CSA N290.11:21

Requirements for reactor heat removal capability during outage of nuclear power plants

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Preface

This is the second edition of CSA N290.11, *Requirements for reactor heat removal capability during outage of nuclear power plants.* It supersedes the previous edition published in 2013.

The following are the major changes to this edition:

a) updated requirements and specifications for the back-up heat sink and the protection it is to provide;
b) provided additional clarification in areas identified by users; and
c) improved alignment with current industry standards.

The CSA N-Series of Standards provides an interlinked set of requirements for the management of nuclear facilities and activities. CSA N286 provides overall direction to management to develop and implement sound management practices and controls, while the other CSA nuclear Standards provide technical requirements and guidance that support the management system. This Standard works in harmony with CSA N286 and does not duplicate the generic requirements of CSA N286; however, it can provide more specific direction for those requirements.

This Standard reflects the operating experience of the Canadian nuclear power industry.

Users of this Standard are reminded that the design, manufacture, construction, commissioning, operation, and decommissioning of nuclear facilities in Canada are subject to the provisions of the *Nuclear Safety and Control Act* and its supporting Regulations.

This Standard was prepared by the Subcommittee on Requirements for Reactor Heat Removal Capability during Outage of Nuclear Power Plants, under the jurisdiction of the Technical Committee on Reactor Control Systems, Safety Systems, and Instrumentation of Nuclear Power Plants and the Strategic Steering Committee on Nuclear Standards, and has been formally approved by the Technical Committee.

Notes:

1) *Use of the singular does not exclude the plural (and vice versa) when the sense allows.*
2) *Although the intended primary application of this Standard is stated in its Scope, it is important to note that it remains the responsibility of the user of the Standard to judge its suitability for their particular purpose.*
3) *This Standard was developed by consensus, which is defined by CSA Policy governing standardization — Code of good practice for standardization as "substantial agreement. Consensus implies much more than a simple majority, but not necessarily unanimity". It is consistent with this definition that a member may be included in the Technical Committee list and yet not be in full agreement with all clauses of this Standard.*
4) *To submit a request for interpretation of this Standard, please send the following information to inquiries@csagroup.org and include "Request for interpretation" in the subject line:*
   a) *define the problem, making reference to the specific clause, and, where appropriate, include an illustrative sketch;*
   b) *provide an explanation of circumstances surrounding the actual field condition; and*
   c) *where possible, phrase the request in such a way that a specific "yes" or "no" answer will address the issue.*

   Committee interpretations are processed in accordance with the CSA Directives and guidelines governing standardization and are available on the Current Standards Activities page at standardsactivities.csa.ca.
5) *This Standard is subject to review within five years from the date of publication and suggestions for its improvement will be referred to the appropriate committee. To submit a proposal for change, please send the following information to inquiries@csagroup.org and include "Proposal for change" in the subject line:*
   a) *Standard designation (number);*

b) *relevant clause, table, and/or figure number;*
c) *wording of the proposed change; and*
d) *rationale for the change.*

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Requirements for reactor heat removal capability during outage of nuclear power plants

1 Scope

1.1
This Standard covers the design, qualification, installation, commissioning, operation, maintenance, testing, inspection, and documentation requirements for systems providing heat removal from the reactor core to the ultimate heat sink(s) for water-cooled nuclear power plants during outages.

1.2
This Standard covers only fuel cooling within the reactor core and does not cover spent fuel pool cooling, off-reactor fuelling operations, or the completely defuelled core state.

1.3
This Standard covers all systems that contribute to the transfer of heat by
a) conveying heat to the ultimate heat sink;
b) providing power or compressed air;
c) providing inventory makeup to heat sink systems; or
d) monitoring and control.

Note: *The combination of systems or portions of systems that contribute to these functions are referred to in this Standard as "heat sinks".*

1.4
The term "outage" refers to the following reactor states:
a) a shutdown state where subcriticality is assured by physical means; or

   Note: *For CANDU reactors, this refers to a guaranteed shutdown state.*
b) critical or sub-critical at any power where the normal (at high power) heat sinks are not the primary heat sinks.

   Note: *Examples of high power heat sinks include steaming of boilers to turbine or condensers.*

1.5
This Standard does not cover requirements for design extension conditions (DEC). Requirements and principles for maintaining fuel cooling for outages during DECs, including requirements for emergency cooling water and power supplies, are covered in CSA N290.16.

1.6
For the purposes of this Standard, the outage commences when the normal (at high power) heat sinks are no longer the primary heat sinks.