

# 10th International Workshop on the Application of FPGAs in Nuclear Power Plants

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## FPGA Workshops: A Decade in Review

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**Sun** *port*  
Connecting Forward

**10<sup>th</sup> anniversary of the FPGA workshop**

**... a time for reflection**

**... a time to consider accomplishments**

**... a time to look around to learn from others**

**... and a time to look to the future**

## 9<sup>th</sup> FPGA Workshop - 2016 Lyon, France, hosted by EdF



## 8<sup>th</sup> FPGA Workshop - 2015 Shanghai, China, hosted by SNPAS





## 7<sup>th</sup> FPGA Workshop - 2014 Charlotte, North Carolina USA, hosted by EPRI





## 6<sup>th</sup> FPGA Workshop - 2013 Kirovograd, Ukraine, hosted by Radiy



## 5<sup>th</sup> FPGA Workshop - 2012 Beijing, China, hosted by CNCS





## 4<sup>th</sup> FPGA Workshop - 2011 Chatou, France, hosted EdF





## 3<sup>rd</sup> FPGA Workshop - 2010 Hamilton, Ontario, Canada, hosted by AECL/McMaster University



## 2<sup>nd</sup> FPGA Workshop - 2009 Kirovograd, Ukraine, hosted by Radiy





## 1<sup>st</sup> FPGA Workshop - 2008 Chatou, France, hosted EdF



## Where we started in the nuclear industry...

- FPGA technology new to the nuclear industry
- Experience with microprocessor technology shaped concerns with FPGA technology
- No specific guidance documents or standards for FPGA technology
- Regulatory bodies had to treat FPGA technology as software



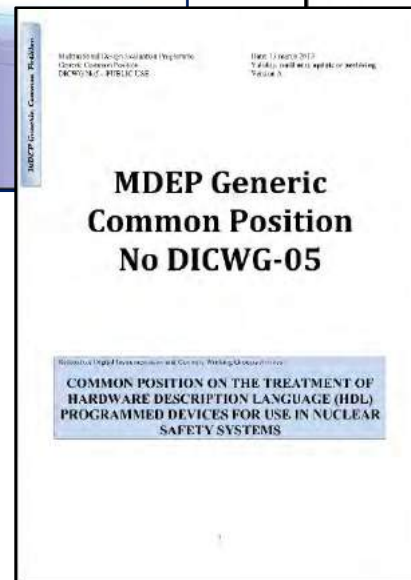
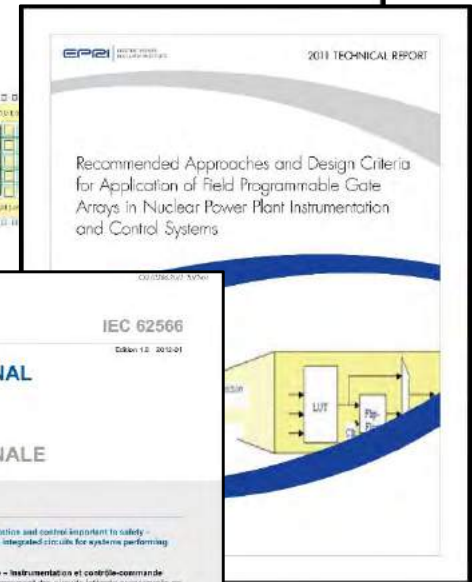
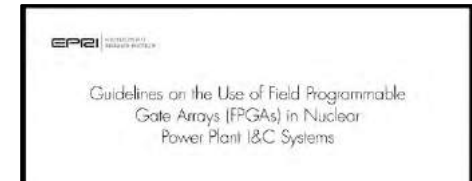
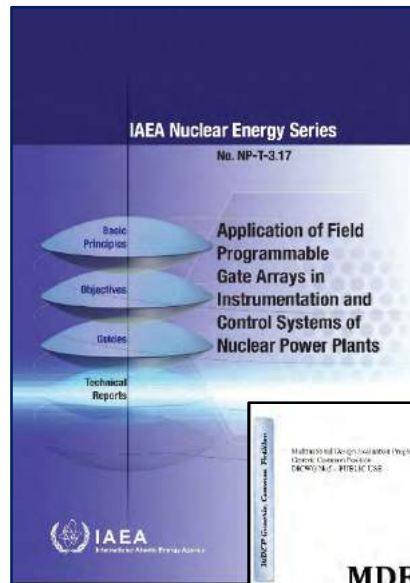
### What is FPGA Programming?





## What has been accomplished since then ...

- Specific guidance documents and standards for FPGA technology use in the nuclear sector
- Additional standards are in development



## What has been accomplished since then ...

- Nuclear industry and regulatory bodies have learned how to treat FPGA technology for safety applications
  - FPGA-based systems installed in nuclear plants in many countries
  - FPGA-based I&C platforms now accepted and available for use
  - FPGA technology provides solutions for common cause failures vulnerabilities based on internal diversity features





## Other trends to watch ...

- Other industry sectors have also developed standards for use of FPGA technology in safety-critical applications
  - Driving market towards certified FPGA components and development tools
  - Driving market towards certified products (e.g., IEC 61508 SIL Certification)



Medical electrical equipment –  
Part 1: General requirements for basic safety and essential performance  
Appareils électromédicaux –  
Partie 1: Exigences générales pour la sécurité de base et les performances essentielles

**ISO 26262**  
Road Vehicles - Functional Safety

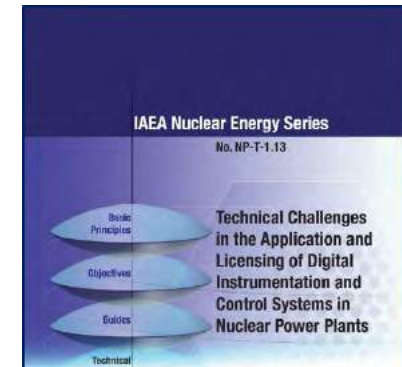
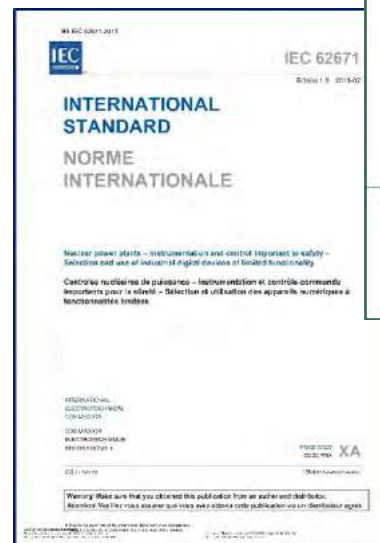
## What is being accomplished now ...

- Nuclear industry and regulatory bodies are learning how to treat embedded digital technologies like FPGA in smart devices and how to credit certification of FPGA components, development tools, and products



ONR Office for Nuclear Regulation

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IAEA Safety Standards  
for protecting people and the environment

Design of Instrumentation  
and Control  
Nuclear Power Plants

Specific Safety  
No. SSG-39



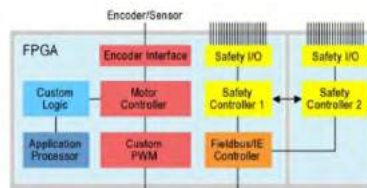
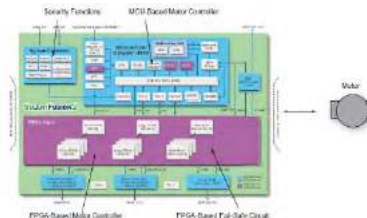
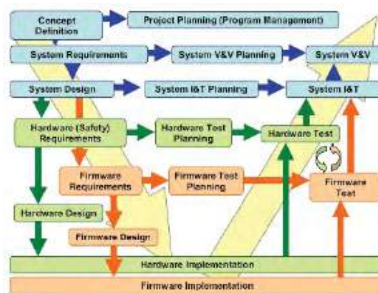
MDEP Common  
Position  
CP-DICWG-07

COMMON POSITION ON SELECTION AND USE  
OF INDUSTRIAL DIGITAL DEVICES OF LIMITED  
FUNCTIONALITY



## The future for the nuclear sector?

- Accepted standard development processes and tool flows
- Accepted safe integrated solutions for standard industry needs
- Realization process improvements through use of certified products





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**Thank you**

**SunPort SA**

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