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SE Requirements Management: ***A Success Story for the Nuclear World***

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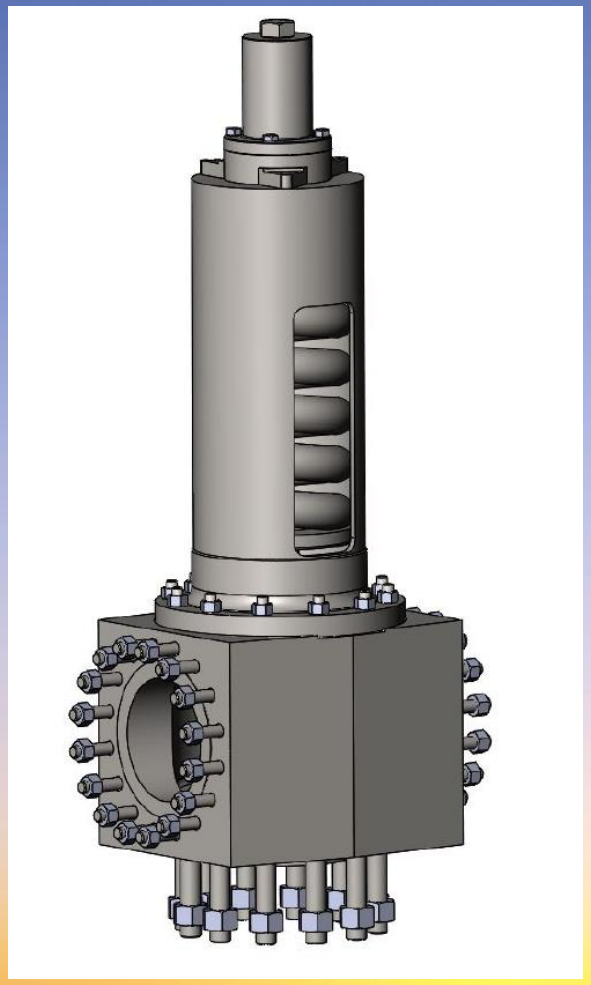
Senior Engineer – Black Belt
Enterprise Engineering



Agenda

- Project Background
- Project Challenge
- Execution Plan
- Project Results

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Project Background

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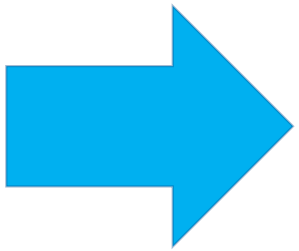
Project Background

Flow & Process Technologies manufacture Valves for Nuclear Reactors

International Customer Site

- Valves failed during hot commissioning testing in 2013
- Valve parts failed material certification in 2015
- Impacted delivery of 44 valves
- *Nuclear Plant Start up Delayed*



Cost of Poor Quality
$4M

Project Background

What Failed?

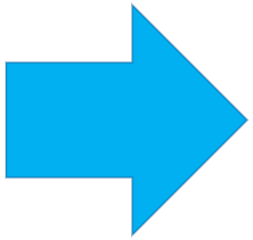
Root Cause Analysis Performed

2013 Hot Commissioning Testing

2015 SS Material Non-Conformance

Root Causes In

- ❑ Engineering
- ❑ Sourcing
- ❑ Quality
- ❑ Manufacturing
- ❑ Internal Processes



Failure to Meet Requirements

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Project Background

Solution for Success Was Needed

HQ Systems Engineering

Flow & Process Technologies

Plan for Execution

❑ Selected Pilot Project

❑ Executed with Systems Eng Principles

Project Goal

❑ Risk Mitigation

❑ Bring Value of Systems Eng to the table

❑ **Cultural Change**

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Project Challenge

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Systems Engineering to the Rescue

U.S. Based Customer

High Risk

Multiple project managers

Requirements Review

Product Delivery < 1 Year

Learning Curve to SE Principles for Nuclear Engineering team

My Challenge

Influence and drive the engineering team to adopt systems engineering principles

Dive into the tail end of the engineering deliverables AND review all customer and industry requirements documents

26 Industry Standards

23 Customer Specifications

Deliverable

Clear line of sight of Requirements Verification and Validation

In 8 Months

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Execution Plan

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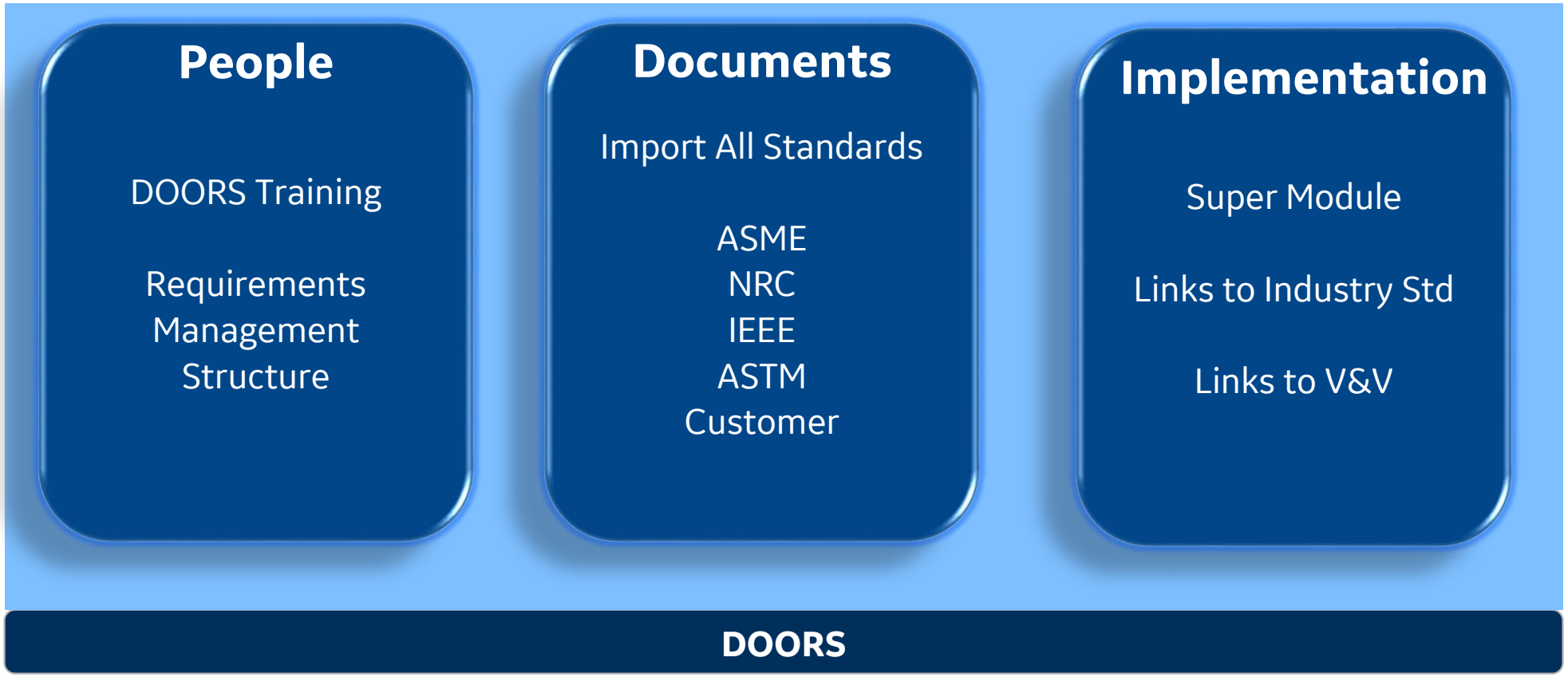
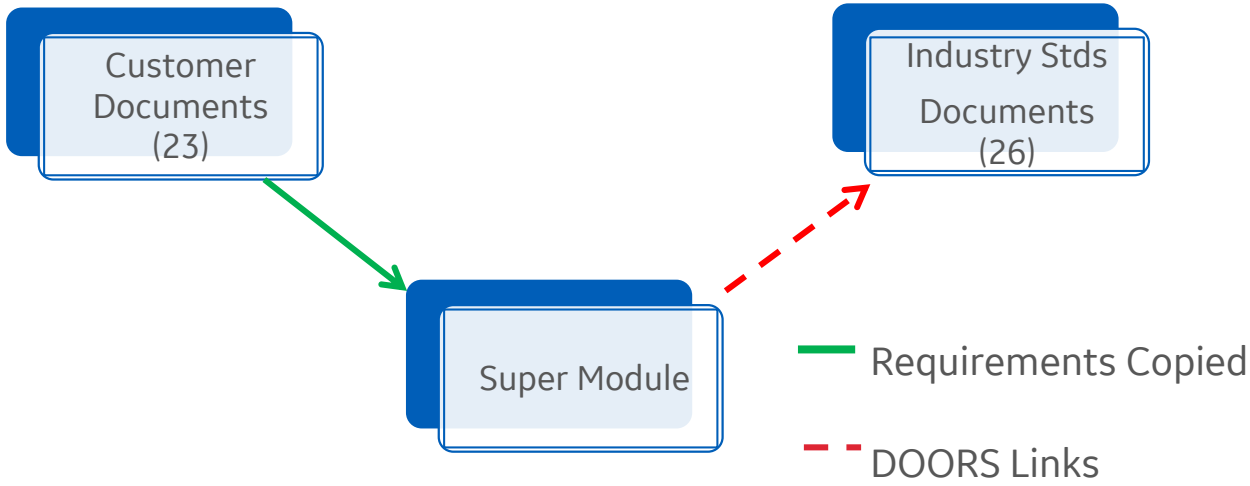
Partnership Formed

Project Pillars– *Major Requirements Review*



Operating Rhythm

How did we deliver in 6 months?



Systems Team Houston, TX

Imported Documents

Analyzed Object Texts
-*Requirement*
- *Section Heading*
-*Information*

Nuclear Team Jacksonville, FL

Verified Requirements

Assigned Verification

Delivery Track

Weekly Status Meetings

KPIs for DOORS

Requirements Verification Matrix

Requirements Management Structure

Clear Line of Sight of Verification & Validation of Requirements

Requirement ID	Compliance	Applicable TRS Section	Rationale	Verification Method	Verification Evidence	Verification Evidence Details	Verification Status
96	Compliant			Analysis	Design Report	DR-XX	✓
				Test	Test Report	TR-XX	
97	Compliant			Analysis	Design Report	DR-XX	✓
				Inspection	Drawing	DWG-XX	
98	Compliant			Analysis	Design Report	DR-XX	✓

Sample Report

Project Results

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Project Results

What did we accomplish?

DOORS Metrics

1863

# of Requirements

However

849

Assigned V & V

We learned some things along the way…

System Engineering Results

40 Non-Conformances

~400 Hours Spent

Engineering Documentation

Factory Documentation

Factory Tools

Product Certification

Critical Gaps

Transient Analysis

Stamping Method

Cleanliness Level of Rough Machine

If Req  ***was Missed***

Delay in Valve Delivery

Failure in the Field

Key Successes

OTD AND COA

CULTURAL CHANGE

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Conclusion

Final Thoughts 

Implement Systems Engineering Processes

❑ *Drive Cultural Change*

It may save your company $Millions

Questions


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