

# **U.S. Commercial ~ Nuclear Quality Management**

1990

Accident Impacted - Design | Fabrication | Build | Startup | Operations

2020

2030

a GQM Advisors quality management service

1960

U.S. Quality Leaders Emerging

- Dr. W. Edwards Deming

**Complex Engineered Products / Systems** 

1957

**ISO Formed** 

1946

1950

**IAEA** Founded 1960

Increased Emphasis on Quality | Safety

1962

Mil-Q-9858A, UK BS-5750 1965

**New Codes / Standards / Regulations** 1971

1958 NASA & DARPA Formed

**LNPP Design | Build Period** 

NRC QA Public Law

10CFR50 Appendix B

1970

1971

**OSHA Regulations** 

1970

- Dr. Walter A. Shewhart
- Dr. Armand V. Feigenbaum
- Dr. Joseph M. Juran

Philip B. Crosby \_\_\_\_\_

IS FREE 1987 U.S. Reagan Baldrige **Performance Excellence** 

> 1987 **Project Management Institute** (PMI) Formed

1977 DOE Formed

1975 NRC Formed

**'79** 1980

1987 Quality Management Systems (QMS) ISO 9001 QMS Standards Released

# **Quality Management Tools**

 SixSigma, QFD, FEMA, PDCA, C&E Diagraming, Mapping, Software. Assessments

1995 ISO QMS Certified 75K

- **Enterprise Software** Intra- & Internet
- e-QMS
- CMM Site Wide

### **Integrated Management Systems (IMS)**

2010

- IMS, QMS, EMS, RM, CM, SCM, Others
- Requirements Matrix (Advanced)
- Process Hazards Mgt
- Enterprise Software (Advanced)
- Supply Chain Mgt (Advanced)
- Post 911 Safety / Security 2006 ISO 9001 QMS Certified

2012 ISO 9001 QMS Certified 1.1 mil, among 178 Countries

<<<< Knowledge Transfer Gap >>>>

## Renaissance ~ TBD

- SMRs > 150+ Reactor Designers
- MMRs ~ TBD

2025

- LNPPs > 25 Reactor Designs
- Fusion ~ TBD
- CS & AI ~ TBD

Numerous global non-nuclear industry sectors have been implementing ISO 9001 Quality Management Systems & quality tools since 1987. QMS certifications now exceed 1.5 million. Many nations require QMS certification as a part of product / service / system safety-basis certifications.

The U.S. NRC recognized ISO9001:2000 in 2003. This model also suggests the industry may require provisions for implementing "Integrated Management Systems."

### 2018 ~ New ISO 19443 Nuclear QMS

Will U.S. Nuclear Industry Executives Recognize & Integrate Advanced Quality Management Tools to Enhance Overall **Operational Effectiveness?** 

The U.S. chemical, oil, and gas industries have a history of QC, Inspection, & Testing as the methods for ensuring safety & specification compliance. In the mid-'60s, the nuclear industry initiated QA with

- the goal of "error prevention." • Is the new generation of professionals well trained in U.S. NRC 10CFR50, App. B & ASME NQA-1 Quality Management Requirements?
- Does the nuclear industry recognize the 'Management of Quality' & its focus is driven by company executives & safety-related items?
- Do executives recognize & embrace advanced 'Quality Management Tools' available to enhance, safety, effectiveness, & compliance?
- Will industry members realize the benefits by unconditional Quality Management support?

- Cyber Security

ISO 45001 ISO 27001 other Management System Certs. ISO 19443 QMS ITNS

**U.S ANS 3.2** 

2005

Renaissance ~ AP1000 ~ U.S. NuStart Consortium 9 Utilities - Build 28 AP1000 Reactors

- .6 million, among 155 Countries

2000 Renaissance ~ AP1000 LNPP & SMR NPPs

2005 China AP1000 2 NPP Sites w/ 4 Reactors

Operational ~ Vogtle 3 & 4 AP1K ~ 2024

VC Summer AP1K Cancelled \$9 bil ~ 2017

2010 BP

2011 Accident

**Fukushima NPP** 

**Deepwater Horizon** 

WXT mPower SMR Cancelled \$400 mil ~ 2016

2008 NuScalePower SMR ~ TBD

**CSA Z299** 

IAEA-GS-R3

Inspection | Test Era

1957 First U.S. **Nuclear Power Plant** 

'Cost of Poor Quality' (COPQ) **U.S. Military Suppliers** 

> **Quality Assurance Programs**

**Quality Control Programs** 

**Industry Standards** ANSI N45.2 - **1971 QA** ANSI N45.2 – **1977 QA** ASME / NQA-1 - 1979 QA

1974 **NRC Regulatory Guides** 

**RGs / Codes / Standards** Audits / Assessments / **Oversight** 

QC, QA, Test, Supply Chain Management **Quality Engineering, Design Assurance** 

App B, Needs Major Upgrade - Requirements Documents & Quality Management Practices

ISO 9001 ISO 14001

65 LNPP Sites & 100+ Power Reactors

U.S 10CFR50 App B U.S. Reg Guides U.S. ASME/NQA-1

1984 Marble-Hill Cancelled \$3.2 bil

1984 WH Zimmer Cancelled \$ 3.4 bil

1979 Accident Three Mile Island NPP 1986 Accident **Chernobyl NPP** 

1984 U.S. NRC NUREG-1055 Report to Congress

NURSIG-1995 For Comment Improving Quality and the Assurance of Quality in the Design and Construction of Nuclear Power Plants U.S. Nuclear Regula (W)

1987 Quality Management Systems (QMS) ISO 9001 QMS Standards Released

911 Twin Towers

**EMS Shift 'Paper Work'** to 'Information Work'

Quality Management **Systems** 

**Enterprise** Management **Robotics Software** 

Integrated **System** 

**Management** 

- Security

**Culture** 

- Safety

- Quality

- Risk

Cyber Security | Al

1970 QE 1980 QM **QMS 1990 EMS 2000 IMS** 1960 QA 2010 Culture 2020 CS | AI 2030