Non-Proprietary Version

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Agenda

- **Technical Briefing on Non-Rewritable (NRW) Field Programmable Gate Array (FPGA) based Reactor Trip and Isolation System (RTIS) and Neutron Monitoring System (NMS)**
- **FPGA-Based Organization and Processes**
- **Follow up discussion on 5/7/2009 closed meeting**
  - Feedback from NRC on STP 3&4 I&C Programmatic DAC review
  - I&C Engineering Procurement and Construction (EPC) team meeting schedule
  - Training opportunities
  - Schedule overview

Desired Outcomes

- **Provide overview of Non-Rewritable Field Programmable Gate Array (FPGA) design to familiarize the NRC Staff Reviewers with the FPGA Technology.**

- **Continue established dialog with NRC Staff Reviewers and STPNOC on Project Schedule and NRC Staff needs.**

STPNOC Meeting Participants

- **STPNOC:**
  - Scott Head
  - Mike Murray
  - Kyle Dittman
  - Jerry Mauck
- **Toshiba:**
  - Shigeru Suzuki
  - Toshifumi Sato
  - Naotaka Oda
- **TANE:**
  - Fumihiko Ishibashi
  - Jun Ikeda
  - Craig Swanner (MPR)
  - David Herrell (MPR)
- **WEC:**
  - Bob Quinn
  - Mark Stofko
- **Sargent & Lundy:**
  - Mark Santschi

FPGA Technical Briefing

- **Presenters**
  - Kyle Dittman (STPNOC)
  - Naotaka Oda (Toshiba)
  - Craig Swanner (TANE)

Toshiba's Goal for the FPGA-based Systems

- Toshiba FPGA-based I&C Systems are designed as an alternative to analog and microprocessor-based I&C systems
- Toshiba NRW FPGA Systems have been selected for use at STP 3&4
  - Startup Range Neutron Monitoring (SRNM)
  - Power Range Neutron Monitoring (PRM)
    - Local Power Range Neutron Monitoring (LPRM)
    - Average Power Range Neutron Monitoring (APRM)
    - Oscillation Power Range Neutron Monitoring (OPRM)
  - Reactor Trip and Isolation System (RTIS)

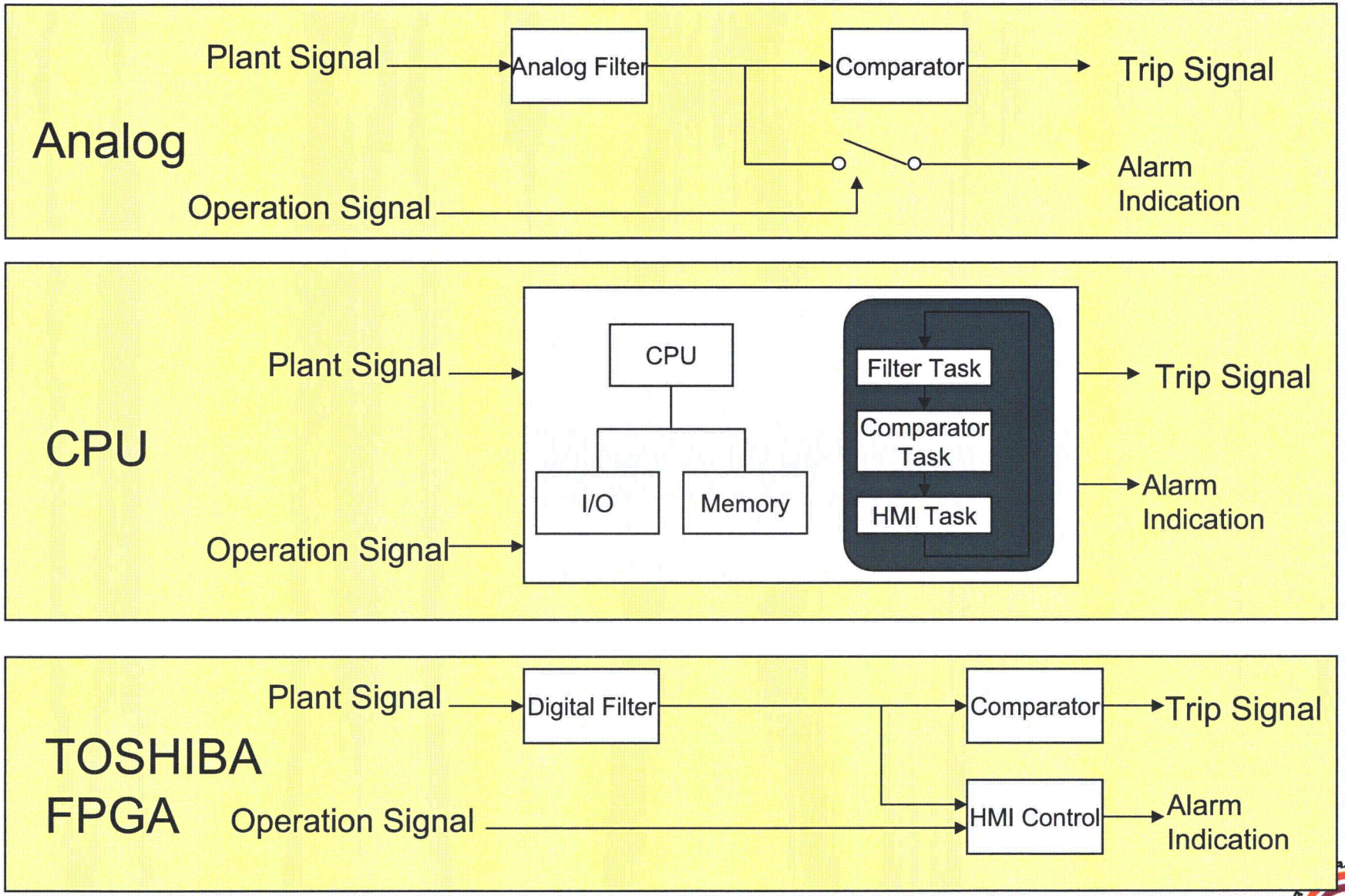
Toshiba Experience with Digital I&C for BWRs

- Toshiba has supplied FPGA-based equipment to Japanese Nuclear Power Plants. For example:
  - Supplied safety- and nonsafety-related Process Radiation Monitoring to many plants, including:
    - Fukushima daiichi-2
    - Fukushima daini-1
    - Fukushima daini-3
    - Kashiwazaki Kariwa-1
    - Tsuruga-1
  - Supplied safety-related Power Range Neutron Monitor system for Kashiwazaki Kariwa-2, with additional shipment to Fukushima daiichi-6
- These were developed under the ISO-9001 QA process.
- The equipment is currently in operation.

Definition of FPGA

- **FPGA: Field Programmable Gate Array**
  - An FPGA is an integrated circuit where logic can be implemented by the system designer, as opposed to coming from the IC fabricator with a fixed set of logic.
- **NRW-FPGA: Non-Rewritable FPGA**
  - A type of FPGA that can not be rewritten once the logic is embedded.
- **Signal processing functions embedded in an FPGA are composed of digital logic, more like a hardware-based system.**
- **Toshiba uses a hardware logic development language, similar to conventional programming languages.**

Technology Comparison



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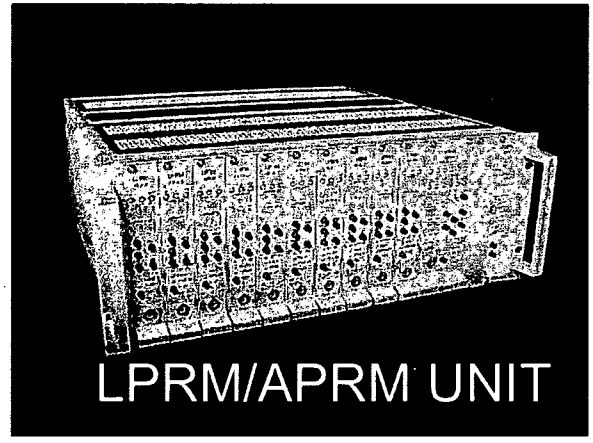
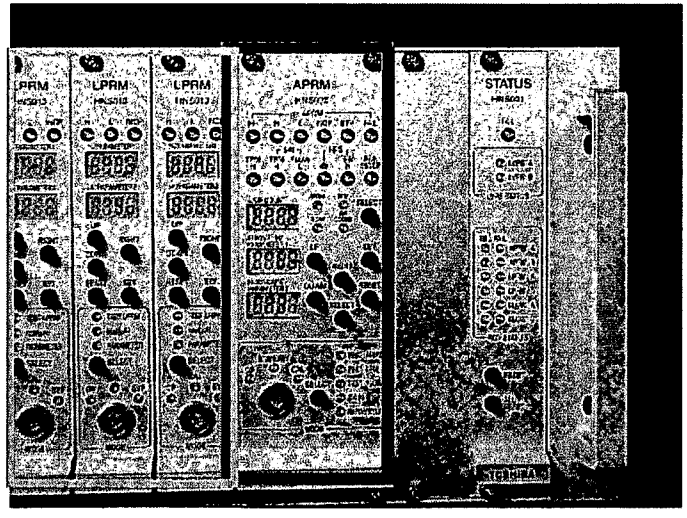
Modular Design

- Toshiba builds systems from modules.
- Upper level "building block" is a unit.
- The unit is a chassis that has front and back slots to mount modules.
- A backplane inside the chassis provides signal connections between modules.
- Each unit consists of several different types of modules.





LPRM Modules APRM Module

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FPGA-Based Neutron Monitoring System (NMS)

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NMS Outline

NMS consists of Safety-Related and Non-Safety-Related Subsystems as follows. Toshiba has FPGA-based I&C in Japanese plants. STPNOC is working with Toshiba to license this technology for STP Units 3&4 through the DAC / ITAAC process.

Safety-Related Subsystems:

- Startup Range Neutron Monitor (SRNM)
- Local Power Range Monitor (LPRM)
- Average Power Range Monitor (APRM)
- Oscillation Power Range Monitor (OPRM)

} Power Range Neutron Monitor (PRNM)

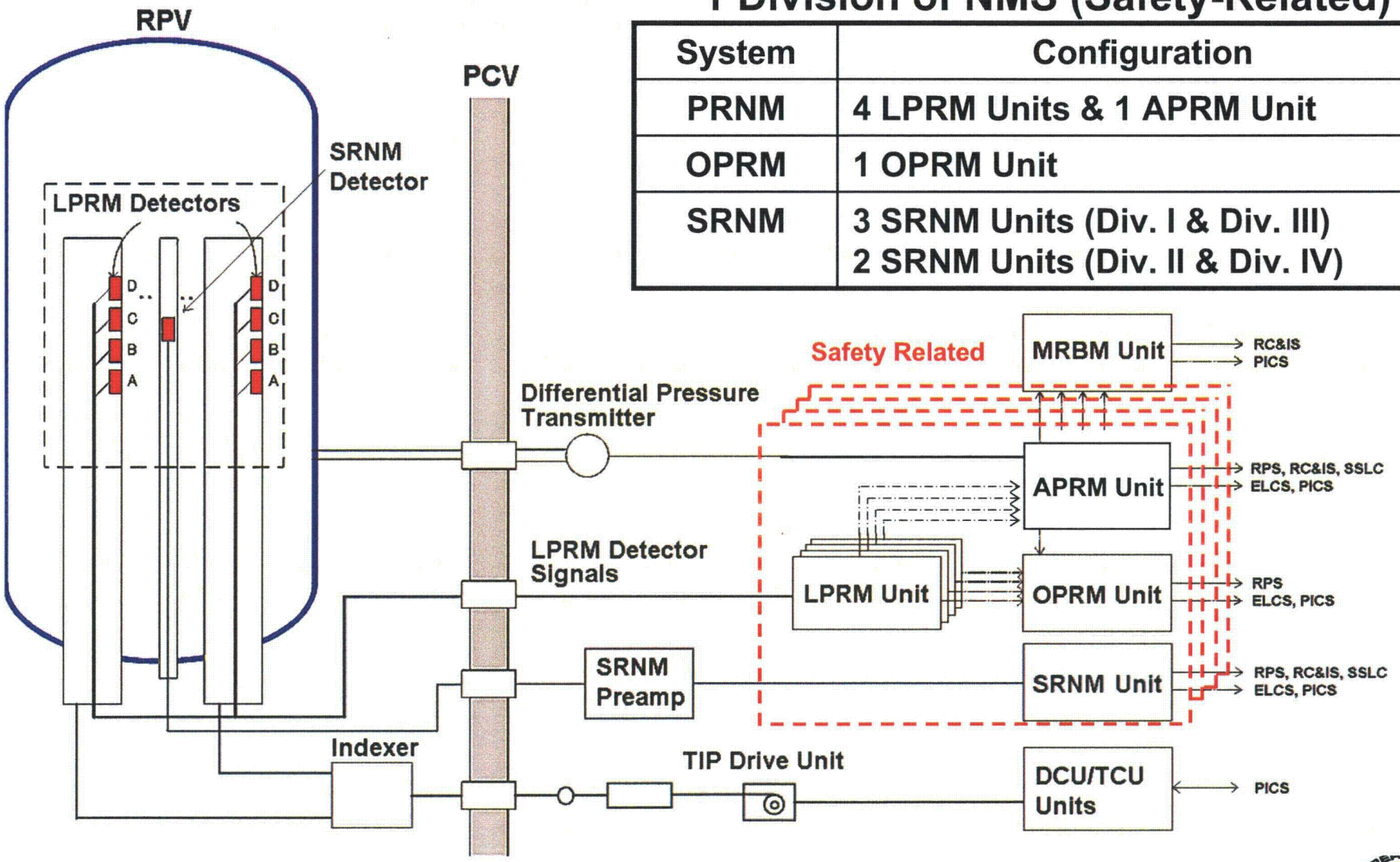
Non-Safety-Related Subsystems:

- Multi-Channel Rod Block Monitor (MRBM)
- Automatic Traversing In-core Probe (ATIP)

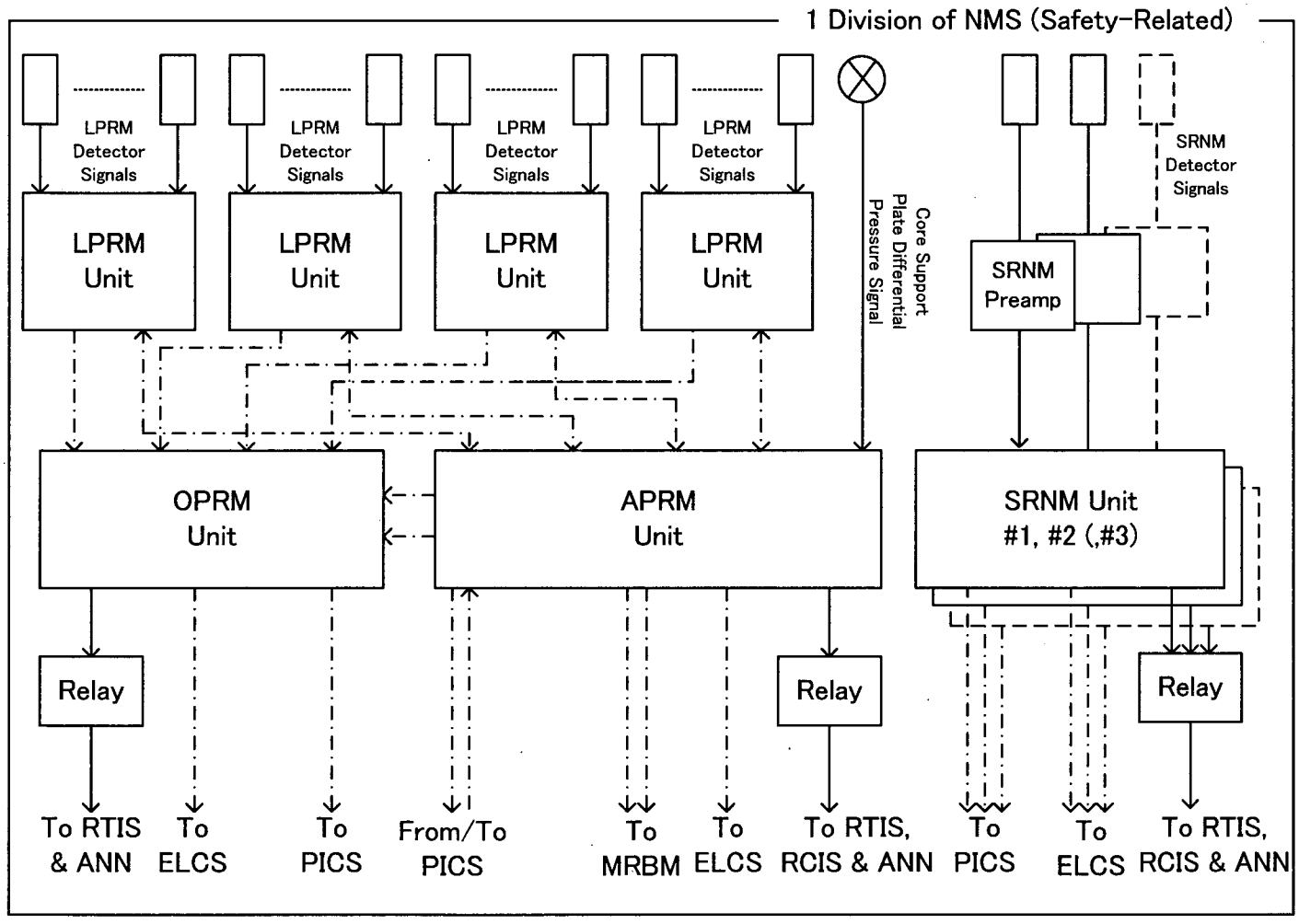
NMS System Outline

1 Division of NMS (Safety-Related)

System	Configuration
PRNM	4 LPRM Units & 1 APRM Unit
OPRM	1 OPRM Unit
SRNM	3 SRNM Units (Div. I & Div. III) 2 SRNM Units (Div. II & Div. IV)



Safety-Related NMS Configuration

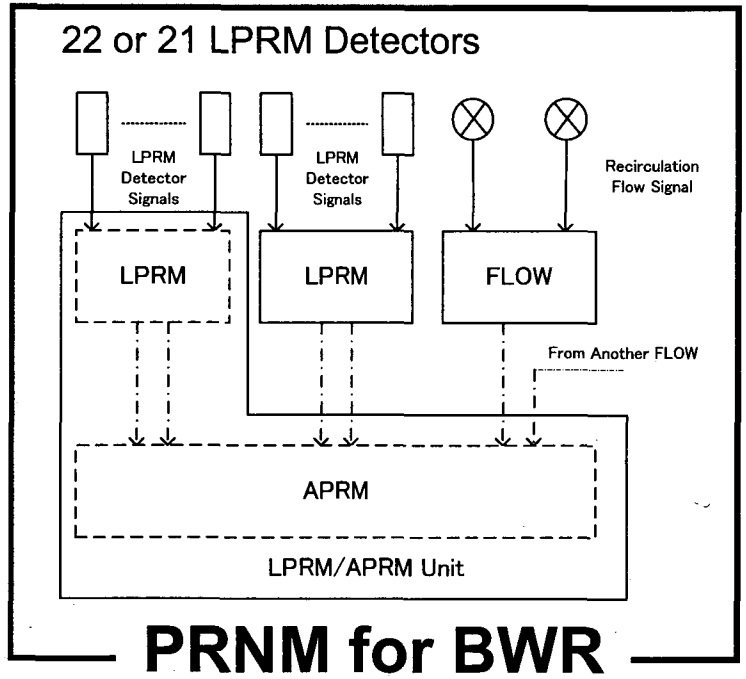


PRNM Background

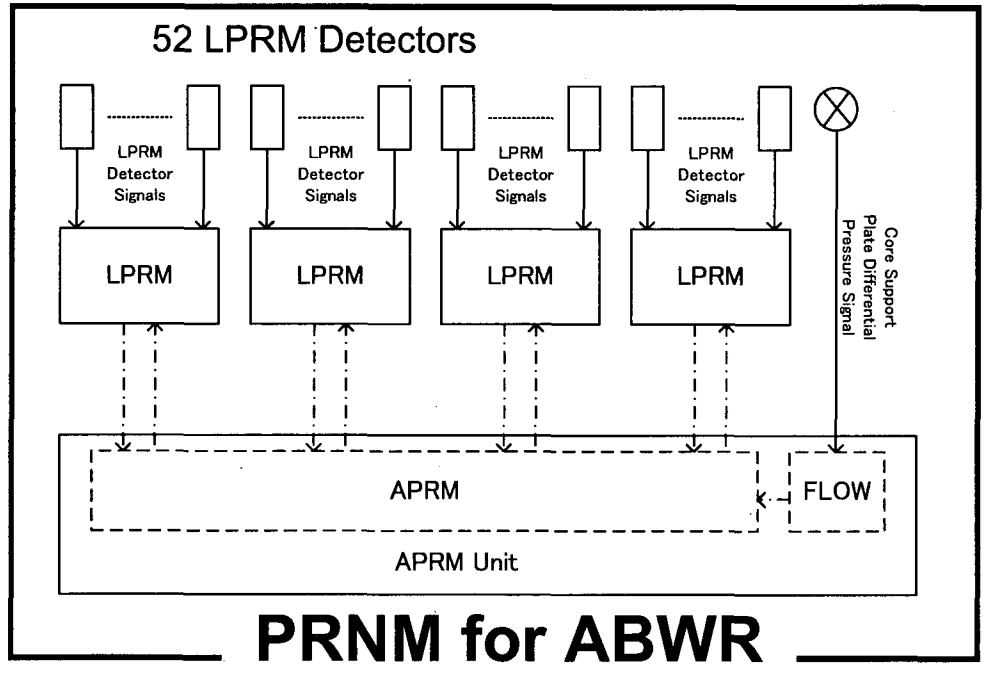
- Toshiba has 13 years of experience of implementing CPU-based PRNM for BWR & ABWR plants in Japan.
- Toshiba has experience with FPGA-based PRNM for Japanese BWR plants.
- Toshiba has developed an FPGA-based PRNM for Japanese ABWR plants.
- Toshiba is modifying the Japanese ABWR PRNM design to meet the STP 3&4 based on COLA requirements.

PRNM Differences for BWR & ABWR

ABWR PRNM are different based on the BWR design. There are 52 ABWR LPRM inputs in each division. The ABWR measures flow using the core support plate differential pressure signal. The LPRM Gain Adjustment Factor (GAF) is downloaded from the PICS.



PRNM for BWR
(1 APRM Part)



PRNM for ABWR
(1 Division)

ABWR PRNM System Specification

- There are 208 LPRM detectors in the core. LPRM detector signals are divided and assigned to four APRM channels corresponding to four divisions.
- LPRM monitors local neutron flux at each LPRM detector signal in the power range from 0% to 125% of rated power.
- APRM monitors average neutron flux of LPRM signals and generates a high neutron flux trip, a simulated thermal power (STP) trip signal, and a Core Flow Rapid Coastdown trip to the Reactor Trip and Isolation System (RTIS).
- OPRM monitors the LPRM signals for core instability and generates trips for RTIS.
- On operator demand, the LPRM units receive GAF from PICS through the APRM unit and accepts the GAF on each PRNM.

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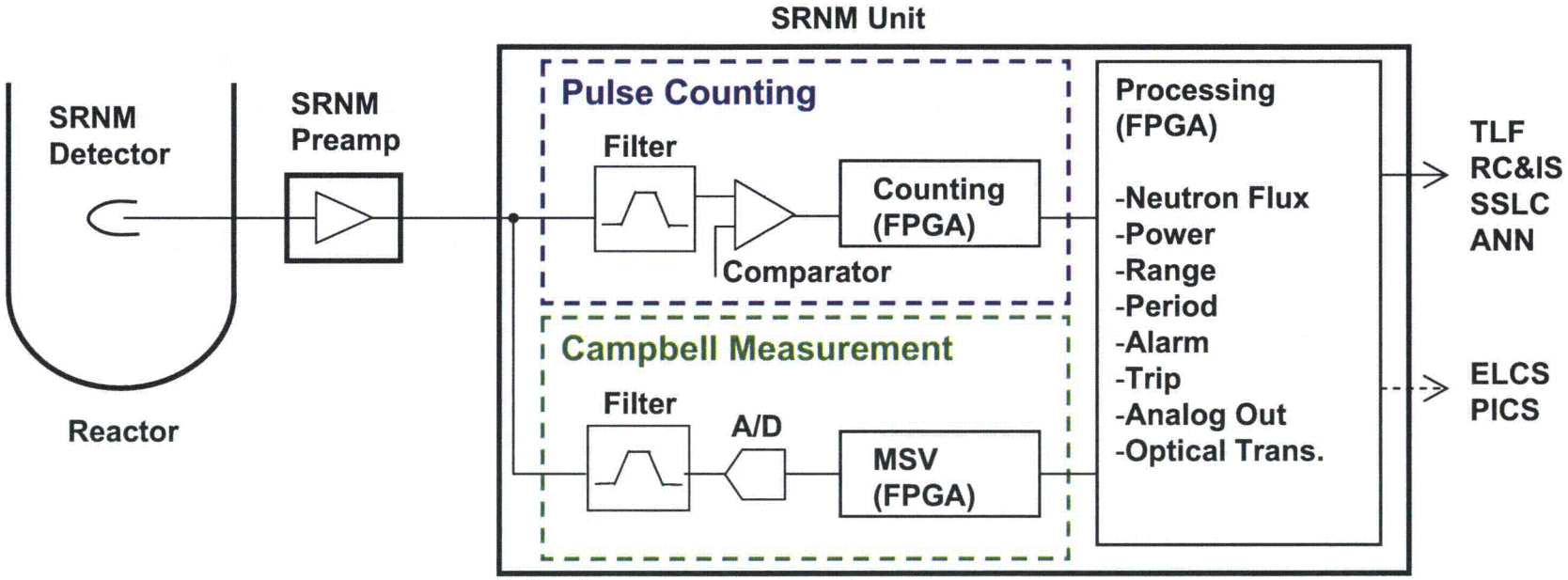
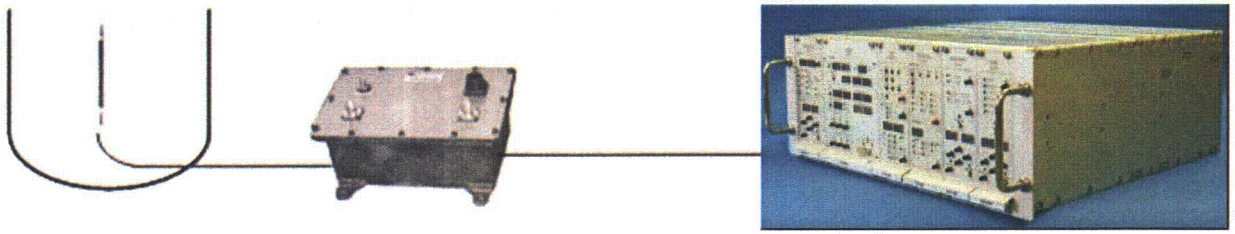
Startup Range Neutron Monitor (SRNM) Background

- Toshiba has 18 years of experience of implementing CPU-based SRNM for Japanese BWR plants.
- Toshiba has developed FPGA-based SRNM for Japanese BWR plants.
- Toshiba will ship FPGA-based SRNM for Japanese BWR plant in May 2009.
- Toshiba is modifying the SRNM Unit for STP 3&4 to meet the requirements of the COLA.

SRNM Outline

- **SRNM Configuration**





SRNM System Specification

- There are 10 SRNM detectors in the core. SRNM detector signals are divided and assigned to four divisions.
- SRNM monitors neutron flux from the source range (10^3 neutron/$cm^2 \cdot$sec) to around 15% of the rated power.
- For the over 10-decade SRNM range, both the counting method and the Campbelling technique (mean square voltage, or MSV measurement) are used.
- The calculation algorithm of the period-based trip circuitry generates the trip margin setpoint for the period trip protection function.

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FPGA-Based Reactor Trip and Isolation System

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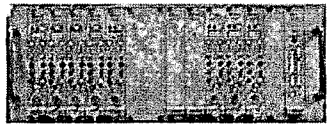
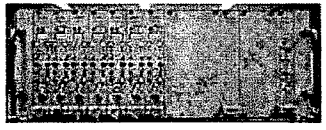
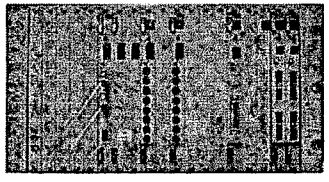
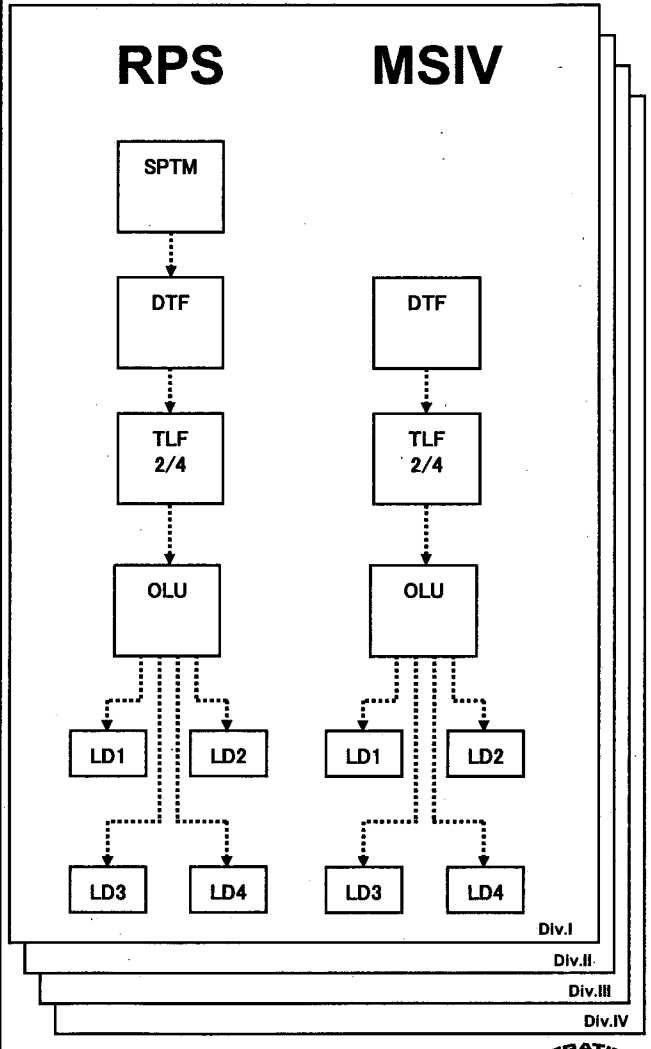
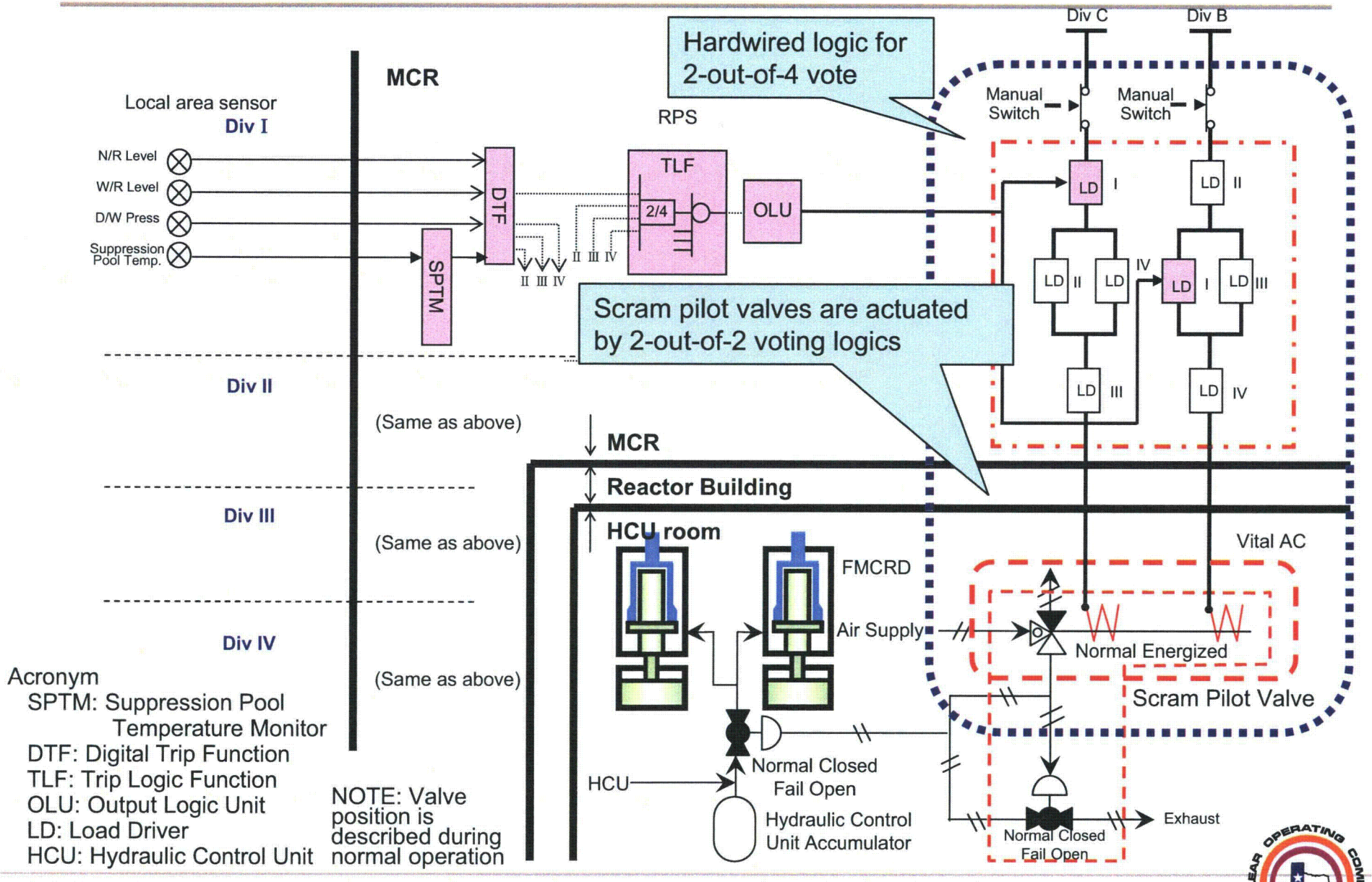
RTIS System Outline

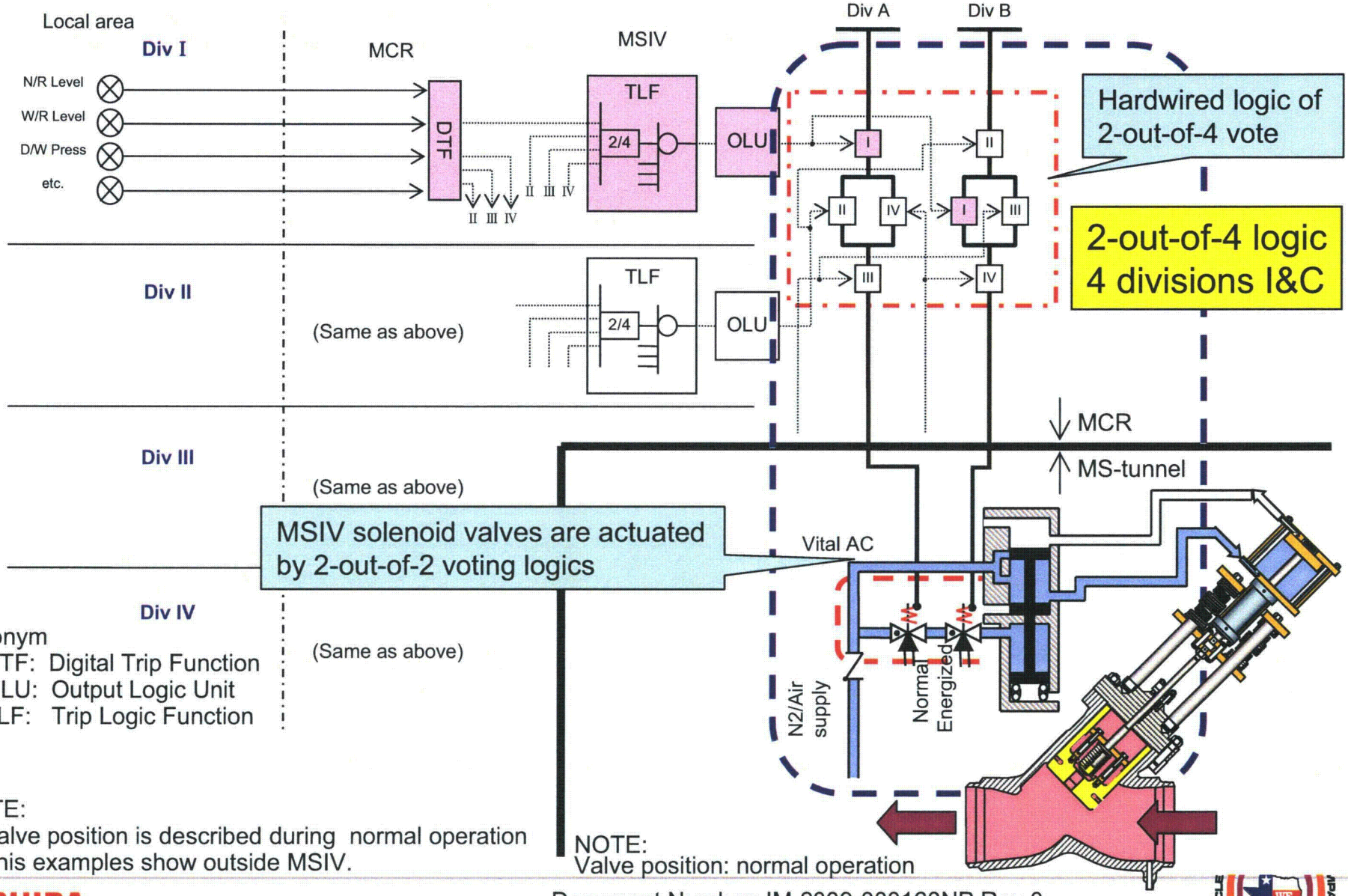
SPTM	**[Suppression Pool Temperature Monitor]** **SPTM provides trip signal to DTF when the calculated average temperature exceeds the setpoint.**	
DTF	**[Digital Trip Function]** **The DTM compares individual monitored variable values with trip setpoint values and sends a separate, discrete (trip/no trip) output signal to TLF.**	
TLF	**[Trip Logic Function]** **TLF performs the 2-out-of-4 voting function.**	
OLU	**[Output Logic Unit]** **The OLUs perform division trip, seal-in, reset, and trip test function.**	
LD	**[Load Driver]** **RPS : Driver for Control Rod Drive Scram Pilot Valve** **MSIV : Driver for MSIV Solenoid Valve**	



Reactor Trip



MSIV Closure Logic



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FPGA-Based Organization and Processes

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Summary

- Toshiba has FPGA based Safety-Related NMS Subsystems for Japanese ABWRs, and is developing OPRM for US plants.
- Development of FPGA-based RTIS on schedule.
  - Design and manufacture for all prototype modules complete.
- Toshiba will complete a STP 3&4-specific technical report for the NMS and RTIS, similar to Generic Topical Report (G-TR).
- This STP 3&4 technical report will be made available for NRC review through the DAC / ITAAC process.

Follow up discussion

- **Follow up discussion on 5/7/2009 closed meeting**
  - Feedback from NRC on STP 3&4 I&C Programmatic DAC review
  - I&C Engineering Procurement and Construction (EPC) team meeting schedule
  - Training opportunities
  - Schedule overview

I&C EPC Meetings

- Engineering Procurement and Construction (EPC) Team meeting 2009 schedule Tentative Date & Location
  - May 26-27 Bay City, TX
  - June 23-24 San Jose, CA
  - July 21-22 Chicago, IL
  - August 25-26 Pittsburgh, PA
  - September 15-16 Bay City, TX
  - October 20-21 Chicago, IL
  - November 17-18 Pittsburgh, PA
  - December 15-16 San Jose, CA

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Affidavit for Withholding Confidential and Proprietary Information from Public Disclosure under 10 CFR § 2.390

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of

STP Nuclear Operating Company — Docket Nos.52-012, 52-013

South Texas Project
Units 3 and 4

AFFIDAVIT

I, Naoki Asano, being duly sworn, hereby depose and state that I am Senior Manager, Control & Electrical System Design & Engineering Department, Nuclear Energy Systems & Services Division, Power Systems Company, Toshiba Corporation; that I am duly authorized by Toshiba Corporation to sign and file with the Nuclear Regulatory Commission the following application for withholding Toshiba Corporation's confidential and proprietary information from public disclosure; that I am familiar with the content thereof; and that the matters set forth therein are true and correct to the best of my knowledge and belief.

In accordance with 10 CFR § 2.390(b)(ii), I hereby state, depose, and apply as follows on behalf of Toshiba Corporation:

(A) Toshiba Corporation seeks to withhold from public disclosure the document entitled and identified as "South Texas Project Units 3 & 4, NRC I&C Meeting" Revision 0 (IM-2009-000160P), and all information identified as "Proprietary" therein (collectively, "Confidential Information").

(B) The Confidential Information is owned by Toshiba Corporation. In my position as Senior Manager, Control & Electrical System Design & Engineering Department, Nuclear Energy Systems & Services Division, Power System Company, Toshiba Corporation, I have been specifically delegated the function of reviewing the Confidential Information and have been authorized to apply for its withholding on behalf of Toshiba Corporation.

(C) This document is the presentation material for May 20th meeting to provide technical briefing on Non-Rewritable (NRW) Field Programmable Gate Array (FPGA) based I&C systems applied for South Texas Project Units 3&4. The Confidential Information which is entirely confidential and proprietary to Toshiba Corporation is indicated in the document using brackets.

(D) Consistent with the provisions of 10 CFR § 2.390(a)(4), the basis for proposing that the Confidential Information be withheld is that it constitutes Toshiba Corporation's trade secrets and confidential and proprietary commercial information.

(E) Public disclosure of the Confidential Information is likely to cause substantial harm to Toshiba Corporation's competitive position by (1) disclosing confidential and proprietary commercial information about the design and manufacture I&C systems for nuclear power reactors to other parties whose commercial interests may be adverse to those of Toshiba Corporation, and (2) giving such parties access to and use of such information at little or no cost, in contrast to the significant costs incurred by Toshiba Corporation to develop such information.

Further, on behalf of Toshiba Corporation, I affirm that:

(i) The Confidential Information is confidential and proprietary information of Toshiba Corporation.

(ii) The Confidential Information is information of a type customarily held in confidence by Toshiba Corporation, and there is a rational basis for doing so given the sensitive and valuable nature of the Confidential Information as discussed above in paragraphs (D) and (E).

(iii) The Confidential Information is being transmitted to the NRC in confidence.

(iv) The Confidential Information is not available in public sources.

(v) Public disclosure of the Confidential Document is likely to cause substantial harm to the competitive position of Toshiba Corporation, taking into account the value of the Confidential Information to Toshiba Corporation, the amount of money and effort expended by Toshiba Corporation in developing the Confidential Information, and the ease or difficulty with which the Confidential Information could be properly acquired or duplicated by others.

Naoki Asano

May 25 2009

Naoki Asano
Date

Senior Manager
Control & Electrical System Design & Engineering Department
Nuclear Energy Systems & Services Division
POWER SYSTEMS COMPANY
TOSHIBA CORPORATION

平成２１年登簿第　　65　　号

認　　証

嘱託人株式会社東芝部長浅野直樹は、公証人の面前で、添付書面に署名した。

よって、これを認証する。

平成２１年　5　月　25　日、本公証人役場において

横浜市中区羽衣町2丁目7番10号

横浜地方法務局所属

公　証　人

Notary　寺西賢一

KENJI　TERANISHI

証　　明

上記署名は、横浜地方法務局所属公証人の署名に相違ないものであり、かつ、その押印は、真実のものであることを証明する。

平成２１年　5　月　25　日

横浜地方法務局長　紺野清幸

APOSTILLE

(Convention de La Haye du 5 octobre 1961)

1. Country : JAPAN
   This public document
2. has been signed by　KENJI　TERANISHI
3. acting in the capacity of Notary of the Yokohama District Legal Affairs Bureau
4. bears the seal/stamp of　KENJI　TERANISHI　, Notary

Certified

5. at Tokyo　　6. MAY. 25. 2009
7. by the Ministry of Foreign Affairs
8. 09-№ 300544
9. Seal/stamp :　　10.Signature :

MINISTRY OF FOREIGN AFFAIRS 外務省 JAPAN

K. Oyabe

Kazutoyo OYABE
For the Minister for Foreign Affairs

Registered No. 63 of 2009.

Certificate of Acknowledgment of Notary

On this 25th day of May, 2009, before me, KENJI TERANISHI, a notary in and for YOKOHAMA District Legal Affairs Bureau, personally appeared NAOKI ASANO, Senior Manager of TOSHIBA Corporation, with satisfactory evidence of his identification, affixed his signature to the attached document.

Witness, I set my hand and seal.

Notary Notary's seal(Official)

Kenji Teranishi

KENJI TERANISHI

Kannai-odori Notary office

2-7-10, Hagoromocho, Naka-ku, Yokohama-city, Japan.

Attached to the Yokohama District Legal Affairs Bureau.