



# 9th International Workshop on Applications of Field Programmable Gate Arrays in Nuclear Power Plants

Lyon, France  
October 3-6, 2016

## The meeting is

- ▶ hosted by the Electricite de France, EDF SEPTEN,
- ▶ in cooperation with the International Atomic Energy Agency (IAEA) and SunPort SA

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**Lyon, France**

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## Meeting in numbers

- ▶ **53** participants
- ▶ **24** presentations
- ▶ **14** countries
- ▶ **3** panel discussions
- ▶ **12** vendors/suppliers
- ▶ **11** service/research/TSOs
- ▶ **3** nuclear regulators
- ▶ **2** utilities/NPPs
- ▶ **1** international organization

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## Series of FPGA Workshops

FPGA workshops attracted a significant interest and had a broad representation of utilities, vendors, regulators, and research organizations.

2008 Chatou, France, hosted by EdF

2009 Kirovograd, Ukraine, hosted by RPC Radiy

2010 Hamilton, Ontario, Canada, hosted by AECL/McMaster University

2011 Chatou, France, hosted by EdF

2012 Beijing, China, hosted by CNCS

2013 Kirovograd, Ukraine, hosted by RPC Radiy

2014 Charlotte, North Carolina, USA, hosted by EPRI

2015 Shanghai, China, hosted by SNPAS

2016 Lyon, France, hosted by EDF SEPTEN

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## Lyon, France

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## Panel Discussions

- ▶ Panel Discussion 1 on Technology or Design: Which is more important in the design of safety-classified I&C systems? Moderator: Alexander Wigg, EdF
- ▶ Panel Discussion 2 on Regulations, Licensing, and Standards of FPGA Applications, Moderator: Mark Burzynski, NewClear Day Inc.
- ▶ Panel Discussion 3 on Development tools and processes for FPGA applications, Moderator: Sergio Russomanno, SunPort SA

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## Sessions

- ▶ Design Process
- ▶ Platforms
- ▶ Certification, Qualification, and Standards
- ▶ Studies, Modelling, and Testing
- ▶ Systems & Applications

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## What's New?

- ▶ Applications in NPP modernization
  - ▶ 60 FPGA-based safety systems installed in operating NPPs by RPC Radiy in the past 10 years

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# What's New?

## ▶ Other Applications

- ▶ Wolf Creek Plant, USA, Main Steam and Feed-water Isolation System Replacement
- ▶ BWRs and Advanced BWR, Japan, Start-up Range & Power Range Neutron Monitoring System, Radiation Monitoring Systems
- ▶ EDF 900 MW Series (34 units), France, obsolete electronic modules replaced in Rod Control System and Reactor In-Core Measurement Systems (2009-2019)

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## What's New?

- ▶ Other Applications (continued)
  - ▶ OPG, Canada: FPGA based emulators for obsolete PDP-11 computers used in fuel handling systems and DCC (Reactor Regulation Systems)
  - ▶ Refurbishment of the Window Annunciation System, Embalse CANDU NPP, Argentina
  - ▶ Signal Processing Unit, SDS2 PHT pump trip, Embalse CANDU NPP, Argentina
  - ▶ EDF: FPGA based I&C platform redesign and class 2 qualification

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## What's New?

- ▶ Applications in new NPP designs
  - ▶ UK ABWR Hitachi-GE
  - ▶ AES-2006 Rosatom (TPTS-SB)
  - ▶ EC-6 by SNC-Lavalin (SDS)
  - ▶ Diverse FPGAs in PRPS of CAREM
  - ▶ ALS platform of WH
  - ▶ EPR Areva

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## What's New?

- ▶ Standards, Guidelines
  - ▶ IEC standard for HDL programmed integrated circuits for systems performing category B or C functions
  - ▶ IEC 62566 - Development of HDL-programmed integrated circuits for systems performing category A functions (2012)
  - ▶ Application of FPGAs in I&C Systems of NPPs – IAEA NE Series NP-T-3.17 (2016)

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## What's New?

- ▶ Platforms
  - ▶ New FPGA-based platforms from China, Korea, Japan
- ▶ Certifications, Reviews
  - ▶ NRC reviews
  - ▶ IAEA IERICS review missions

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**2017 Seoul, South Korea, to be hosted by Doosan**

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