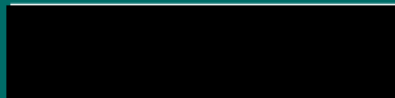




Office for
Nuclear Regulation

Ofgem Presentation ONR Asset Management Overview



21st November 2019

Asset Management Requirements

- LC28 “The licensee shall make and implement adequate arrangements for the regular and systematic examination, inspection, maintenance and testing of plant which may affect safety”
- Full arrangements not required until commissioning however interim arrangements required to ensure preservation and maintenance during construction
- Once the station moves into operations full arrangements are required.



Construction Phase - Asset Management

- ONR focus is nuclear safety and hence aimed at ensuring that all equipment which contributes to nuclear safety is appropriately preserved and maintained during construction and installation
 - The arrangements should ensure appropriate preservation and maintenance throughout the construction and installation lifecycle prior to start of commissioning when full arrangements are generally required
 - Hence arrangements need to include packing and preservation prior to shipment, storage in warehouses and preservation when installed on site.



Construction Phase - Asset Management

- The risk of getting this wrong can potentially have significant cost implications as has been experienced on other new build projects.
- Implementation of care and maintenance is significant undertaking and it cannot be assumed that non-nuclear construction/installation companies are used to operating at the required level.
- Sufficient resources need to be established to implement early preservation and maintenance arrangements
- If contractors are to be responsible then robust contractual arrangements are required and suitable licensee organisation to assure effective implementation is required
- Care and maintenance plans need to be developed by either licensee or contractors against care and maintenance standards which define what needs to be done
- Surveillance plans/tools needed to ensure that care and maintenance requirements are effectively implemented

Construction Stage - Asset Management

- Contractors need to understand standards and expectations as these may be very different to a typical construction project
- Arrangements should have suitable mechanism to initiate a review of adequacy should major project change occur – such as significant schedule slippage or inability to weather tight a building etc in the expected time..
- Arrangements for the management of blanks, spades and commissioning links need to be established early on if control is to be maintained

Asset Identification

- Unique identification of assets is necessary to track items into the warehouse (if applicable) and then when installed – as fixed asset
- Asset numbers or other unique metadata needs to be developed
- Consistency of coding is important
- Asset register of installed equipment needs to be developed as equipment is installed
- Records of preservation and maintenance activities to be compiled and recorded against assets to provide adequate lifetime quality records



Example Early Preservation and Maintenance Activities

- Civil Items (including embedded items)
 - Visual inspection of walls, slabs embedded items
 - FME protection, cleanliness , water ingress
 - Special areas – water bars which are exposed (UV degradation)
 - Integrity of paint systems/coat
 - Exposed rebar corrosion
- Other items
 - Environmental requirements are met
 - Bearings turned
 - Application/integrity of rust prevention
 - Integrity of packing
 - Foreign Material Exclusion of equipment

ONR Approach to Operational Power Station Asset Management

- ONR carries out a series of LC28 inspections split into two broad approaches and the frequency and focus areas are developed in accordance with the relevant intervention strategy and underpinning intervention plan:
 - Routine standalone or themed LC28 interventions – aimed at ensuring adequacy of arrangements and/or their implementation
 - System Based Inspections – are intended to establish that the basic elements of a site/facility safety case as implemented in Safety Systems and Structures (SSS) are fit for purpose and that they will fulfil their safety functional requirements – this include a number of LCs and included LC28 – to ensure the SSS are being appropriately maintained.



Asset Management - Expectations

- ONR Asset Management TAG provides detailed guidance on expectations for an overall asset management system
- In addition to normal asset management expectations, licensees are required to complete formal periodic reviews of safety to which are to be undertaken at a frequency no greater than 10 years and include specific requirements relating to asset management

Asset Management and Impact of Safety

- Whilst in general ONR is not focused on commercial aspects and hence generation output, there is some overlap.
- Causes of reactor trip/loss of generations include:
 - Unavailability of safety systems causing planned shutdown/reactor trip or conservative decision due to failure of equipment which may affect safety
 - Automatic reactor trip by safety system – it is worth noting that turbine trips etc of conventional plant intertrip the reactor and hence thereby challenges safety systems – it is ONR's expectations that such trips are minimised so far as is reasonable practicable
- Clearly there are many potential other causes of unavailability such as operator error, maintenance induced fault etc but these are not considered in this presentation.



Annual Review of Safety

- Purpose of annual review of safety is for licensee to review performance and look forward and provide a “set piece” high level opportunity for senior level regulatory discussions ensure
- Facilitated by discussion focused on licensee's annual review of safety report which summarises its performance and priorities
- ONR is informed by the results of its interventions (and associated ratings) over the previous 12 months



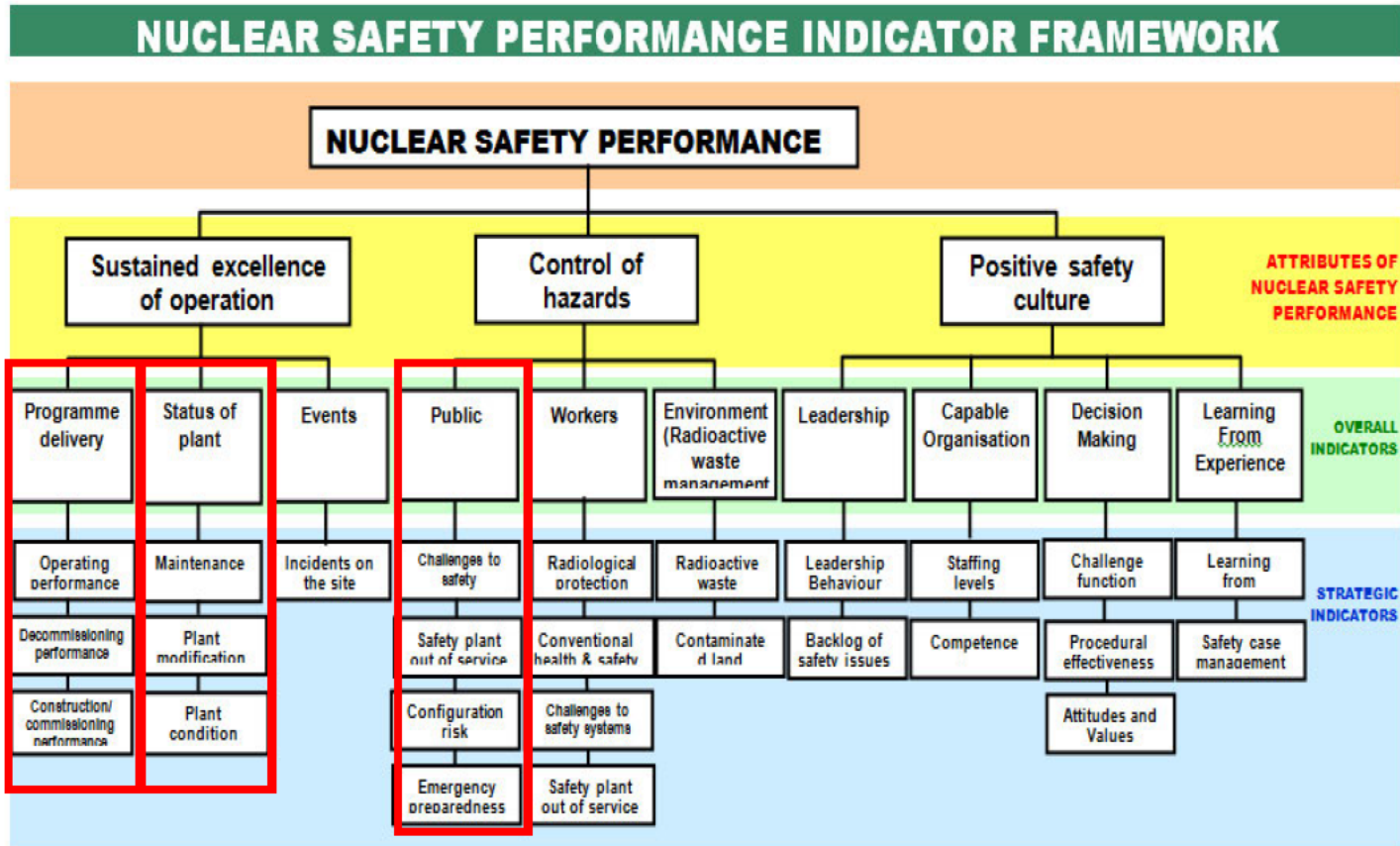
Annual Review of Safety

- Typical SPIs (relevant to asset management)
 - Unplanned automatic/manual trips
 - Safety system unavailability
 - Unplanned capability loss factor
 - Operation focus indicator (includes leaks and defect backlog)
 - Equipment reliability index aggregates maintenance performance, system health management, generation and a number of other metrics
 - Critical components defect inventory
 - Non-outage defect inventory
 - Total preventative maintenance backlog
 - Outage performance

Important to note some of these metrics and be influenced by other factors such as human performance etc..



SPIs



* Human performance spans this framework and licensees should be able to describe how this is reflected in their choice of indicators



SPIs - Maintenance

Sustained Excellence of Operation

STATUS OF PLANT

MAINTENANCE

Effectiveness of the maintenance of nuclear safety related plant
(planning and execution)

Examples:

- Number or frequency of events or incidents where deficiencies with maintenance quality identified as a factor
- Number of significant maintenance quality issues identified through the 'leader in the field' or task observation programme
- % number of plant walk downs (by plant specialists) compared to schedule
- Number of operator burdens or work-arounds
- Number or frequency of unexpected breakdowns of safety related plant
- Number of maintenance concessions
- Number or hours of maintenance rework tasks
- Maintenance backlog/defect backlog
- Maintenance productivity (tasks per day)
- % of maintenance schedule tasks completed within 50% of tolerance
- Periodicity of filter changes compared to plan/expected
- % adherence to the planned work schedule
- Availability of back-up services
- % unavailability of key services or plant/equipment
- % maintenance downtime
- Number or rate of failure of safety mechanisms, devices and circuits
- Number of maintenance tasks cancelled or postponed
- % of maintenance tasks or statutory inspections completed on time and/or to schedule



SPIs – Plant Condition

PLANT CONDITION

To monitor the condition of nuclear safety related plant

Examples:

- Number of unrevealed failures identified from consequential events or incidents
- Number of safety defects not cleared within specified timescales
- Monitoring of defect backlog (numbers, rate fixed, rate raised, average age)
- Average age of significant defects or deficient conditions
- Evidence of work-arounds or overrides – number or rate
- Output rates of abatement plants (e.g. unplanned elevated discharge level)
- Number of safety systems identified in a failed or deficient condition
- % Chemistry performance – adherence to specified dosing requirements etc
- Number of significant items in routine work backlog
- Frequency of surface contamination
- Number and/or age of control room defects



SPIs – Operating Performance

Sustained Excellence of Operation

Programme Delivery

Operating Performance

Compare the actual plant performance to that planned

Examples:

- Plant availability or reliability - % of planned downtime and/or unplanned downtime against maximum capability or planned availability
- Trip rates or % time affected by unplanned forced outages or (downtime)
- Plant configuration – number of times or rate that plant misconfigured
- % correct procedures are in place (work scheduled with correct procedure)
- Number of rework hours or rework tasks
- Procedural quality issues
- Operating rule breaches or non-conformances with licence condition 23
- % of work instructions in date or within specified review period



Conclusions

- ONR implements a comprehensive programme of intentions to ensure appropriate asset management/maintenance both during construction and into operations
- Whilst ONR's focus is nuclear safety (and its other purposes) a high reliability plant contributes to this by maximising safety system availability and reducing safety system challenge from unplanned trips (manual or automatic)
- Careful selection of SPIs is required to ensure that safety outcomes are achieved and they do not derive inappropriate behaviours



Any Questions?