCORR'2007 in Freiburg (Germany) and publication of a "Green Book" of the EFC (EFC Publication No. 56), a 2<sup>nd</sup> workshop will be organised during EUROCORR'2011 in Stockholm (Sweden). This workshop is arranged to reveal the progress in corrosion monitoring research and applications reached during the last 4 years and to gather new insights in this topic. Contributions are invited covering research on or the application of any kind of corrosion monitoring or related techniques (e.g., electrochemical noise, ACPD/DCPD methods, acoustic emission, electrochemical impedance spectroscopy, monitoring corrosion potentials, activity monitoring, etc.) for all types of fission reactors (incl. secondary side), nuclear waste disposal or other industrial nuclear systems (e.g., reprocessing plants). Papers presenting more basic research on corrosion monitoring techniques are also very welcome.

**Organiser:** EFC WP 4 "Nuclear Corrosion" in co-operation with the ECG-COMON  
Chairmen: Stefan Ritter (stefan.ritter@psi.ch) and Anders Molander (anders.molander@studsvik.se)

**Abstracts should be submitted to the EUROCORR'2011 website  
(<http://www.eurocorr.org>) by January 31, 2011!**

The papers presented at this workshop will be published in the **proceedings** of EUROCORR'2011 (CD-ROM). In addition, it is planned to submit selected papers (after a review process) in a special issue of a journal or an EFC Publication ("Green Book").

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#### 4. EFC WP4 future events

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### **5<sup>th</sup> International Workshop on "Prediction of Long Term Corrosion Behaviour in Nuclear Waste Systems (LongTermCor2013)"**

- Discussions with Dr.Eng. ASANO Hidekazu, Radioactive Waste Management Funding and Research Center Pacific Marks, Tsukishima, Japan
- Response received on August 26 by Email: «... we told about a possibility to have a next workshop in Japan and today I would like to inform you of our acceptance of it. Although there are still some choices for place and time, it can be held in Japan in 2013... »
- Support from CRIEPI (Central Research Institute of Electric Power Industry)
- Accepted at the WP4 meeting in Moscow

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### Summer School "nuclear corrosion"

- Proposed in Maastricht (2006)
- WP4 Spring Meeting 2008 decisions
  - Target: young scientists and engineers
  - Topics: 3-days general session + 2-days focus on specific item (NPP, Gen IV, Nuclear Waste, ...)
  - The event will be organised in relation with others (ENEN / European Nuclear Education Network)
  - Task Force "Summer School": B. Kursten (Chair), B. Cottis, D. Féron, A. Legat, St. Ritter, D. Tice, P. Wood, M. Le Calvar
  - It is planned to have one event every (x) year(s)
- Planned initially in Belgium, SCK-CEN resigns (Spring meeting 2009)
- Andraz Legat (Slovenia) offered to organise the 2<sup>nd</sup> summer school -> the first edition (?)

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### • EFC WP4 page (on the EFC website)

[http://www.efcweb.org/Working\\_Parties-p104085/WP\\_4.html](http://www.efcweb.org/Working_Parties-p104085/WP_4.html)

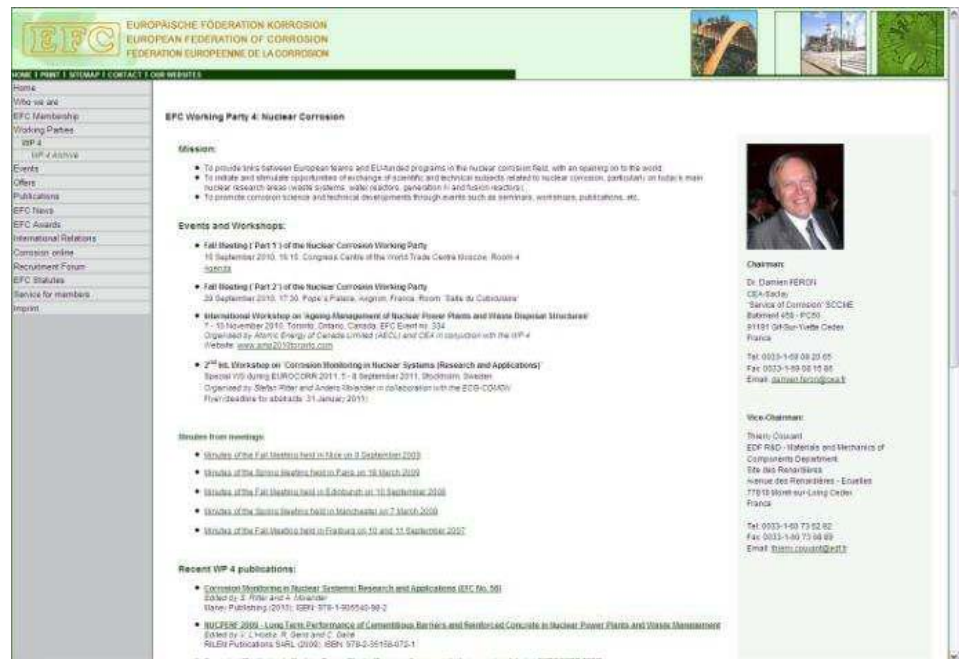
- Items on the web site:
  - ✓ **WP4 activities:** reports on WP4 activities and presentation of the WP4 at OCDE/NEA
  - ✓ **WP4 groups:** ECG-COMON
  - ✓ **Minutes of the WP4 meetings** (without overheads)
  - ✓ **Future events/workshops of the WP4**
  - ✓ **WP4 recent publications**
    - EFC series
    - Other publications
- **EFC website has been "renewed"**  
New presentation - easier to use
- **Stefan Ritter** in charge of the WP4 web page: many thanks for the work done
- New : a "private domain"

## 5. EFC WP4 Website



### Status of EFC WP 4 web page ([www.efcweb.org](http://www.efcweb.org))

The WP 4 website is updated frequently! Please pass by from time to time and/or feel free to send events or any other useful infos to [stefan.ritter@psi.ch](mailto:stefan.ritter@psi.ch) !



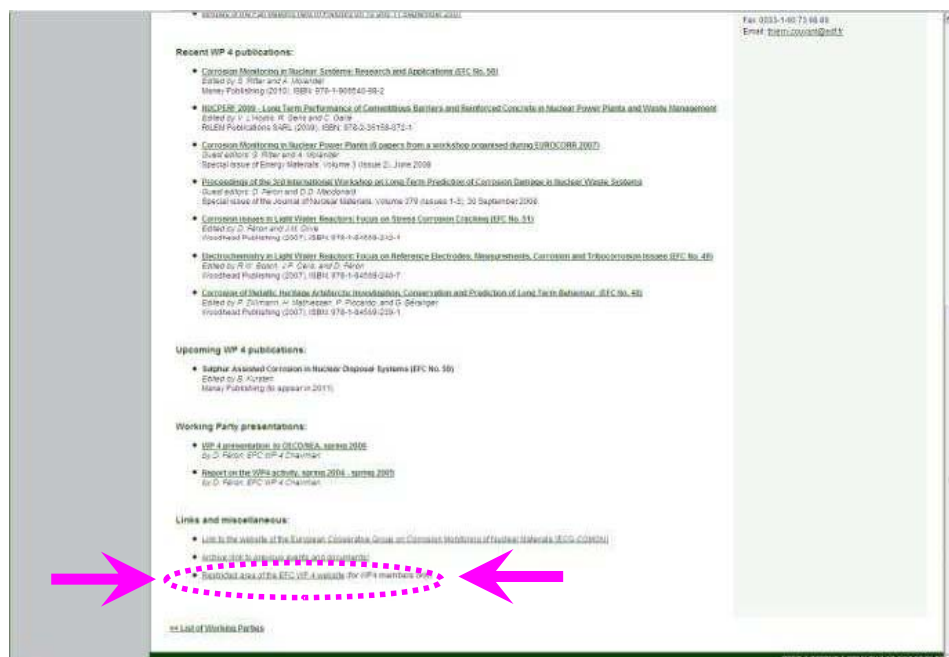
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## 5. EFC WP4 Website



### Status of EFC WP 4 website ([www.efcweb.org](http://www.efcweb.org))

A restricted area (for members only) has been added to the WP 4 website. The password will be provided with the minutes of the meeting.



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## 6. Eurocorr

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- **EUROCORR 2010 "from the Earth's Depths to Space Heights"** / 13-17 September, Moscow, Russia  
Session "nuclear corrosion" : one day session / 11 papers  
4 cancellations (Russian papers!) / very small attendance (highest 25 - lowest 5! And only two Russian people). 9 persons at the WP4 meeting
- **EUROCORR 2011 "developing solutions for the global challenge"** / 5-8 September, Stockholm, Sweden  
Workshop "corrosion monitoring in nuclear systems" (S. Ritter - ECG-COMON)  
Common session with WP5 (Environmental sensitive fracture) on initiation of Stress Corrosion Cracking (under discussion with C. Wolski)
- **EUROCORR 2012** / 9-13 September, Istanbul, Turke
- **EUROCORR 2013** / 1-5 September, Estoril, Portugal

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## 7. Missing items

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### Some points to discuss?

How the Spring Meeting can be more attractive?

- including scientific and technical presentations
- visiting laboratories, workshops, plants, ...

Date and place of the next EFC WP4 Spring meeting

Next WP4 fall meeting: in Stockohlm, during EUROCORR 2011 (4-8 September)

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WP4 Meeting - September 15, 2010 - Moscow, Russia



## Upcoming events

- **International workshop "Ageing Management of Nuclear Structures and Installations"** Toronto, Canada, November 8-13, 2010 (with AECL)
- **7<sup>th</sup> annual meeting of the ECG-COMON** in 2011, June 20-21, 2011, Finland

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# Thank you for your participation

**EFC WP4 "Nuclear Corrosion"**  
**Second 2010 Fall Meeting**  
Avignon, France  
September 29, 2010