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Risk-based Configuration Control

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The Configuration Control

- The configuration is a set of component states. (components out of service due to test, maintenance or failure)
- The configuration control provides problemless, safe production along the maintenance activity of the plant.

The Risk-based Configuration Control

- The risk-based configuration control is to control and manage plant risks resulted by configurations
- It focuses on high risk configuration, and reduces burden on unimportant areas. (redirects the efforts from the unimportant to the important areas)

The Risk-based Configuration Control (cont'd)

- During power operations
 - to plan smooth low risk production (risk planning)
 - to follow dynamic configuration behaviour
 - to avoid high risk configurations, and reorganize operation and maintenance tasks in order to minimize risk (risk following)
 - to identify and relax TS limitations on unimportant areas

The Risk-based Configuration Control (cont'd)

- during shutdown conditions
 - shutdown risk is more dynamic than power operation risk
 - to plan low risk configuration in the maintenance period
 - to follow the plan and “fine-tune” if necessary
 - taking into account the minimum required safety configuration by TS

Criteria Used by Configuration Control

- control of configuration risk by means of
 - strategies to avoid high risk peaks
 - transfer to less risky configuration
 - repairs in required durations
- provide adequate repair times
 - enough time to complete repair
 - avoid unnecessary long durations
- avoid unnecessary shutdowns

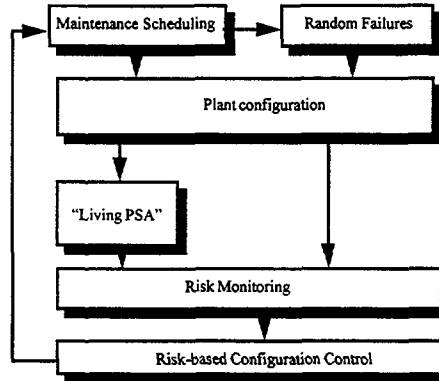
Risk Importances

- The risk-based configuration control manipulates the risk importances of the equipment, systems in different configurations to determine the most effective risk reduction possibilities.
 - risk reduction
 - components in operation and standby
 - components out of service
 - risk increase
 - Fussel-Vesely importance

PSA Requirements

- The risk-based configuration control uses the PSA models and data on a dynamic way, i.e. it requires a PSA of the nuclear power plant being transformed to a dynamic everyday tool.
 - => living PSA and risk monitor
 - +immediate knowledge on actual plant configuration

PSA requirements (cont'd)



Configuration Management

- Basic elements

The configuration management is a complex of management tasks consisting of:

- Manage components out of service
- Manage operating components
- Manage unavailability durations
- Manage frequency of occurrence

Configuration Management (cont'd)

- **Manage components out of service (OOS)**
 - Identify high risk configurations
 - Test and maintenance scheduling in order to avoid high risk configurations
 - Test of components/systems after failure if applicable
- **Manage operating components**
 - Identify functional alternatives to OOS components

Configuration Management (cont'd)

- **Manage unavailability durations**
 - Determine risk significant AOT's
 - optimization, alternatives
 - Determine non-impacting AOT's
 - optimization, extension(?)

Configuration Management (cont'd)

- **Manage frequency of occurrence**
 - monitor history of plant configurations
 - frequency of high risk configurations
 - modify maintenance and/or test frequency and practice where applicable
 - to lower the frequency of high risk configurations

Configuration Management (cont'd)

- **Benefits of configuration management**
 - identify critical configurations
 - identify functional alternatives of OOS
 - develop typical schedules to reallocate resources
 - optimize AOT's
 - lower frequency of high risk peaks
- => reduce risk and burden

Configuration Management (cont'd)

- Information requirements (direct input)
 - immediate knowledge on current plant configuration
 - OOS equipment
 - causes, failures, maintenance
 - duration
 - current maintenance schedule
 - PSA information
 - model
 - data

Configuration Management (cont'd)

- Information requirements (output to maintenance scheduling)
 - critical configurations to reduce momentaneous risk
 - critical configurations to develop typical low risk schedules
 - alternatives equipment and tests to OOS equipment

Configuration Management (cont'd)

- risk information to optimize AOT's
- risk information to determine downtime actions
- risk based indicators to track occurrences
- reliability analyses to update/modify test/maintenance activities