Chemistry Design Change Checklist

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ASSESSMENT

Does the proposed change result in:

1.0	An effect on core or fuel performance or a change to primary coolant chemistry?	☐ Yes	☐ Unknown	☒ No
2.0	A change in the material specification of any component that may be exposed to a fluid contained in the system?	☒ Yes	☐ Unknown	☐ No
3.0	A change in the operating conditions of the system (e.g., flow, pressure, temperature, velocity, volume, etc), at any point in the system?	☐ Yes	☐ Unknown	☒ No
4.0	A change in the characteristics of the system fluid or any additive to the fluid (e.g., concentration, viscosity, density)?	☐ Yes	☐ Unknown	☒ No
5.0	The addition, deletion, relocation or replacement of any equipment in a system that is subject to Chemistry Control Parameters?	☒ Yes	☐ Unknown	☐ No
6.0	The addition, deletion, relocation or replacement of any equipment that is associated with taking chemistry control action, e.g., chemical dosing, ion exchange purification, etc?	☒ Yes	☐ Unknown	☐ No
7.0	The impairment of capability to take actions required by Chemistry Control Procedures?	☐ Yes	☐ Unknown	☒ No
8.0	The addition, deletion, relocation or replacement of any equipment that is associated with chemical sampling systems?	☒ Yes	☐ Unknown	☐ No
9.0	The impairment of capability to take samples from chemical sampling systems in accordance with Chemistry Laboratory Procedures?	☐ Yes	☐ Unknown	☒ No
10.0	The addition, deletion, relocation or replacement of analytical instrumentation?	☐ Yes	☐ Unknown	☒ No
11.0	An impact on the response characteristics of existing on-line or laboratory analytical instrumentation?	☐ Yes	☐ Unknown	☒ No
12.0	An impact on the rate of flow-accelerated corrosion currently experienced by existing systems or components?	☐ Yes	☐ Unknown	☒ No
13.0	A change in chemistry specifications that has the potential to affect the calibration of any operating instrumentation?	☐ Yes	☐ Unknown	☒ No
14.0	The need for commissioning procedures to ensure that the equipment (e.g., piping) is chemically conditioned prior to being put into service.	☒ Yes	☐ Unknown	☐ No
15.0	A need to change Station or Program documentation (e.g. Design, Operating, Specification Manuals) as a result of changes to chemistry specifications/process chemicals.	☒ Yes	☐ Unknown	☐ No
16.0	The Manager - Chemistry, Metallurgy and Welding Department has been notified of the proposed chemistry design changes. (see Keypoint 16.0)	☒ Yes	☐ No	

Where necessary, initiate further actions in accordance with the Engineering Change Control Program.

REVIEW SUMMARY:

☐ **The proposed change is not subject to Chemistry Program requirements.**

*Associated with N-PROC-OP-0013, Control of System Chemistry

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☒ **The proposed change is subject to Chemistry Program requirements.**

☒ **The proposed change requires the development, revision, or cancellation of the following Chemistry Program documents:**

☐ **The following additional actions are required to be taken in accordance with the Engineering Change Control program:**

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Keypoints

The following keypoints will aid in completing the Chemistry Design Change Checklist.

1.0 An effect on core or fuel performance or a change to primary coolant chemistry?
WANO SOER 2004-1 "Managing Core Design Changes" identifies a weakness where implemented chemistry changes have resulted in unanticipated adverse core and fuel performance and recommends that the effects of chemistry changes on core and fuel performance (and the effects of core and or fuel design changes on coolant chemistry) be assessed.

a) The assessment should cover all modes of operation, including low power operation and shutdown conditions. Examples include assessing the potential effects on fuel or increased potential for axial offset anomaly when considering shortening the length of crud burst cleanup at the beginning of an outage, a change in lithium concentration, or changing to a new type of ion exchange resin.
b) Include site chemistry staff in the review of changes in core operating conditions and core and fuel design changes that could affect coolant chemistry, potentially causing fuel or core performance problems.
c) Review chemistry-related industry OPEX, and assess the potential effects on the core design.
d) Additionally, assess the cumulative effect of multiple changes.

2.0 A change in the material specification of any components that may be exposed to a system fluid?
Any change in the material specification of components exposed to system fluid may require a change to the chemistry regimen in that system. Obvious examples include changes to tubing, piping, or vessel shells. Alternatively, the material specification may be required to be compatible with the system chemistry specification. Refer to the sections within the OPG Nuclear System Chemistry Specifications Manual, N-STH-01807-10000 for the technical basis of chemistry specifications.

3.0 A change in the operating conditions of the system (e.g., flow, pressure, temperature, velocity, volume, etc), at any point in the system?
Changes in operating conditions can change system chemistry. Changes in local flow conditions caused by changes in pipe size or pipe configuration can create localized flow-accelerated corrosion (see 12.0). Changes in pressure and temperature can change the partition of volatile species between liquid and gas phases, resulting in changes in concentrations. Changes in volumetric capacity can change concentrations. Refer to the sections within the OPG Nuclear System Chemistry Specifications Manual, N-STH-01807-10000, for the technical basis of chemistry specifications.

4.0 A change in the characteristics of the system fluid or any additive to the fluid (e.g., concentration, viscosity, density)?
The impact of changes in the properties of system fluids on system chemistry must be assessed. For example, introduction of new impurities into the system may be benign, but may cause interference with the response characteristics of analytical equipment (see also 11.0). This type of change needs to be reviewed for consistency with chemistry specifications (see N-STH-01807-10000).

5.0 The addition, deletion, relocation or replacement of any equipment in a system that is subject to Chemistry Control Parameters?
New materials introduced into a system may impact on the chemistry within that system. Alternatively, system chemistry must be considered in the selection of materials for new equipment. This type of change needs to be reviewed for consistency with chemistry specifications (see N-STH-01807-10000).

6.0 The addition, deletion, relocation or replacement of any equipment that is associated with taking chemistry control action, e.g., chemical dosing, ion exchange purification, etc?
Changes made to equipment, such as chemical dosing systems, can potentially negatively impact chemistry control.

7.0 The impairment of capability to take actions required by Chemistry Control Procedures?
The ability to take chemistry control actions must be either improved or unaffected by engineering changes.

8.0 The addition, deletion, relocation or replacement of any equipment that is associated with chemical sampling systems?
Sampling equipment must be designed to provide samples that are representative of the system. If samples are not representative, chemistry monitoring, and consequent chemistry control, will be sub-optimal or ineffective.

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9.0	The impairment of capability to take representative samples from sampling systems in accordance with Chemistry Laboratory Procedures? Changes that affect the temperature or flow of samples, e.g., sampling room conditions, may impact on the ability to obtain a representative result.
10.0	The addition, deletion, relocation or replacement of analytical instrumentation? On-line analytical instrumentation must continuously provide accurate and precise measurements as appropriate for the parameter being sampled.
11.0	An impact on the response characteristics of existing on-line or laboratory analytical instrumentation? If the response characteristics of analytical equipment are upset, erroneous measurement and inappropriate actions may result.
12.0	An impact on the rate of flow-accelerated corrosion (FAC) currently experienced by existing systems or components? Flow-accelerated corrosion is a phenomenon which has been recognized as a cause for concern in the Heat Transport System. Consideration should be given to the possibility of exacerbating this condition in any sections of piping.
13.0	A change in chemistry specifications that has the potential to affect the calibration of any operating instrumentation? For example, will the change result in a different conductance of the fluid? If the accurate operation of instrumentation such as level or flow monitoring is dependent upon conductance, a change could potentially impact on system operation.
14.0	The need for commissioning procedures to ensure that the equipment (e.g., piping) is chemically conditioned prior to being put into service. Some equipment, notably piping, needs to be chemically treated in situ to remove impurities or to produce a passive coating to protect against corrosion.
15.0	The need to change Station or Program documentation (e.g. Design, Operating, Specification Manuals) as a result of changes to chemistry specifications/process chemicals. Will the change require compensatory changes to Station documentation or involve the development or updating of the Chemistry Program documentation.
16.0	If the answer to any of the questions is “Yes” or “Unknown”, the Manager, Chemistry, Metallurgy and Welding Department (CMWD) shall be notified of the proposed chemistry design changes.