

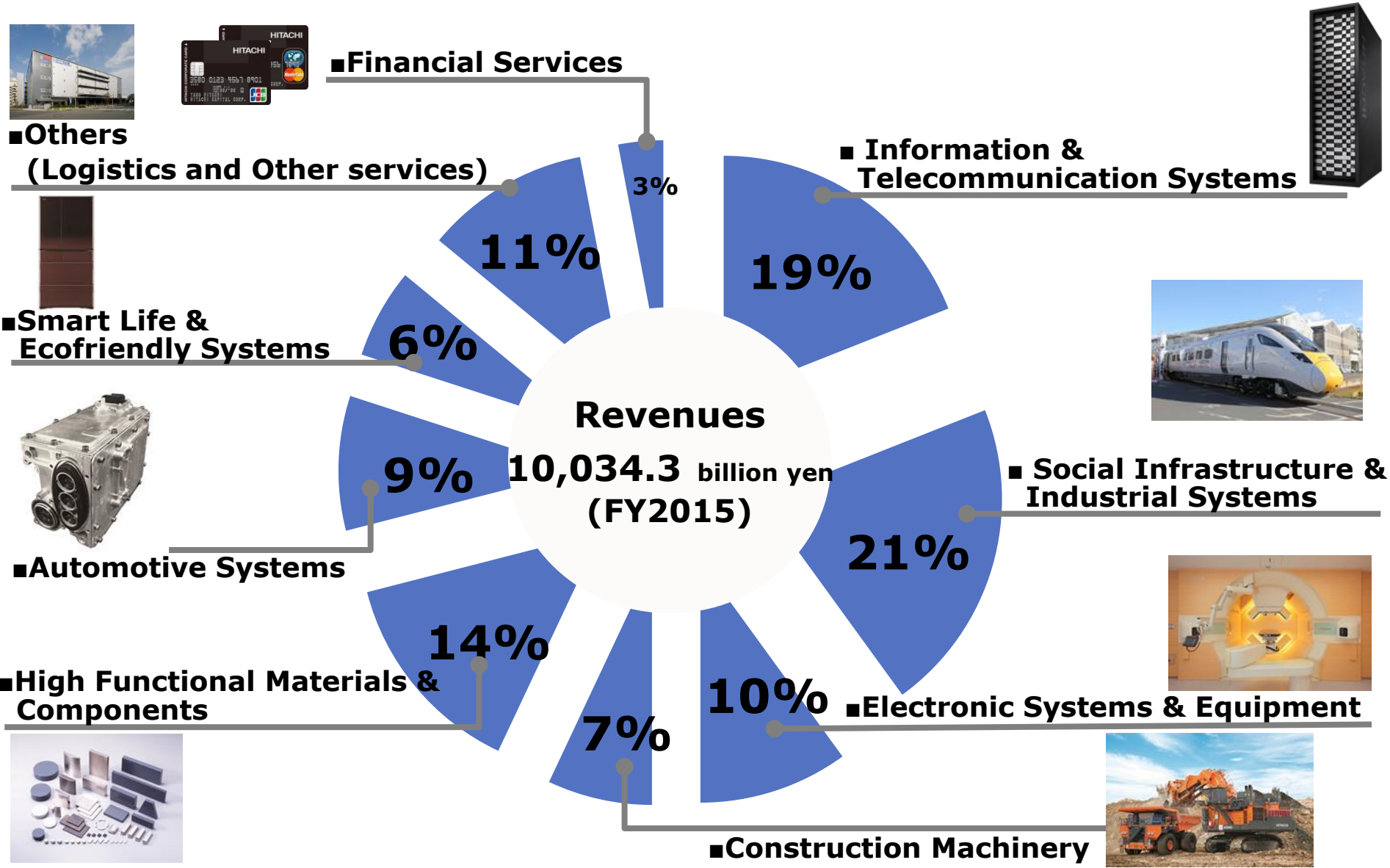
9<sup>th</sup> International Workshop on the Application of FPGAs in NPPs  
Lyon, 3-6 October 2016

---

## **Introduction of Class 1 FPGA Platform for the UK ABWR**

**Hideo Harada**  
**Satoshi Nishikawa**

Hitachi, Ltd.



# Global Expansion (FY2015)

## Europe

- Revenues: **951.1** billion yen
- Number of companies: **194**
- Number of employees: **20** thousand

## North America

- Revenues: **1,280.3** billion yen
- Number of companies: **112**
- Number of employees: **21** thousand

## China

- Revenues: **1,055.5** billion yen
- Number of companies: **180**
- Number of employees: **47** thousand

## Japan

- Revenues: **5,231.5** billion yen
- Number of companies: **262**
- Number of employees: **187** thousand

## Asia (incl. China)

- Revenues: **2,112.3** billion yen
- Number of companies: **399**
- Number of employees: **95** thousand

## Other Areas

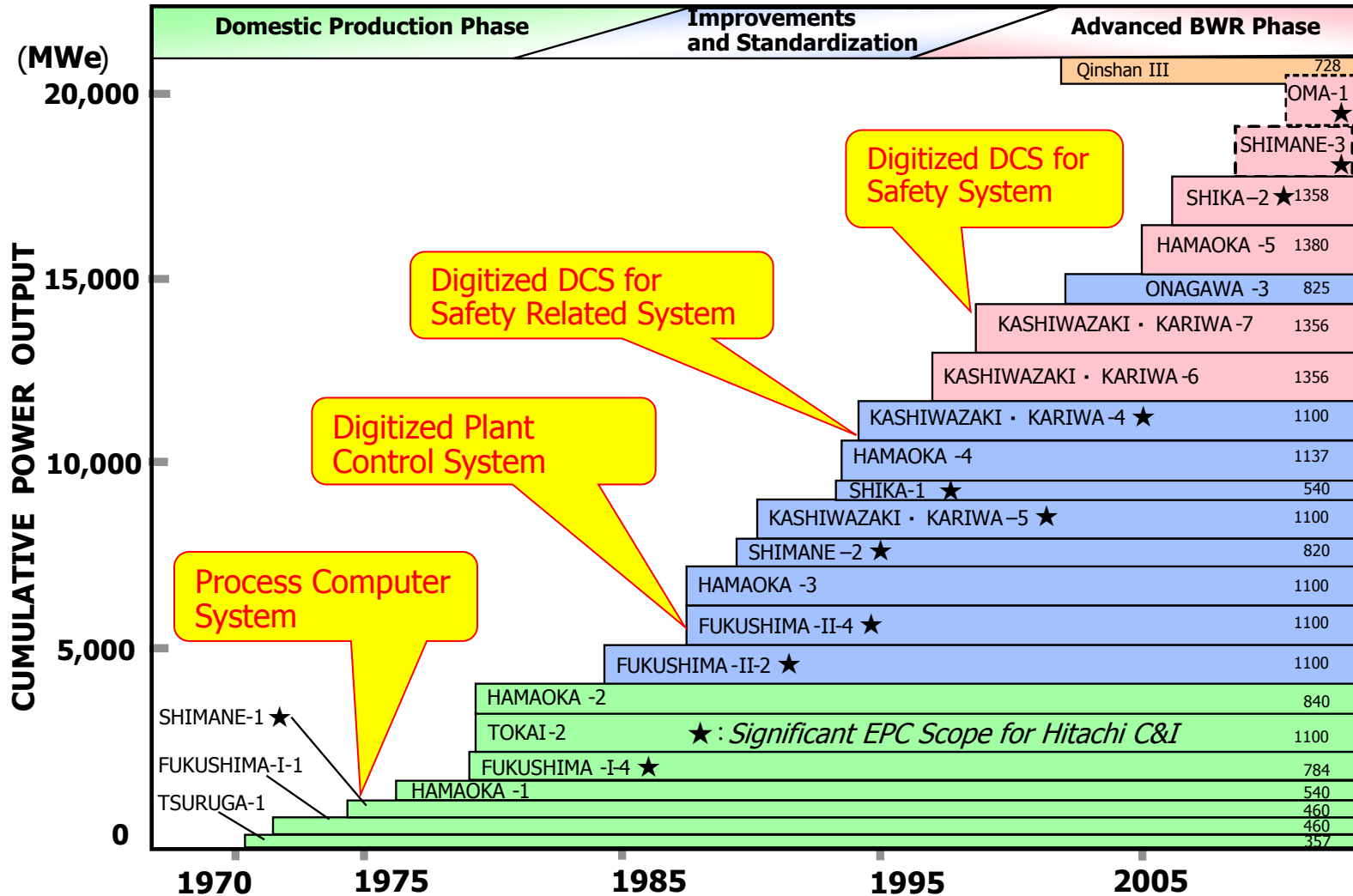
- Revenues: **459.0** billion yen
- Number of companies: **89**
- Number of employees: **10** thousand

Japan Revenues: **5,231.5** billion yen/Number of companies: **262**/Number of employees: **187** thousand

Outside Japan Revenues: **4,802.7** billion yen/Number of companies: **794**/Number of employees: **147** thousand

Total Revenues: **10,034.3** billion yen/Number of companies: **1,056**/Number of employees: **335** thousand

# Hitachi Nuclear Application History



DCS: Distributed Control System

Note: Definition of Safety System and Safety Related System is based on IAEA Safety Glossary 2007

Ohma Unit 1 (NI and TI), FAT finished (FSS), completed in 2016

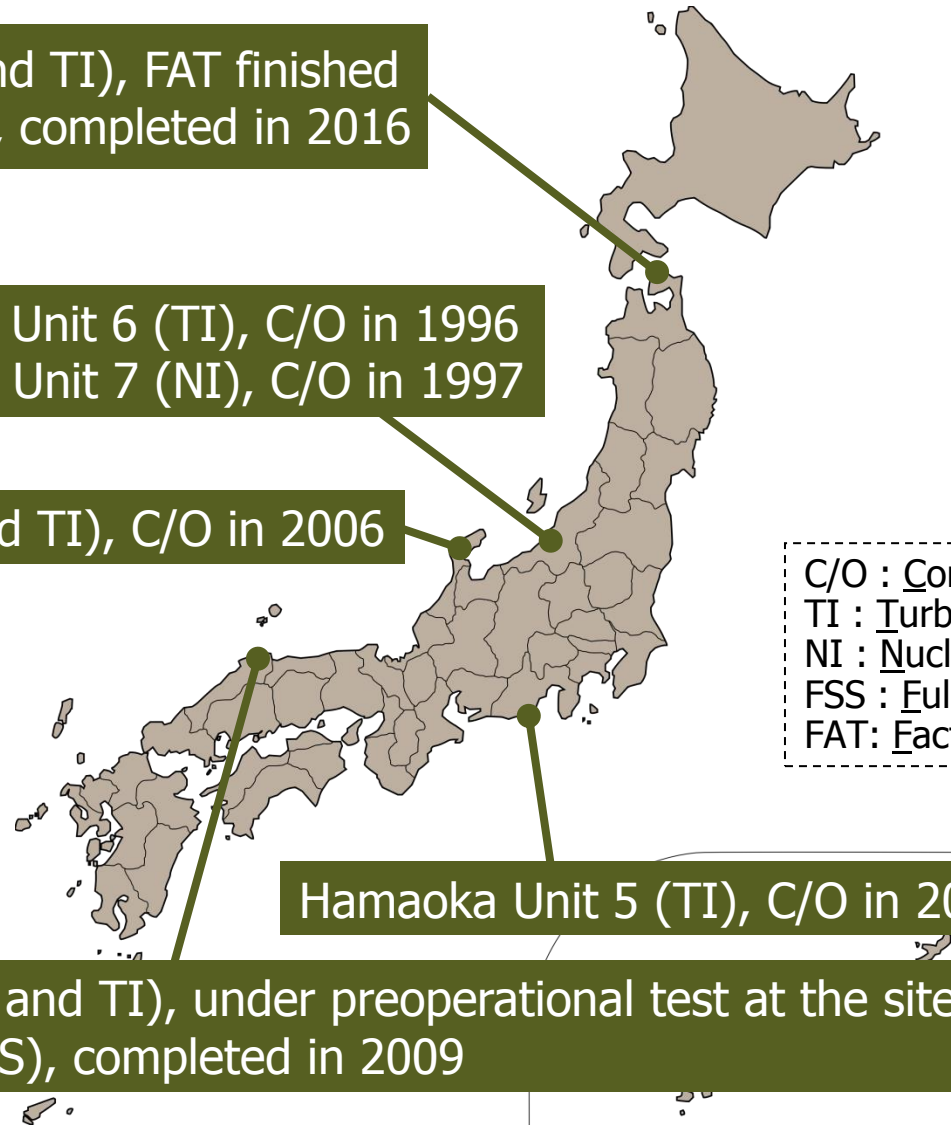
Kashiwazaki-Kariwa Unit 6 (TI), C/O in 1996  
Unit 7 (NI), C/O in 1997

Shika Unit 2 (NI and TI), C/O in 2006

C/O : Commercial Operation  
TI : Turbine Island  
NI : Nuclear Island  
FSS : Full Scope Simulator  
FAT: Factory Acceptance Test

Hamaoka Unit 5 (TI), C/O in 2005

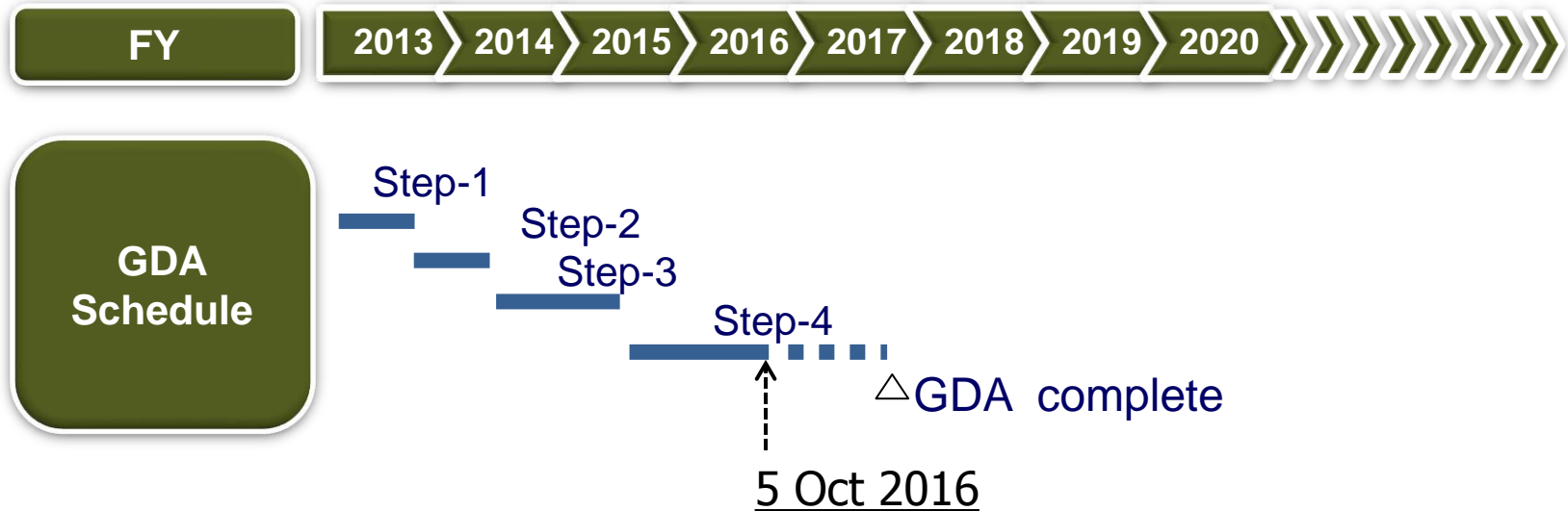
Shimane Unit 3 (NI and TI), under preoperational test at the site (FSS), completed in 2009



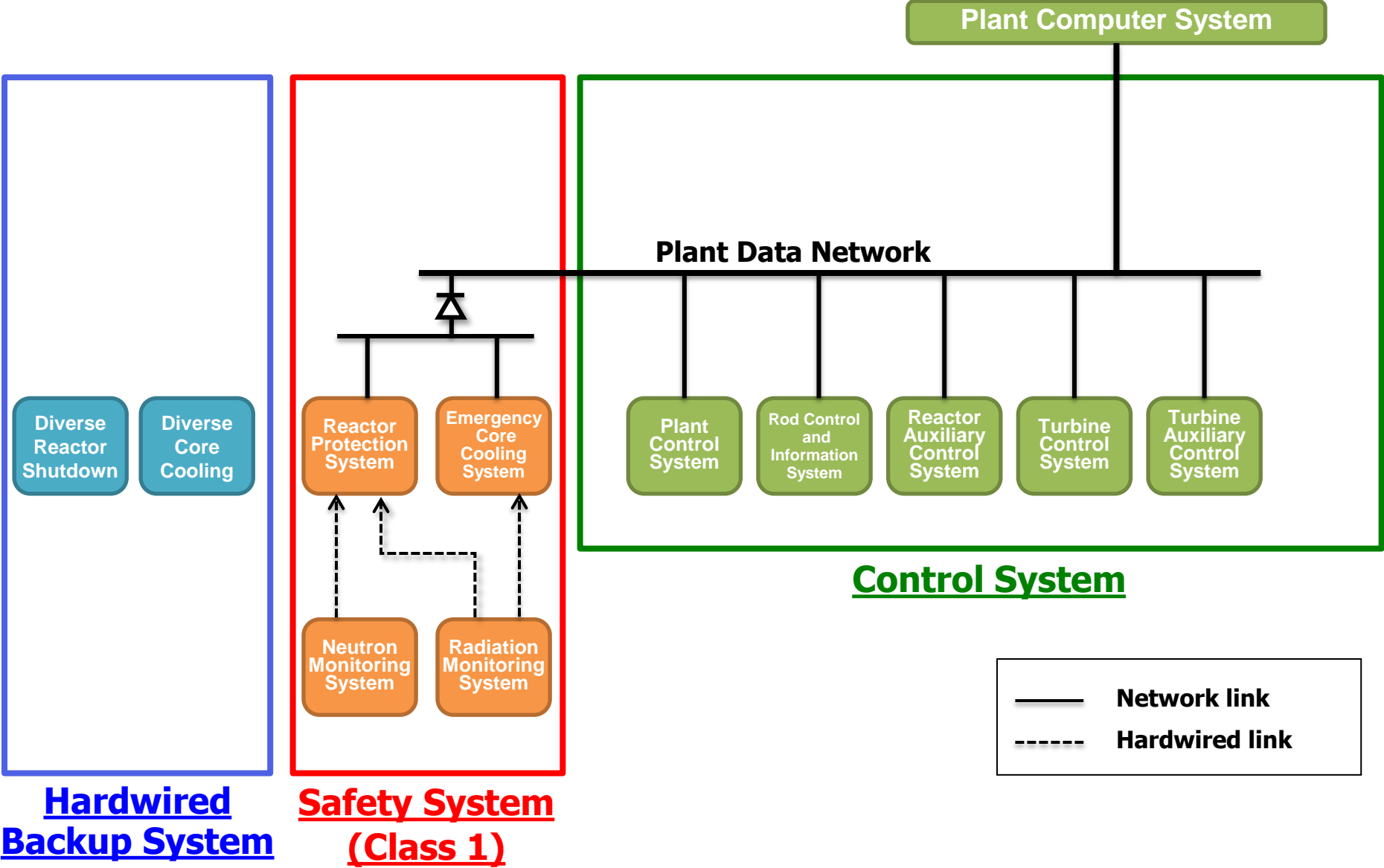
- Horizon Nuclear Power is planning to build 1,350 MWe class Advanced Boiling Water Reactors (ABWR) in Wylfa and Oldbury.
- The primary focus is to secure all key agreements and permissions in place for the Final Investment Decision in 2019.
- Commercial operation of the 1st unit at Wylfa is planned to be in the first half of the 2020s.



- Hitachi GE Nuclear Energy (HGNE), as an ABWR supplier, officially applied Generic Design Assessment (GDA) licensing process to the UK regulator in 2013.
- Final process of Step-4 has been started and will be completed in December, 2017 based on the latest timeline.

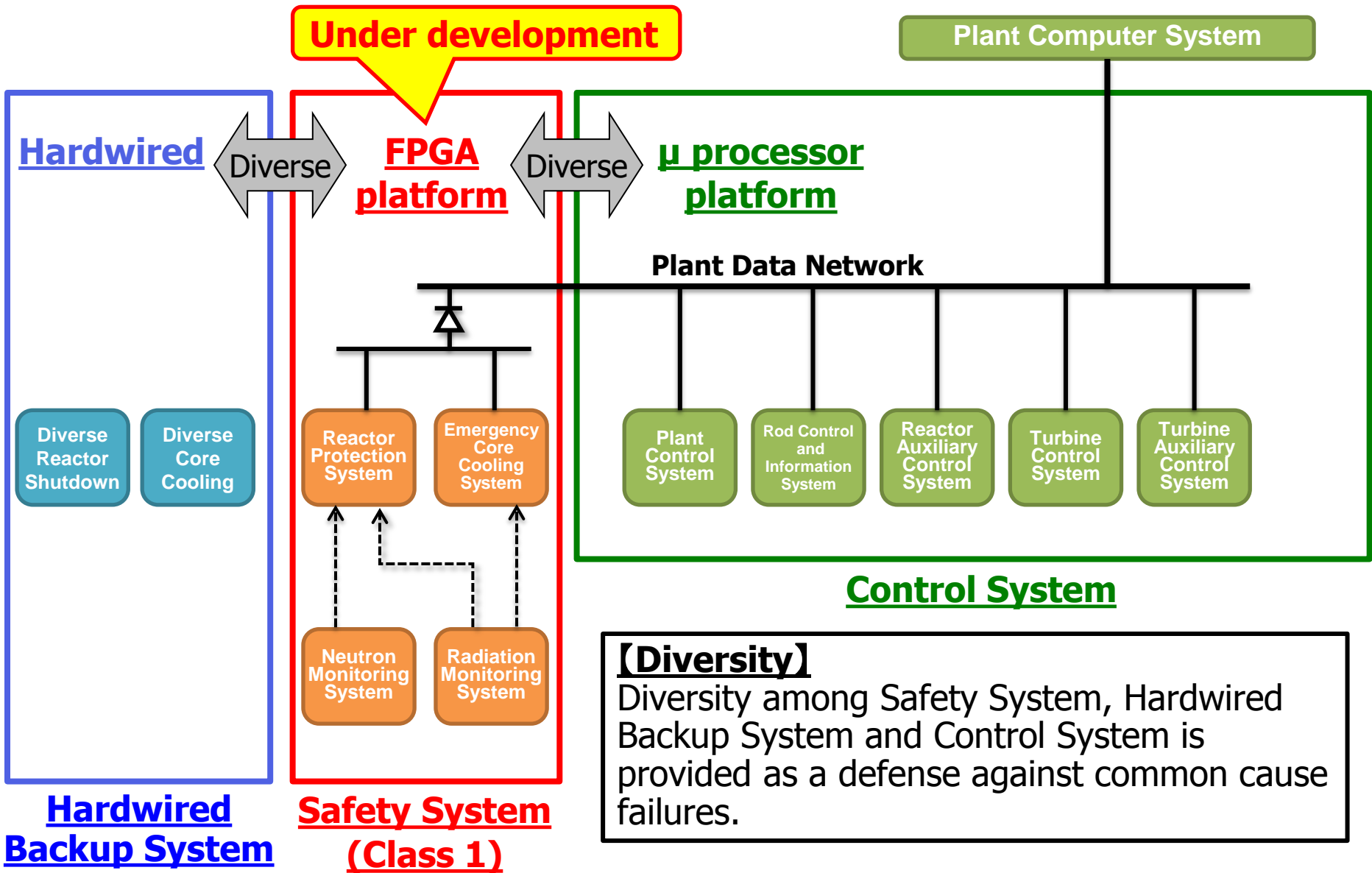


# Overall UK ABWR System Configuration

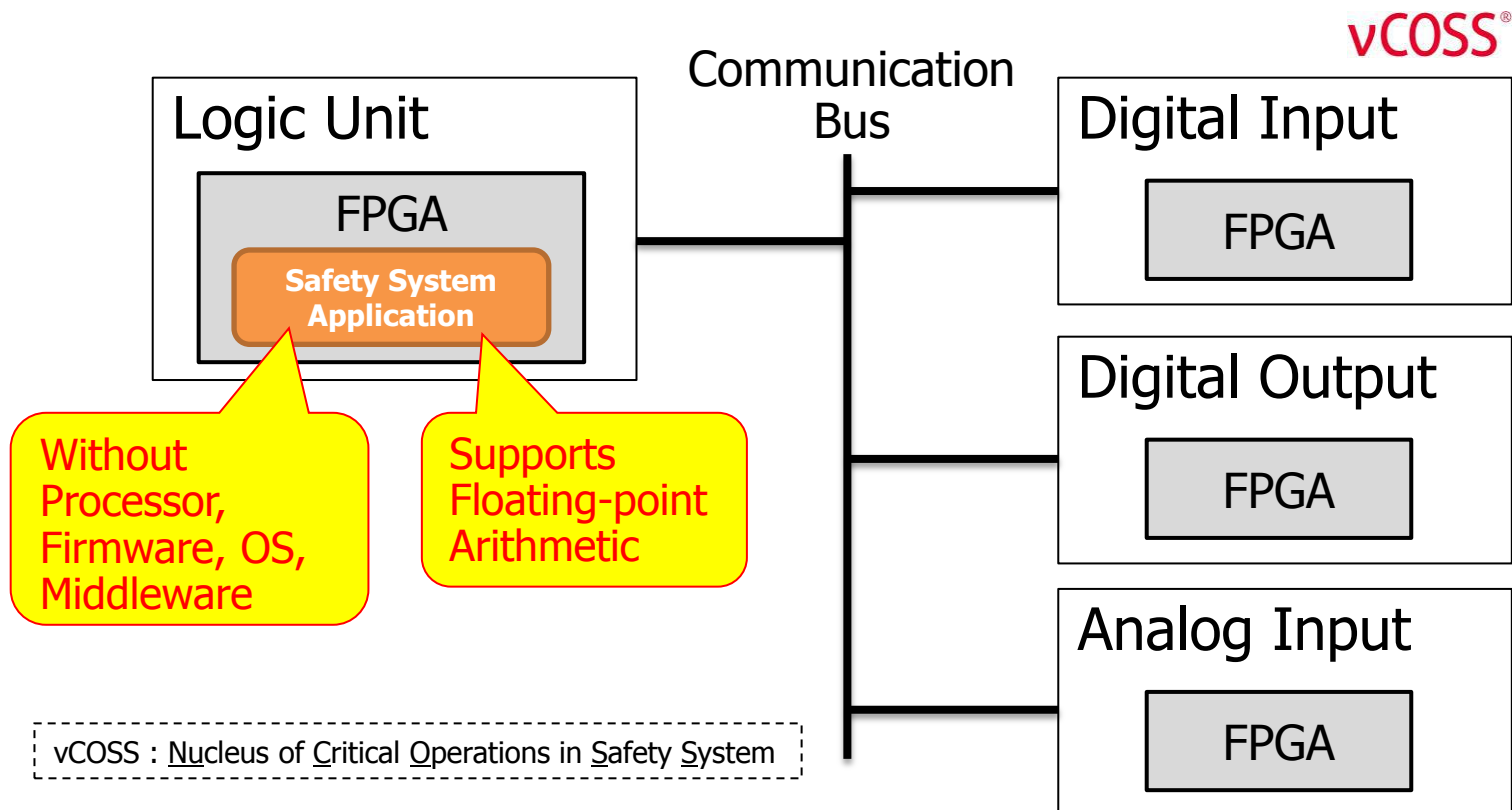




# The Key UK Regulatory Expectation (Diversity)



- Each module has FPGAs inside, and connected to a communication bus.
- The Logic Unit supports floating-point arithmetic without relying on an FPGA vendor's floating-point IP cores.



- The UK Regulatory Expectations

- $10^{-4}$  PFD
- Compliant to SAP, TAG-046, IEC 61513, IEC 62566
- Independent Confidence Building Measures (ICBM)

PFD : Probability of Failure on Demand  
SAP : Safety Assessment Pinciples  
TAG : Technical Assessment Guide

- Hitachi's Target for Platform Development

- IEC 61508 SIL3 (Single) /  
SIL4 (Redundant Configuration)

The development is progressing as scheduled.

**Further information to be shared later in this project!**

**END**



## **Introduction of Class 1 FPGA Platform for the UK ABWR**

**Hideo Harada**  
**Satoshi Nishikawa**

Hitachi, Ltd.

**HITACHI**  
Inspire the Next 