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United States Nuclear Regulatory Commission

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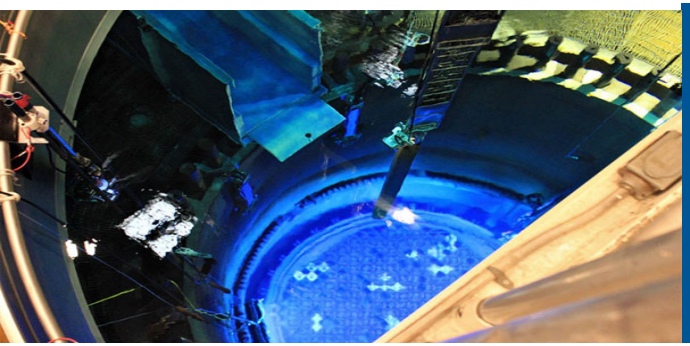
ROP Monthly Meeting
Insight From Temporary Instruction 2515/194 (TI-194) Implementation

December 2021



Insight From TI-194 Implementation

- **Background**
  - 01/30/2012: Byron Unit 2 automatic reactor trip from full power due to the reactor protection scheme detected an undervoltage condition on the 6.9 kilovolt (kV) buses that power reactor coolant pumps (RCPs) B and C (undervoltage on two of four RCPs initiates a reactor trip).
  - 03/03/2012 - NRC staff issued Information Notice 2012-03, "Design Vulnerability in Electric Power System."
  - 07/27/2012 - NRC staff issued Bulletin (BL) 2012-01, "Design Vulnerability in Electric Power System."

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Insight From TI-194 Implementation

- **Background (cont.)**
  - 10/09/2013 – Industry approved the Nuclear Energy Institute (NEI) Voluntary Industry Initiative (VII), Revision 0 to address open phase conditions (OPCs).
  - 03/09/2017 - The Commission issued Staff Requirements Memorandum (SRM) SECY 16-0068, "Interim Enforcement Policy for Open-Phase Conditions in Electric Power Systems for Operating Reactors," directing, in part, the staff to verify that licensees have appropriately implemented the VII.
  - 10/31/2017 - TI 2515/194 (TI-194) Revision 0 issued.

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Insight From TI-194 Implementation

- **Background (cont.)**
  - 09/20/2018 - Revision 2 of NEI VII issued, which revised the completion schedule to December 31, 2019, to allow time for the OPC modifications to be implemented and monitored.
  - 06/20/2019 - NEI submitted Revision 3 of the VII and accompanying guidance (NEI 19-02, "Guidance for Assessing Open Phase Condition Implementation Using Risk Insights") to include an option and provide guidance for plants to perform a risk evaluation to support manual response to an OPC.

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Insight From TI-194 Implementation

- **Background (cont.)**
  - 04/15/2020 – TI-194 Revision 1 was issued to extend the TI completion and expiration dates.
  - 08/18/2020 – TI-194 Revision 2 was issued to include instructions for verifying that licensees appropriately implemented Revision 3 of the VII.

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Insight From TI-194 Implementation

- **TI-194 Scope**

➢ To verify that licensees have appropriately implemented the VII.

➢ To gather the information necessary for NRR staff to determine whether the licensees adequately addressed potential OPCs.

	RI	RII	RIII	RIV	Total
Sites	12	12	13	12	49
Units	20	22	21	18	81

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Insight From TI-194 Implementation

- **TI-194 Inspection Exceptions** (As of 12/02/21)

Regions	Alarms and General Criteria	Protective Actions	Risk Evaluation
I	14	14	2
II	18	13	0
III	10	13	8
IV	16	15	0

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- **TI-194 Inspection Exceptions** (cont.)

➢ Exceptions are where the VII was not fully met, examples include:

- Plant modification(s) and/or documentation not completed at the conclusion of the inspection
- Plant was in monitoring mode
- OPC Risk Evaluation not consistent with NEI 19-02

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- **Examples of TI-194 exceptions**
  - *Detection, Alarms and General Criteria*
    - Final Safety Analysis Report (FSAR) had not been updated to include information related to OPCs at the conclusion of the onsite inspection.
    - Alarm disabled without operator understanding of the impact or compensatory measures in place.
    - Components lacked maintenance programs and periodic tests, calibrations, setpoint verifications, or inspections.

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- **Examples of TI-194 exceptions (cont.)**
  - *Protective Actions*
    - Under a non-accident condition with an ungrounded double open phase condition, there was a potential for safety related motors to trip on overcurrent prior to actuation of the degraded voltage relays when grid voltage is greater than 359 KV and no safety injection signal is present, however, no instructions or procedures were in place to restart the motors.
    - Tripping function input to the transformer lockout relays remained deactivated during the onsite system implementation.

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- **Examples of TI-194 exceptions (cont.)**
  - *Use of Risk Informed Evaluation Method*
    - Incomplete review of all allowable risk significant configurations which resulted in a deficient risk-informed evaluation to support the operator manual actions in lieu of automatic actions.
    - Risk-informed evaluation methodology is not consistent with NEI guidance.

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- **TI-194 Inspection Summary**
  - The plants implemented the VII to address the OPC (detect, alarm and mitigate)
  - The exceptions identified did not present a significant safety impact.

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- **Status of OPC Bulletin Closure** (As of 12/02/21)

Sites with no modification	Sites with LAR	Sites with Automatic Protection Implemented	Sites with Risk Option Implemented
2/2	5/5	13/13	16/35

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- **OPC Risk Option Implementation**

  - The NRC has a concern that licensees are not evaluating the OPC and the Open Phase Isolation System (OPIS) for inclusion into their PRA models of record. This has been observed during the TI-194 inspections.

  - While the level of risk from OPC doesn't rise to the level of backfit, it can affect Risk-Informed Decisionmaking (RIDM) activities. It also does not reflect the as-built as operated plant.

Insight From TI-194 Implementation

- **OPC Risk Option Implementation (cont.)**
  - OPC can particularly affect plant risk during Risk-informed Completion Time (RICT) or (a)(4) assessments when plant configurations change. For instance, by removing an offsite power transformer from service for a workweek configuration leaving the plant and its safety buses aligned to a single source of offsite power for the duration of the maintenance window.
  - Section 1-5.3 of the ANS PRA Standard discusses monitoring of PRA inputs and collecting new information for the PRA Configuration Control Program.

Insight From TI-194 Implementation

- **OPC Risk Option Implementation (cont.)**
  - The OPC is industry-wide operational experience that affects the PRA. It resulted in plant modifications, procedure changes, and in some cases, operator actions. It changes the results of the PRA and can affect RIDM in the future.
  - NRC's expectation is that licensees consider whether OPC should be included in their PRA model, consistent with RG 1.200 and the ASME/ANS Standard PRA standard.

Requirement
- As-built, as-operated plant

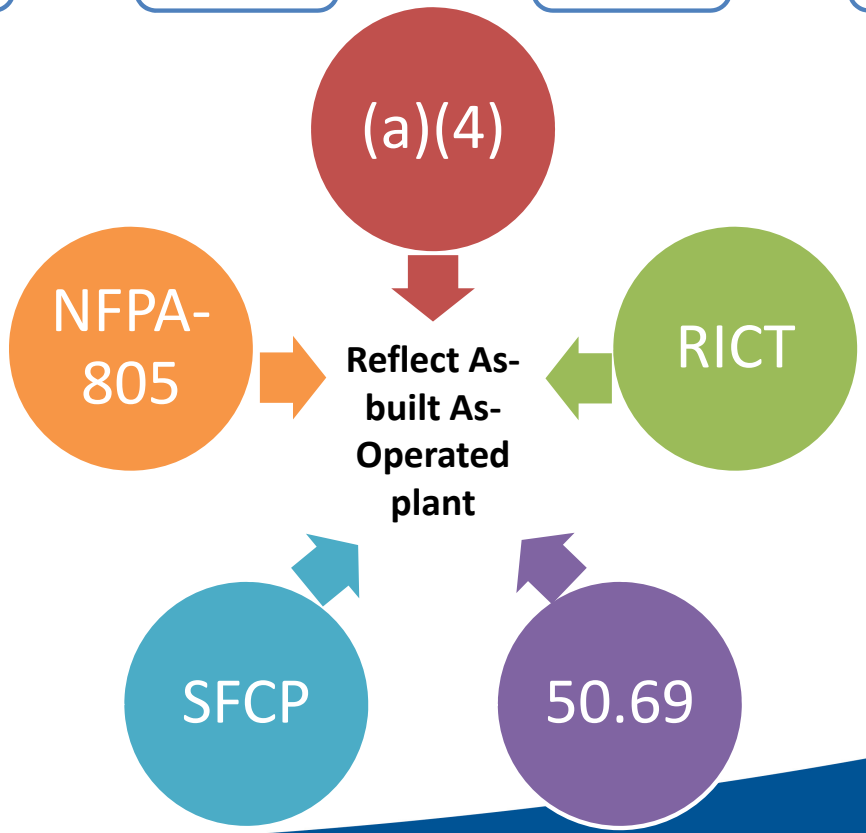
NFPA-805
- License condition
- Standard Section 2.4.3.3

SFCP
- License condition
- ASME/ANS Ra-Sa-2009

RICT
- License Condition
- ASME/ANS Standard Ra-Sa-2009

50.69
- 10 CFR 50.69(e)(1)
- ASME/ANS Ra-Sa-2009

a(4)
- NUMARC 93-01, Rev 4F, Section 11.3.3



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Questions?

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