



Croatian Nuclear Society

in cooperation with



10<sup>th</sup> International Conference on

**NUCLEAR OPTION  
IN COUNTRIES WITH  
SMALL AND MEDIUM  
ELECTRICITY GRIDS**

June 1–4, 2014, Zadar, Croatia

Conference Programme

# UNDER THE AUSPICES OF



EUROPEAN NUCLEAR SOCIETY



**IAEA**

International Atomic Energy Agency



**MINISTARSTVO GOSPODARSTVA,  
RADA I PODUZETNIŠTVA**

Ministry of Economy, Labour  
and Entrepreneurship



Croatian Chamber of  
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DRŽAVNI ZAVOD ZA RADIOLOŠKU I NUKLEARNU SIGURNOST

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## CONFERENCE LOCATION

The conference will take place in the **Hotel Kolovare** in Zadar.

## CONFERENCE PROCEEDINGS

All papers, presented orally or as posters, accepted upon peer review are included into the proceedings on memory stick. Book of Abstracts and Conference Proceedings can be found in conference bags.

## INFORMATION

For further information and possible questions please refer to the Conference registration desk in the Hotel Kolovare.

## SOCIAL EVENTS

### WELCOME RECEPTION

The welcome reception will take place on **Sunday, June 1<sup>st</sup> 2014, at 20:00 h** in the **Hotel Kolovare, Wine Boutique area**. You are welcome to attend.

### CONFERENCE DINNER

The conference dinner will take place on **Tuesday, June 3<sup>rd</sup> 2014**, in the **Foša Seafood Restaurant** at **20:00 h** in Zadar. The restaurant is within walking distance from the conference venue.

### YOUNG AUTHORS AWARD CEREMONY

The Young Authors Award Ceremony will take place on **Wednesday, June 4<sup>th</sup> 2014**, during the Conference Closing session.

## CONFERENCE OVERVIEW

### ORAL PRESENTATIONS

From Monday, June 2<sup>nd</sup>, till Wednesday, June 4<sup>th</sup>, following 8 sessions with oral presentations are foreseen:

1. **Energy Planning and Nuclear Option**
2. **Power Reactors and Technologies**
3. **Nuclear Safety**
4. **Radioactive Waste Management and Decommissioning**
5. **Operation and Maintenance Experience**
6. **Environment, Public Relations and Safety Culture**
7. **Regulatory Practice and Emergency Preparedness**
8. **Reactor Physics and Nuclear Fuel Cycle**

### POSTER PRESENTATIONS

Poster session will take place on Tuesday, **June 3<sup>rd</sup>, 2014 from 14:00 h to 15:00 h.**

### ROUND TABLE

It is foreseen that the following round table discussion will be organized during the conference:

Round Table	Tuesday, June 3 <sup>rd</sup> , 17:00 - 18:00 h	<b>Fulfillment of EURATOM Directive 2011/70 requirements in a countries with small nuclear program</b>
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# CONFERENCE

	Sunday, June 1 <sup>st</sup>	Monday, June 2 <sup>nd</sup>
8:30		<b>Registration</b>
9:00		<b>Welcome Addresses</b>
9:30		<b>Invited Lectures 1-3</b>
10:00		
10:30		
11:00		<b>Coffee Break</b>
11:30		<b>Session EP&amp;NO</b>
12:00		
12:30		
13:00		<b>Lunch Time</b>
13:30		
14:00		<b>Invited Lectures 4-6</b>
14:30		
15:00		
15:30		<b>Coffee Break</b>
16:00		<b>Session PR&amp;T</b>
16:30		
17:00		
17:30		<b>Invited Lectures 7-8</b>
18:00		
18:30	<b>Conference Registration</b>	
19:00		
19:30		
20:00	<b>Welcome Reception</b>	
21:00		

## Sessions:

- EP&NO** Energy Planning and Nuclear Option
- PR&T** Power Reactors and Technology
- NS** Nuclear Safety
- RWM&D** Radioactive Waste Management and Decommissioning
- O&ME** Operation and Maintenance Experience
- EPR&SC** Environment, Public Relations, and Safety Culture
- RP&EP** Regulatory Practice and Emergency Preparedness
- RPNFC** Reactor Physics and Nuclear Fuel Cycle

# PROGRAMME

Tuesday, June 3 <sup>rd</sup>	Wednesday, June 4 <sup>th</sup>	
<b>Invited Lecture 9</b>		8:30
<b>Session NS</b>	<b>Session O&amp;ME (part 1)</b>	9:00
		9:30
<b>Invited Lecture 10</b>	<b>Coffee Break</b>	10:00
<b>Coffee Break</b>		10:30
<b>Session NS</b>	<b>Session O&amp;ME (part 2)</b>	11:00
		11:30
	<b>Session EPR&amp;SC</b>	12:00
		12:30
<b>Lunch Time</b>	<b>Lunch Time</b>	13:00
<b>Poster Session</b>		13:30
		14:00
<b>Invited Lecture 11</b>	<b>Session RP&amp;EP</b>	14:30
		15:00
<b>Coffee Break</b>	<b>Coffee Break</b>	15:30
<b>Session RWM&amp;D</b>	<b>Session RP&amp;NFC</b>	16:00
		16:30
<b>Round Table</b>		17:00
	<b>Conference Closing</b>	17:30
		18:00
		18:30
		19:00
<b>Conference Dinner</b>		19:30
		20:00
		20:30

**Round Table:** Fulfillment of EURATOM Directive 2011/70 requirements in a countries with small nuclear program

# CONFERENCE SCHEDULE

## MONDAY, June 2<sup>nd</sup>

08:30-09:00	Registration of participants
09:00-11:00	<p>OPENING SESSION</p> <p>D. Grgić, N. Čavlina, D. Pevec (Croatian Nuclear Society)</p> <p>Welcome Addresses</p> <p>Invited Lectures</p>
	<p>IL-1 <b>Michael Modro</b></p> <p>The IAEA Safety Standards and SMR design features</p>
	<p>IL-2 <b>Francesco Romanelli</b></p> <p>The European Roadmap to Fusion Electricity</p> <p>IL-3 <b>Nikola Čavlina</b></p> <p>Assessment of Energy Options for CO2 Emission Reduction</p>
11:00-11:30	Coffee Break
11:30-12:30	<p>Energy Planning and Nuclear Option</p> <p>Chairs: V. Kuznetsov (IAEA, Austria), Ž. Tomšić (FER, Croatia)</p>
	<p>S1-148 <b>Vladimir Knapp, Dubravko Pevec</b></p> <p>A view on the future of nuclear fission energy</p>
	<p>S1-149 <b>Vladimir Knapp, Dubravko Pevec, Mario Matijević, Dinka Lale</b></p> <p>Molten Salt Thorium Reactor - A Promising Nuclear Technology for the Second Half of the Century</p> <p>S1-162 <b>Željko Tomšić</b></p> <p>From Market Uncertainty to Policy Uncertainty for Investment in Power Generation: Real Options for NPP on Electricity Market</p>
13:00-14:00	Lunch Time
14:00-15:30	Invited Lectures
	<p>IL-04 <b>Nick Shulyak</b></p> <p>Westinghouse Small Modular Reactor (SMR) Program</p>
	<p>IL-05 <b>Nick Shulyak</b></p> <p>Westinghouse AP1000® PWR: Meeting Customer Commitments and Market Needs</p> <p>IL-06 <b>Zoran V. Stošić</b></p> <p>Reactors Project Delivery: The Value of Experience</p>
15:30-16:00	Coffee Break



<b>16:00-18:00</b>	<p style="text-align: center;"><b>Power Reactors and Technology</b></p> <p style="text-align: center;"><b>Chairs: B. Petrović (GATECH, USA), N. Čavlina (FER, Croatia)</b></p>
	<p>IL-07 <b>Bojan Petrović</b> Progress in Development of the I2S-LWR Concept</p> <p>IL-08 <b>Sanda Irina</b> Safety Assessment Challenges of the New Generation Reactors -Experience from the IAEA Generic Reactor Safety Reviews</p> <p>S2-106 <b>Kim Min-Hwan, Hong Seong-Deok, Kim Yong-Wan, Shin Dong-Ho, Lee Jeong-Hun, Park Goon-Cherl</b> Status of Thermo-Fluid Experimental Research on VHTR in Korea</p> <p>S2-141 <b>Bojan Niceno, Manuel Pouchon</b> Thermal-Hydraulic Aspects of Changing the Nuclear Fuel-Cladding Materials from Zircaloy to Silicon Carbides</p> <p>S2-151 <b>Davor Grgić, Tomislav Fancev, Vesna Benčik, Siniša Šadek</b> Hot Leg Streaming Calculation for Two-Loop PWR Plant</p>

**TUESDAY, June 3<sup>rd</sup>**

<b>8:30-9:00</b>	<b>Invited Lecture</b>
	IL-09 <b>Jože Špiler</b> Nuclear Power Plant Krško 2 Project
<b>9:00-10:30</b>	<b>Nuclear Safety</b> <b>Chairs: F. D'Auria (UNI Pisa), D. Grgić (FER, Croatia)</b>
	IL-10 <b>Chris M. Allison</b> Update on the SDTP sponsored Fukushima Daiichi Related Assessment Activities
	S3-101 <b>Andrej Prošek</b> Sensitivity analysis of LOFT L2-5 test calculations
	S3-125 <b>Ivan Horvatović, Chirayu Batra, Marco Cherubini Alessandro Petruzzi, Francesco D'Auria, Tomislav Bajš</b> Benchmark analysis of EBR-II shutdown heat removal test SHRT-17
<b>10:30-11:00</b>	<b>Coffee Break</b>
<b>11:00-12:40</b>	S3-137 <b>Mario Mihalina, Srđan Špalj, Bruno Glaser Robi Jalovec</b> NPP Krško SAMG Upgrade
	S3-139 <b>Siniša Šadek, Davor Grgić</b> Containment Modelling with the ASTEC Code
	S3-146 <b>Kaliopa Stefanova Mancheva</b> Main Aspects and Results of Level 2 PSA for KNPP WWER-1000/B320
	S3-177 <b>George Vayssier, Ivica Bašić</b> Systematic Review of Accident Management Programs - Principles, Experiences
<b>13:00-14:00</b>	<b>Lunch Time</b>
<b>14:00-15:00</b>	<b>Poster Session</b> <b>Chair: K. Trontl (FER, Croatia)</b>
	S3-135 <b>Mitja Uršič, Matjaž Leskovar</b> Analysis of sodium thermo-dynamical properties effect on fuel-coolant interaction
	S3-150 <b>Siniša Šadek, Tomislav Fancev, Davor Grgić</b> Calculation of hydrogen concentration in containment during LOCA accident
	S3-157 <b>Reni Banov, Zdenko Šimić, Davor Šterc</b> Short overview of PSA quantification methods, pitfalls on the road from approximate to exact results
	S3-153 <b>Vesna Benčik, Davor Grgić, Nikola Čavlina, Siniša Šadek</b> Optimization of OPDT Protection for Overcooling Accidents

- S4-112 **Oleg Purtov, Alexander Masko, Victor Vasilchenko**  
Main Results of Updated Decommission Conception of NPP'S Operating in Ukraine
- S5-103 **Matija Vavrous, Krunoslav Markulin, Marijan Brekalo**  
In-service inspection of primary circuit components: Qualification of non-destructive testing applications
- S5-105 **Petar Mateljak**  
CASTOR – Advanced System for VVER Steam Generator Inspection
- S5-129 **Saša Rešković**  
Automatic Analysis for VVER and PWR
- S5-136 **Bruno Bach, Rudi Čížmek, Bojan Božin**  
Developing Effective Corrective Action Plan in Krško NPP
- S5-142 **Ivan Vrbanić, Ivica Bašić**  
On Use of PSA for Characterization of Risk Significance of Operational Events and Issues in NPPs
- S6-113 **Bogomil Lubomirov Manchev, Vania Stoilova Yordanova, Boyka Gueorguieva Nenkova**  
Configuration Management Program - a part of Integrated Management System
- S6-131 **Irena Jakić, Renato Filipin**  
Analysis of public opinion survey “Nuclear energy - the present and the future” (2000-2012)
- S6-147 **Sanda Pleslić, Gonzalo Jimenez Varas**  
Knowledge Loss Risk Assessment in Education and Industry
- S6-158 **Ivica Prlić, Marija Surić Mihić, Peter Shaw, Mladen Hajdinjak, Željko Božina, Domagoj Kosmina Cerovac, Zdravko**  
EU Outer Borders and Radiation- An urgent need for standardization, new detector technologies and education harmonization
- S7-143 **Saša Medaković, Reni Banov**  
Assessment of NPP Krško accident impact on the population by means of the nonlinear statistical model using the RODOS software package
- S7-155 **Josip Vuković, Damir Konjarek, Davor Grgić**  
Radiation doses estimation for hypothetical NPP Krško accidents without and with PCFV using RASCAL software
- S7-164 **Ivica Bašić, Kim Manwoong, Francesco D’auria, Michel Louis Vidard**  
IAEA Review for Gap Analysis of Safety Analysis Capability

	<p>S7-170 <b>Damir Konjarek, Tomislav Bajš, Davor Šinka</b> Preliminary radiation doses assessment for NPP Krško SBO sequence</p> <p>S8-100 <b>Mario Matijević, Dubravko Pevec, Krešimir Trontl</b> SCALE6 hybrid deterministic-stochastic shielding methodology for PWR containment calculations</p> <p>S8-130 <b>Marjan Kromar, Bojan Kurinčič</b> Influence of the Finer Radial Burnup dalization on the Pin Power Distribution in the PWR core</p> <p>S8-152 <b>Davor Grgić, Siniša Šadek, Vesna Benčik, Damir Konjarek</b> Decay Heat Calculation for Spent Fuel Pool Application</p> <p>S8-154 <b>Radomir Ječmenica, Mario Matijević, Davor Grgić</b> Fuel depletion modeling of reconstituted NEK fuel assembly using lattice cell programs</p>
<b>15:00-15:30</b>	<b>Invited Lecture</b>
	<p>IL-11 <b>Tomaž Žagar</b> Radwaste Management in Small Nuclear Country - National Policy and Strategy</p>
<b>15:30-16:00</b>	<b>Coffee Break</b>
<b>16:30-17:30</b>	<b>Radioactive Waste Management and Decommissioning</b> <b>Chairs: T. Žagar (ARAO, Slovenia), V. Lokner (APO, Croatia)</b>
	<p>S4-132 <b>Alemka Knapp, Ivica Levanat, Diana Šaponja-Milutinović</b> Is Croatia Going to Build a Radioactive Waste Repository?</p> <p>S4-133 <b>Ivica Levanat, Vladimir Lokner</b> Croatian Capacity for Management of the NPP Krsko Radioactive Waste</p> <p>S4-134 <b>Luka Alujević</b> The Safety Assessment Framework tool (SAFRAN) - description, overview and applicability</p>
<b>17:00-18:00</b>	<b>Round Table: Fulfillment of EURATOM Directive 2011/70 requirements in a countries with small nuclear program</b> <b>Panelists: S. Medaković (DZRNS, Croatia), I. Poljičanin (FOND-NEK, Croatia)</b>
<b>20:00</b>	<b>Conference Dinner</b>

**WEDNESDAY, June 4<sup>th</sup>**

<b>8:45-10:00</b>	<p style="text-align: center;"><b>Operation and Maintenance Experience Part I</b></p> <p style="text-align: center;">Chairs: I. Vuković (INETEC, Croatia), Z. Heruc (NPP Krško, Slovenia)</p>
	<p>S5-124 <b>Zdenko Šimić</b> Development of the Operational Events Groups Ranking Tool</p> <p>S5-138 <b>Martin Chambers, Bojan Kurinčič,</b> 16x16 Vantage+ Fuel Assembly Flow Vibrational Testing</p> <p>S5-161 <b>Mario Gluhak, Marko Senegović</b> Shutdown Safety in NEK</p> <p>S5-165 <b>Mladen Dudaš</b> Operator Fundamentals Weaknesses</p>
<b>10:00-10:30</b>	<b>Coffee Break</b>
<b>10:30-12:00</b>	<p style="text-align: center;"><b>Operation and Maintenance Experience Part II</b></p> <p style="text-align: center;">Chairs: I. Vuković (INETEC, Croatia), Z. Heruc (NPP Krško, Slovenia)</p>
	<p>S5-140 <b>Dragoslav Djaković, Darko Kavšek</b> Control of Special Processes at Krško NPP</p> <p>S5-102 <b>Tomislav Tomašić, Igor Vuković, Ante Bakić</b> ARCHER – Advanced system for RPVH inspection and repair</p> <p>S5-104 <b>Matija Kekelj, Marko Budimir, Nikola Pavlović, Renato, Gracin</b> Multielement ultrasound and eddy current integrated probe for non-destructive evaluation of nuclear reactor pressure vessel head penetrations</p> <p>S5-107 <b>Dominik Borović, Igor Vuković</b> GIMIS – Integral Solution for the Inspection Management of Components in NPPs</p> <p>S5-118 <b>Ante Bakić, Mladen Pajnić, Tomislav Tomašić</b> New Solution For Ultrasonic Pipe Inspection System</p>
<b>12:00-13:15</b>	<p style="text-align: center;"><b>Environment, Public Relations and Safety Culture</b></p> <p style="text-align: center;">Chairs: Z. Šimić (EC JRC-IET-NRSA, Netherlands) D. Kavšek (NEK, Slovenia)</p>
	<p>S6-160 <b>Zdenko Šimić</b> On the Impact to the Human Health from the Fukushima Nuclear Accident</p> <p>S6-159 <b>Ivica Prlić, Mladen Hajdinjak, Marko Šoštarić, Gordana Marović, Dinko Babić</b> NORM - Radionuclide transfer studies- A modern approach according Directive 2013/59/EURATOM</p>

	<p>S6-115 <b>Krešimir Trontl, Dubravko Pevec, Mario Matijević, Radomir Ječmenica, Josip Lebegner</b> Public Opinion Survey - Energy - The Present and the Future – 2012/2013</p> <p>S6-123 <b>Romeo Bišćan, Igor Fifnja</b> Krško NPP Quality Assurance Plan Application to Nuclear Safety Upgrade Projects (PCFV System and PAR System)</p>
<b>13:15-14:15</b>	<b>Lunch time</b>
<b>14:15-15:30</b>	<b>Regulatory Practice and Emergency Preparedness</b> <b>Chairs: N. Novosel (DZRNS, Croatia)</b> <b>S. Medaković, (DZRNS, Croatia)</b>
	<p>S7-128 <b>Vladimir Kuznetsov, Zoran Drace, Vyacheslav Lysakov</b> Major Findings of IAEA/INPRO Activity on Legal and Institutional Issues for Transportable Nuclear Power Plants</p> <p>S7-110 <b>Nevenka Novosel</b> EU Directives in the Field of Radiological and Nuclear Safety and Their Transposition in Croatian Legislation</p> <p>S7-127 <b>Zoltán Bazsó</b> Impact of TEPCO Fukushima Dai-ichi accident on severe accident management in the Slovak Republic</p> <p>S7-119 <b>Goran Pogačić</b> Cyber Security in Nuclear Power Plants – U.S. NRC Regulatory Guide 5.71</p>
<b>15:30-16:00</b>	<b>Coffee Break</b>
<b>16:00-17:30</b>	<b>Reactor Physics and Nuclear Fuel Cycle</b> <b>Chairs: F. Rahnema (GATECH, USA), M. Kromar (IJS, Slovenia)</b>
	<p>IL-12 <b>Henri Zaccai</b> AREVA Sustainable Cycle Solutions</p> <p>S8-156 <b>Dingkang Zhang, Farzad Rahnema</b> Efficiency and Accuracy of the Incident Flux Response Expansion Method for</p> <p>S8-144 <b>Matjaž Božič, Marjan Kromar, Bojan Kurinčič</b> Fuel Reloading Strategies in a Hypothetical NPP Krško Forced Outage</p> <p>S8-120 <b>Jan Hascik, Gabriel Farkas, Branislav Vrban, Jakub Lüley, Peter Urban,</b> Power density determination in the VVER 440 reactor by the transport codes MCNP 5 and SCALE 6.</p>
<b>17:30-18:00</b>	<b>Conference Closing</b> <b>D. Grgić, N. Čavlina, D. Pevec</b> <b>(Croatian Nuclear Society)</b>

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Zadar 1-4 June, 2014