Configuration Management Information System for Korean NPP

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1. Overview
1. Project Overview

Development of Configuration Management Platform for Operating NPP
2. Project Schedule

Development of Configuration Management Platform for Operating NPP

- **Requirement**: 2013.10
- **Implementation**: 2014.10
- **Verification**: 2015.10
- **Customizing**: 2016.01
- **Pilot**: 2016.07
- **Operation from SKN 1,2 to all**: 2016.10
- **Database (Standard type)**: 2018.01
- **Database (Older NP)**: 2019.01

- Development of Configuration Management Platform for Operating NPP

- 2019.01
3. Design Principles


- CM Visuals (CM Equilibrium & INPO AP-929)

- CM Life Cycle Diagram

- Margin Definitions

- Benefits of moving to a Data Centric CM System

Contents
- Brief History of CM and CMBG
- CM Source Documents
- The 5 Functional Areas of a CM Program
- CM Visuals
- CM Lifecycle Diagram
- Margin Definitions
- FCI Explanation
- CM Relationships
- Applying a Graded Approach
- Acronyms and Abbreviations
- Benefits of moving to a Data Centric CM System
  "Buzzword Bible"
4. Project Goals

- CM Equilibrium

“3 Ball” CM Model

(ANSI/NIRMAR, IAEA-TECDOC 1335, INPO 87-006)
4. Project Goals

❖ Construction vs. Operation

<table>
<thead>
<tr>
<th>구분</th>
<th>New Built</th>
<th>Operation</th>
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<tbody>
<tr>
<td>Model</td>
<td><img src="diagram.png" alt="Diagram" /></td>
<td><img src="diagram.png" alt="Diagram" /></td>
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<tr>
<td>Viewpoint</td>
<td>• <strong>Making</strong> Configuration based on Requirement</td>
<td>• <strong>Managing</strong> Configuration to be equilibrium</td>
</tr>
<tr>
<td></td>
<td>• Focus on <strong>Requirement Management</strong> from design requirements to FCI including 3-D model</td>
<td>• Focus on <strong>Change management</strong></td>
</tr>
</tbody>
</table>

- **Design Requirement**: What needs to be there
- **Facility Configuration Information**: What we say is there
- **Physical Configuration**: What is actually there

Virtual Plant Data Model
4. Project Goals

❖ Configuration Management Pyramid

- **End State 5**: Integration with the 2D/3D Model
- **End State 4**: Object-Relationship Model
- **End State 3**: Data Centralization
- **End State 2**: Document-Tag Cross Referencing
- **End State 1**: Electronic Document Centralization

Data-centric configuration management
By Kenneth Barry, Robert Renuart, and Thomas Esselman
5. Where we are

❖ Configuration Management Pyramid

End State 1: Some documents are not text searchable format.

End State 2: MEL tag # are cross referenced to critical documentation.

End State 3: Single source of truth

End State 4: 1-Level Relation, not a relationship “chain”

End State 5: Design with 2-D and 3-D model

End State 6: 2-D/3-D Model Analytical tool integration

Time to Find and Verify Data
## 5. Where we are

<table>
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<th>Reactor / Classification</th>
<th>Reactor Type</th>
<th>Capacity</th>
<th>Commercial operation</th>
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2. Building a CM Pyramid

- Document Centric
- Critical Document Electronic Conversion, Centralization, Access
- Document-Tag Cross Referencing
- Data Centralization
- Relationships
- 3-D Model

Time to Find and Verify Data
End State 1: Electronic Document Centralization

❖ Document Conversion (Text searchable format)
End State 2: Document-Tag Cross Referencing

- Cross referencing

<table>
<thead>
<tr>
<th>Equipment &amp; Drawing</th>
<th>Requirement &amp; Document</th>
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<td>Requirement &amp; Equipment</td>
<td>Equipment &amp; Document</td>
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</table>
End State 3: Single source of truth

- Single database

Periodic synchronize
End State 4: Object-Relationship Model

- Relationship “chain”

DBD Taxonomy

- Design Basis Document Management
- Design Document & Requirement Management
- Facility Master Management

Tracking documents and facilities

Various Traceability Display
End State 5: Integration with the 2D/3D Model

- Integration Facility, 2D model, 3D model and Panorama

Two-way linkage and tracking
3. Design Requirement Management

- What is the best DBD (Design Bases Document) taxonomy for us?
- Can utility person make the DBD for old NPP themselves?
  Could we request the original EPC to make the DBD for old NPP?
- Can we have EPRI PIM views for impact analysis?
1. DBD Taxonomy

- DBD Taxonomy
2. Design Bases Document

- How long / How much?
2. Design Bases Document

❖ CM Lifecycle Diagram

- **Phase I: Conceptual Design**
  - Reactor Vendor Establish Certified Design Requirements

- **Phase II: General Design**
  - Establish BOP Design Requirements
  - Establish SSC Information Repository

- **Phase III: Equipment/Detailed Design**
  - Use Collected Information to Produce O&M Documents

- **Phase IV: Installation/Construction**

- **Phase V: Commissioning**

- **Phase VI: Operation/Maintenance**
  - Maintain SSC Information Repository

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**Concept/Design Phase**

**Detail Design Phase**

**Construction Phase**

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**Design Requirement**

*What needs to be there*

**Facility Configuration Information**

*What we say is there*

**Physical Configuration**

*What is actually there*

---

**NOTE:** This Line is not fixed and varies based on contractual alignments.

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**Design Bases Document**

❖ CM Lifecycle Diagram

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**NOTE:** This Diagram Represents Only One System/Building
### Terminology

<table>
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<th>U-DBD</th>
<th>Unit Requirement Based DBD</th>
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<td>F-DBD</td>
<td>File Based DBD</td>
</tr>
<tr>
<td>H-DBD</td>
<td>Hybrid Based DBD</td>
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3. Impact Analysis

❖ EPRI PIM (2012 CMBG - EPRI PIM Workshop)

PIM View – Dynamic Reports

Impact Analysis

PIM Example – CM Taxonomy Relationships

PIM View – Dynamic Radial Diagram

PIM View – Dynamic CM Taxonomy View
4. Facility Configuration Information Management

- Can we manage both MDL and MEL in one system?
- Can we handle simultaneous design change requests in an equipment?
- Can we look up all kind of data within the system?
- How to manage Margins?
1. Single Database

- BOM

Manage the parts that make up the functional location

Efficient management through linking related documents

Part1

Part1-1

Part1-2

Part2

Part2-1

Part2-2

Detailed Parts1

Detailed Parts2

Detailed Parts1-1

Detailed Parts1-2

Detailed Parts1-2-1

Detailed Parts1-2-2
3. Single viewer for various format

Legacy System

LDM

Drawings And Docs

DGN

DWG

TIFF

PDF

View

Release

SECURITY WATERMARK

Drawings and Docs

CMIS

Configuration Management Information System

SILKROAD

Drawings and Docs

Security

Watermark

Unique Key

Watermarked Documents

Document Control

Documents

Time

User ID

Unique Key

Hash

Table:

<table>
<thead>
<tr>
<th>Documents</th>
<th>Time</th>
<th>User ID</th>
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4. Margin Management

❖ Margin Configuration Management

- Operational Region
- Operating Limit
- Design Margin
- Analytical Design Limit
- Design Basis
What is the physical configuration in a SW system?
1. Physical CM of Operating NPP

❖ Reverse engineering with 3D Laser Scan

- 3D Laser Scan
- 3D Model
- SSC Mapping
- QA/QC
- Verified 3D Model
- FCI
6. Change Management

- Is the change process of KHNP followed by AP-929?
- Can we have paperless working environment?
- Can we monitor the process?
- Can we do design change review?
- How can the system help for seamless process?
1. Standard Design Change Process

- INPO AP-929
7. Demo
2. Demo

Configuration Management Information System
8. Questions and Answers
Thank you