

**IEEE SC-2 Meeting
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Microprocessor Based Instrumentation in Nuclear Safety Applications

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Rosemount Nuclear**



Emerson Process Management (Formerly Fisher-Rosemount Group)

World Renowned Names in Process Automation: Unparalleled Breadth of Supply

Emerson

**Emerson Process Management
(formerly Fisher-Rosemount Group)**

Measurement and Analytical

- **Rosemount Measurement**
- **Rosemount Nuclear**

- Dieterich Standard
- PI Components/Senpro
- Micromotion
- Brooks
- Daniel Industries

ROSEMOUNT[®]
Nuclear

- Uniloc
- Rosemount Analytical
 - Liquid & Gas

Systems & Solutions

- Fisher-Rosemount Systems(Delta V)
- Power and Water Systems (Westinghouse PCD-Ovation)
- Asset Management Systems(AMS)
- Field Automation Systems
- Computational Systems, Inc (CSI)
- Intellution
- MDC Technology

- Kenonic Controls
- PC&E
- Orion
- Entech
- Global Energy Services

Final Control Elements

- Fisher Controls
 - Valves
 - Regulators
- Gulde
- El-O-Matic
- Con-Tek
- H. D. Baumann
- Francel


EMERSON[™]
Process Management

Current Instrumentation Technologies

- **Industrial (Commercial) grade instrumentation**
- Technology lowers cost of ownership
 - Performance
 - Availability
 - Features
 - World wide approvals
 - Design and Test using global standards

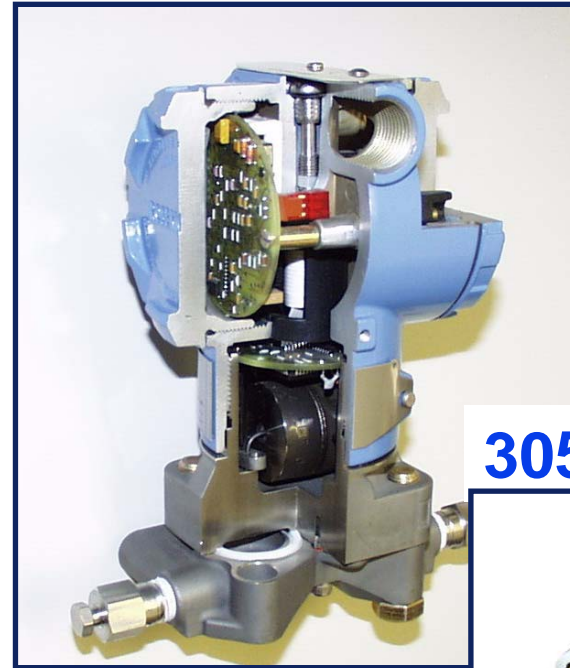


Current Instrumentation Technologies

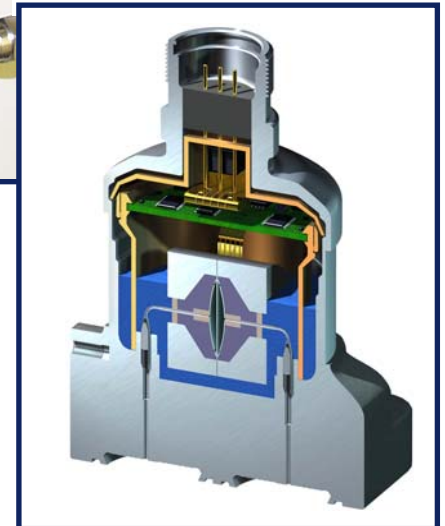
→ What's driving benefits?

- Industrial Market demands *HIGH INNOVATION*
- Microprocessor based electronics
- Advanced mechanical architectures
- Advanced sensors
- World class operations (supply, manufacturing, support)

Model 3051C



3051S Series



Microprocessor Based Products - Performance Benefits

DP Level Application (250 in H₂O)

Analog 1153



Smart 3051N



Smart 3051S



Accuracy:

± 0.6 in H₂O

± 0.2 in H₂O

± 0.1 in H₂O

Temperature Effect:
Δ 50°F (28°C)

± 3.5 in H₂O

± 0.2 in H₂O

± 0.1 in H₂O

Stability/Drift:

± 1.5 in H₂O/30mos

± 0.3 in H₂O/60mos

± 0.5 in H₂O/120mos

Improved TPE/Calorimetrics

Microprocessor Based Products - Other Benefits

- **Diagnostics**
- **Improved Rangeability/Scalability**
 - Less Inventory
- **Simplified Calibration**
- **Availability (lead time)**
 - Commercial pressure transmitter: ***2-3 days***
 - Nuclear transmitter: ***4-6 weeks+***

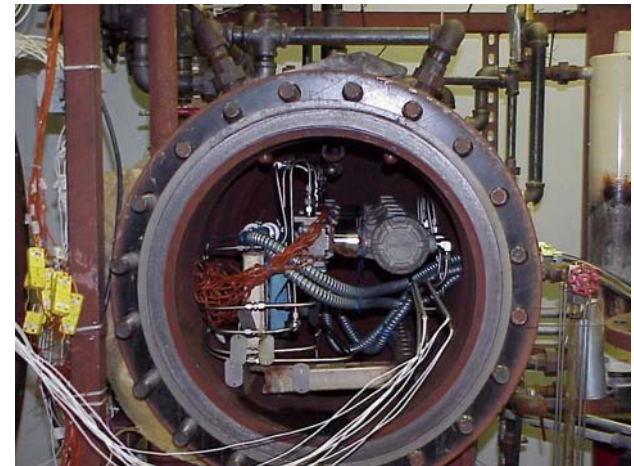
Microprocessor Based Products - Challenges in Nuclear Safety Applications

→ Design Basis Event Stressors

– Radiation tolerance of IC's

- Microprocessors, Memory, Op-amps, Converters, Oscillators, etc...

– High Temperature impact on IC's, electrical components, and materials



Microprocessor Based Products - Challenges in Nuclear Safety Applications

- **Maintaining Design Control of IC's**
- **Licensing Uncertainty**
- **Training / Experience**
- **Procurement Processes**
- **Qualification Maintenance**
- **Historically Nuclear Safety is a Low Volume - Slow Moving Market**
 - Optimism this is changing
 - R&D investment must be carefully considered

Model 3051N

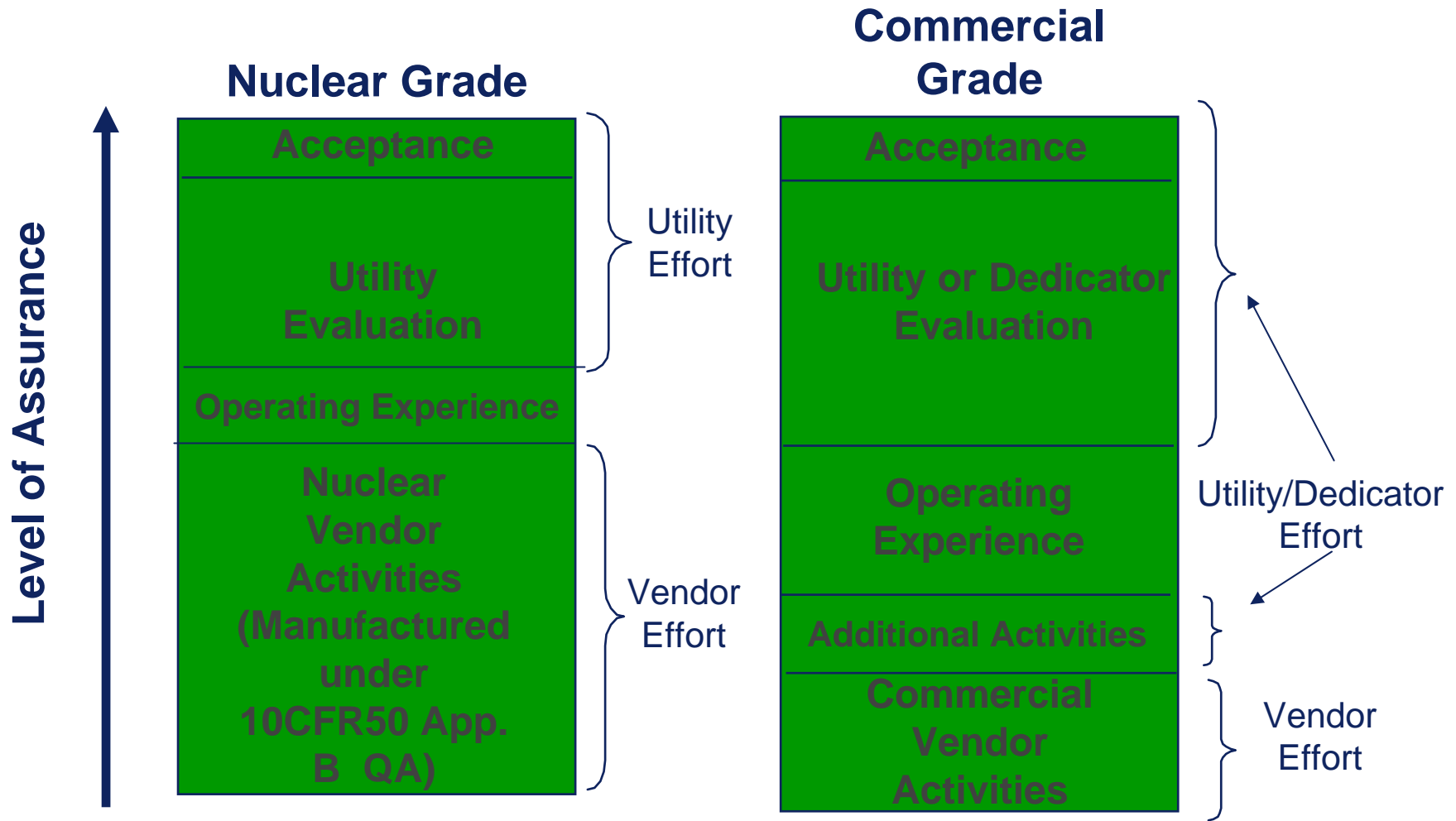
- **Dedicated and Qualified in partnership with EPRI and Utility Sponsors**
- **Class 1E Seismic Qualification**
- **Mild Environments**
- **Typical Applications**
 - Diesel Generator Systems
 - Hydraulic Oil Systems
 - HVAC Systems/Draft range
 - Main Steam Pressure
- **Current 3051N customers include Southern Nuclear, SCE&G, Exelon, Entergy, Florida Power, CP&L, AEP, NAESCO, KEPCO**



Qualified and Dedicated Using

- **IEEE 323-1983**
- **IEEE 344-1987**
- **EPRI TR-106439**
- **EPRI TR-107339**

Nuclear “Dedication” Program



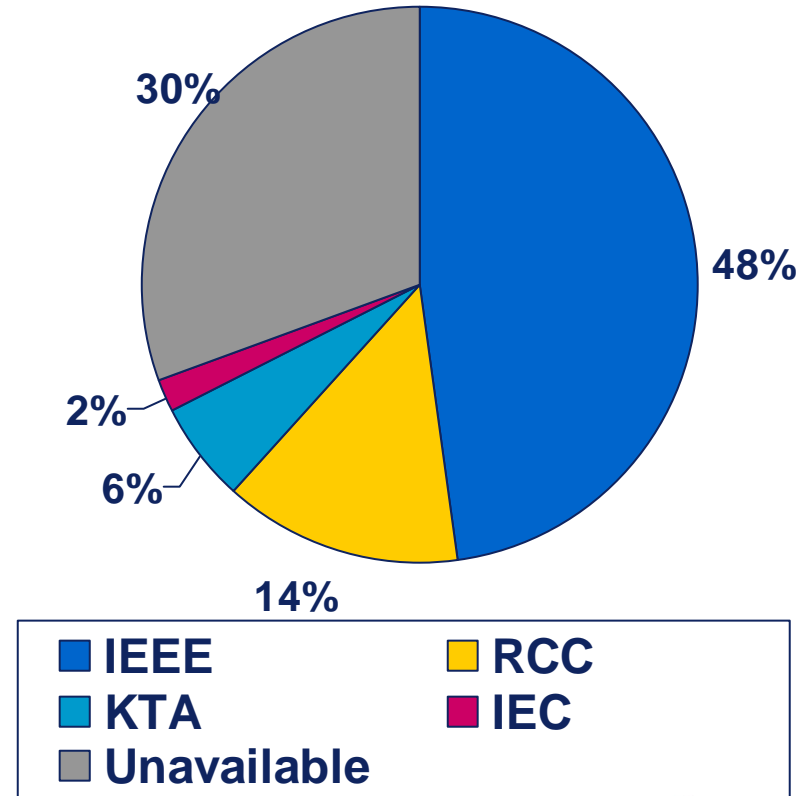
3051N Qualification/Dedication Activities - Based on EPRI TR-106439

Activity	Rosemount responsibility	EPRI responsibility
Critical Digital Review	Support	Lead and document
Operating History Assessment	Support	Lead and document
Review RMD Processes and documentation (commercial grade survey)	Lead and document	Support Especially software oriented items
Functional and Challenge Testing	Lead and document	Support
Seismic Testing	Lead and document	Support
EMC Evaluation	Support	Lead and document
Assess Preponderance of Evidence for Reasonable Assurance	Support	Lead and Document
Maintain Qualification	Lead and document	Support

Path Forward – 2 points

- **Harmonization of qualification standards**
 - Expand the market
- **Allow suppliers to develop/build on *existing software practices***
 - Don't create new standards unique to the nuclear market

Snapshot of Global Commercial Nuclear Power Market



Any Questions?