

DRAFT – FOR DISCUSSION

(BWR Owners' Group comments)

DRAFT PROPOSED CRITERIA FOR OPDRV ENFORCEMENT DISCRETION

The technical specifications (TSs) term, Operations with a Potential for Draining the Reactor Vessel (OPDRV) is an undefined term used to specify when limiting conditions for operation must be met for certain TSs. Because OPDRV is undefined in TSs, licensees must implement their TSs using the plain language context of the OPDRV words, absent some specifically approved activity by the Staff in the plant's licensing basis. Thus, the NRC Staff believes that an OPDRV is any activity that could result in draining or siphoning the reactor pressure vessel water level below the top of fuel, without crediting mitigating measures to terminate or prevent water inventory losses.

As an outcome of an assessment of operating events involving reactor loss of inventory events, the NRC staff recognizes that different OPDRVs present different levels of risk to the plant. Accordingly, the staff is considering an improvement to the Standard Tech Specs that will allow a graded approach to OPDRV requirements. While this improvement is under development, the staff will consider granting enforcement discretion to allow OPDRVs to be conducted without Secondary Containment and/or Primary Containment, as applicable to a plant's design and existing TS for conducting OPDRVs, requirements fully establishedⁱ provided that the following criteria are metⁱⁱ:

1. An Operation with a Potential for Draining the Reactor Vessel (OPDRV) shall constitute any activity that could result in draining or siphoning the reactor pressure vessel water level below the top of active fuel, without allowing for crediting mitigating measures. [Establishing a passive isolation barrier, such as locked closed manual valve, deactivated automatic isolation valve, blind flange, that is within its allowable leakage limitⁱⁱⁱ, as a precondition to the activity, allows an activity to not be considered an OPDRV. Planned system operations, utilizing normal procedures and flowpaths, under the direct control of the Operations staff, are also not considered OPDRVs.]

2. Water Inventory Requirements

I. MODE 5 with RPV Level \geq [23 ft]^{iv}

a. OPDRV activities shall be conducted with:

- i. spent fuel storage pool gates removed and water level \geq [23 ft] over the top of the reactor pressure vessel flange [BWR/4]^v.
- ii. the upper containment [cavity to dryer] pool [gate] removed and water level \geq [23 feet] over the top of the reactor pressure vessel flange [BWR/6].

AND

b. During OPDRV activities at least one safety-related make-up pump (powered by normal or emergency AC Sources) shall be aligned to a makeup water source with the capability to automatically inject water equal to or greater than the maximum potential leakage rate from the reactor pressure vessel (RPV) for a minimum time period of 4 hours. These requirements specify the minimum make-up flow rate and inventory requirements and are not intended to specify a limit on the drain down rate.

Comment [BWROG1]: Some plants have NRC approval (SEs) that permit certain activities to be performed and not be considered OPDRVs. The use of the EGM should not negate those previously approved activities in a given plant's licensing basis.

Comment [BWROG2]: This appears to be contrary to the statements in Criterion 4 regarding isolation. Perhaps "make up" was intended?

Comment [BWROG3]: An alternative approach could be to specify this as "below the TS Safety Limit for reactor vessel water level," which is a standard recognized condition and requires reporting to the NRC as a SL violation.

Comment [BWROG4]: Isolation valves are allowed a specified leakage per other regulatory requirement, such as App. J, Pressure Isolation Valves (PIVs), Excess Flow Check Valves (EFCVs). It should not be the expectation that OPDRV boundaries be perfectly leak tight.

Comment [BWROG5]: There are a number of plant evolutions that involve intentional removal of water from the RPV. For example, CRDMs need cooling water, which is provided by the CRD pump. This inventory (approx. 60 gpm) needs to be removed from the RPV to maintain water level constant.

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~~OPDRV activities shall immediately be suspended~~ If at any time this inventory makeup capability is lost, ~~actions shall be initiated immediately to suspend OPDRVs.~~

II. ~~MODE 4~~ and MODE 5 with RPV Level < [23 ft]

a. ~~LCO 3.5.2 (ECCS – Shutdown), or equivalent plant-specific requirements, shall be met. If one or more -required ECCS sources are not Operable, then initiate action immediately to suspend OPDRVs.~~

3. ~~Secondary~~ Containment Requirements

I. ~~Secondary~~ Containment (BWR/4 and BWR/6, as applicable)

a. ~~Secondary Containment functionality shall be maintained at all times during the OPDRV activity unless the licensee is capable of shall be able to establishing Secondary Containment functionality before water inventory can drains down to the top of the RPV flange. For activities where the time to drain down to the top of the RPV flange could be less than 72 hours at the maximum predicted leak rate, Secondary Containment integrity shall be maintained at all times during the OPDRV activity.~~

b. ~~Automatic Containment isolation, as required by Tech Specs, shall be Operable during the conduct of any OPDRVs.~~

II. ~~Primary~~ Containment (BWR/6, as applicable)

a. ~~Primary Containment functionality, including containment air locks and penetrations^{vi} shall be maintained at all times during the OPDRV activity unless the licensee is capable of establishing Primary Containment functionality before water inventory can drain to the top of the RPV flange.~~

3.4. ~~OPDRV activities shall, to the maximum extent practicable, be performed in a manner that maintains defense-in-depth against the release of fission product inventory to the environment. In addition to the water inventory and ~~Secondary~~ Containment requirements described above, the following limitations shall be followed:~~

a. ~~Removal of control blades and OPDRVs involving control rod drive mechanism replacement activities may not take place concurrently in the same core quadrant.^{vii}~~

b. ~~Movement of irradiated fuel within the RPV shall be prohibited during OPDRVs unless the licensee can establish that irradiated fuel being moved can be placed in a safe condition should a draining event occur.~~

b. ~~Not more than a single potential leakage path shall be permitted during as a OPDRVs.~~ c. ~~Capability to isolate the potential leakage path during OPDRVs shall be maintained. It is not necessary that the isolation capability result in zero leakage.~~

d. There shall be ~~at~~ a minimum of two independent means of monitoring RPV level for identifying the onset of loss of inventory events during an OPDRV indicators, at least one of which is an ~~continuous automatic~~ alarming indicator in the Control Room, for identifying the onset of loss of inventory events. It is acceptable that one of the two indications be by direct observation of RPV water level, provided that such observation is essentially continuous. It is not necessary to modify existing instrumentation to provide the required indication (e.g., recalibration to cold shutdown conditions.^{viii}) Procedures should be established to ensure that a draining event is

Comment [BWROG6]: Non-ECCS pumps, such as Condensate, Reactor Water Clean-up (RWCU), Control Rod Drive (CRD) that are aligned to the Condenser, should be allowed. Given the other requirements for water inventory and drain-down time, it should not be required to be automatically initiated; manual initiation should be allowed.

Comment [BWROG7]: The purpose of splitting out MODE 4 from MODE 5 is to preclude an interpretation that to perform an OPDRV in MODE 4 without Secondary Containment would require RPV disassembly and cavity flood up (i.e., meeting 2a above).

Comment [BWROG8]: Note that this is more restrictive than LCO 3.5.2, which does not require suspending OPDRVs until both required ECCS injection/spray subsystems are inoperable.

Comment [BWROG9]: Given that the 72 hours is somewhat arbitrary, tied to drain-down estimates for CRDM replacement with the cavity flooded, and normally it shouldn't take anywhere near 72 hours to regain functionality of Secondary Containment, let's separate them. If there is a lower limit on this time to establish Secondary Containment functionality, the industry would be open to that, for example 4 hours.

Comment [BWROG10]: The intent of the statement is that any time the water level is below the RPV flange, the secondary containment must be functional during OPDRVs. The allowance to be capable of establishing secondary containment functionality before the water level reaches the RPV flange during OPDRVs is only applicable when water level is above the RPV flange.

Comment [BWROG11]: This requirement is redundant to the requirements in Criterion 5, which require the SCIV and SCIV instrumentation specification to be met.

Comment [BWROG12]: This restriction is to prevent an inadvertent removal of a control blade and CRDM from the same location.

Comment [BWROG13]: The proposed change above requires establishing containment functionality within the drain down time. With this proposed approach, it is not necessary to limit OPDRVs to a single penetration as the licensee must consider all potential leakage paths. Under the proposed restriction, the size of the drain down path was not considered and small and large leakage paths were treated the same.

Comment [BWROG14]: It is not necessary to say either continuous or automatic and is potentially confusing terminology.

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detected with sufficient time to establish ~~secondary~~ containment functionality prior to reaching the top of the reactor vessel flange, as discussed in Criterion 3, above.

5. If any of the following LCOs Specifications^{ix} are not met during their Applicability, initiate action to suspend OPDRVs operations immediately.

- i. Primary Containment Isolation Instrumentation (Section 3.3.6.1 [BWR/6, as applicable])
- ii. Secondary Containment Isolation Instrumentation (Section 3.3.6.2 [BWR/4 & BWR/6, as applicable]).
- iii. Main Control Room Environmental Control System Instrumentation (Section 3.3.7.1 [BWR/4]); Control Room Fresh Air System Instrumentation (Section 3.3.7.1 [BWR/6]).
- iv. Primary Containment Isolation Valves (Section 3.6.1 [BWR/6, as applicable])
- v. Secondary Containment Isolation Valves (Section 3.6.4.2) [BWR/4 & BWR/6, as applicable]
- vi. Standby Gas Treatment System (Section 3.6.4.3) [BWR/4 & BWR/6, as applicable]
- vii. Main Control Room Environmental Control System (Section 3.7.4 [BWR/4]); Control Room Fresh Air System (Section 3.7.3 [BWR/6]) and Control Room Air Conditioning Systems (Section 3.7.5 [BWR/4]; Section 3.7.4 [BWR/6])
- viii. AC Sources - Shutdown LCO (Section 3.8.2 [BWR/4] and 3.8.5 [BWR/6]),
- ix. DC Sources – Shutdown (Section 3.8.5), or
- x. Inverters (Section 3.8.8)
- xi. Distribution Systems - Shutdown (Section 3.8.10)

A number of the above LCOs allow indefinite operation in the Required Actions if one of the required subsystems is not Operable during OPDRVs. It is permissible to invoke LCO 3.0.4.b to allow OPDRVs to commence with those LCOs not met, provided that the risk is assessed and managed in accordance with the requirements of LCO 3.0.4.b and the Required Actions of those LCOs are met with one subsystem out of service (e.g., ventilation subsystems placed into operation^x.)

ⁱ Establishing Secondary [Primary] Containment functionality means closing previously open doors, hatches, penetrations, etc. such that gross leakage to the environment is precluded. It is not necessary for Secondary [Primary] Containment to be returned to Operable status such that all Surveillance Requirements are met.

ⁱⁱ The criteria are based on the Standard Technical Specifications (NUREG-1433 and NUREG-1434). Inspectors may need to apply additional discretion, consistent with the criteria, when applying the Enforcement Guidance to licensees that do not have Standard Technical Specifications.

ⁱⁱⁱ Minor leakage past valves and flanges that do not have pre-established allowable leakage limits is acceptable (e.g., less than 1 gpm).

^{iv} This RPV level is that specified in the plant's TS for being considered "flooded up," for example as in the Applicability of LCO 3.5.2 (ECCS – Shutdown).

Comment [BWROG15]: Primary containment plants will be required by Criteria 3.II.a to control primary containment penetrations, similar to containment airlocks, through the administrative controls to establish primary containment functionality. There are very few primary containment penetrations opened at any one time during an outage and there are strict administrative controls to facilitate their rapid closure under the shutdown safety program. Therefore, the PCIV and PCIV isolation specifications should not be required during ODPRVs.

Comment [BWROG16]: The "or" appears to be in error.

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^v References to [BWR/4] and [BWR/6] are intended to refer to the Standard TS NUREGs 1433 and 1434, respectively. A given plant will use these references as applicable to their similar TS requirements.

^{vi} This incorporates manual valves which may be open for reasons such as local leak rate testing.

^{vii} Note that if the CRDM penetration is closed with a blank flange, it is no longer an OPDRV.

^{viii} It is not necessary to dedicate an individual to monitor the RPV level with no other duties. Also, short breaks in monitoring are allowed, such as shift turnover, provided no new OPDRVs are initiated during that period. Also, it is not intended to modify or add instrumentation for this monitoring beyond currently installed equipment. Instrument accuracy, etc. is not critical, as only gross water level indication is needed.

^{ix} Specifications includes the LCO and the applicable Actions.

^x Both LCO 3.0.4.a AND b must be met. This is an additional requirement, commensurate with the Staff's desire to maintain defense-in-depth.

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