U.S. NUCLEAR REGULATORY COMMISSION

STANDARD REVIEW PLAN

OFFICE OF NUCLEAR REACTOR REGULATION

Appendix 8-A BRANCH TECHNICAL POSITIONS (PSB) - Currently the responsibility of the Electrical Engineering Branch (EELB)[1]

The ~~PSB~~ Branch Technical Positions (BTPs) included herein[2] represent guidelines intended to supplement the acceptance criteria established in Commission Regulations, guidelines presented in Regulatory Guides, and recommendations presented in applicable IEEE standards. As technical problems or questions of interpretation arise in the detailed reviews of plant designs, the staff must determine an acceptable resolution for each such case to complete its review of a particular application. Where the same technical problem or question of interpretation arises in several cases, the staff's determination on the point at issue is formalized in a BTP. The BTP is primarily an instruction to staff reviewers that outlines an acceptable approach to the particular issue and ensures a uniform treatment of the issue by staff reviewers. The approaches taken in the BTPs, like the approaches taken in regulatory guides, are not mandatory, but do provide defined, acceptable, and immediate solutions to some of the technical problems and questions of interpretation that arise in the review process. In some instances, regulatory guides may be developed from BTPs after sufficient experience in their use has accumulated. ~~All PSB~~ BTPs applicable to Chapter 8 of the Standard Review Plan that are the responsibility of EELB[3] have been included in this appendix for convenience. They are listed below:

BTP ICSB (PSB)*	Branch Technical Positions ~~of the PSB~~Included Herein[4]
~~2~~	~~Diesel-Generator Reliability Qualification Testing (Deleted)~~[5]
4	Requirements on Motor-Operated Valves in the ECCS Accumulator Lines

* These BTPs ~~are~~were formerly the responsibility of the EICSB, ICSB and/or PSB (outdated NRC review branch designations) ~~BTPs~~ which are now in the area of review responsibility of the ~~Power Systems Branch (PSB)~~Electrical Engineering Branch (EELB). Their ~~EICSB (now ICSB)~~ICSB and/or PSB numbers ~~has~~have been retained in order to provide continuity and correlation with completed reviews.

8	Use of Diesel-Generator Sets for Peaking
11	Stability of Offsite Power Systems
~~15~~	~~Reactor Coolant-Pump Breaker Qualification (Deleted)~~
~~17~~	~~Diesel-Generator Protective Trip Circuit Bypasses (Deleted)~~[6]
18	Application of the Single Failure Criterion to Manually-Controlled Electrically-Operated Valves
21	Supplemental Guidance for ~~Application of Regulatory Guide 1.47~~Bypass and Inoperable Status Indication for Engineered Safety Features Systems[7]

BTP PSB

1	Adequacy of ~~Shutdown Electronic~~Station Electric[8] Distribution System Voltages
2	Criteria for Alarms and Indications Associated with Diesel-Generator Unit Bypassed and Inoperable Status

~~BRANCH TECHNICAL POSITION 2 (PSB)~~
~~DIESEL-GENERATOR RELIABILITY QUALIFICATION TESTING~~
~~(BTP ICSB-2 (PSB) HAS BEEN SUPERSEDED BY IEEE-387)~~[9]

BRANCH TECHNICAL POSITION ICSB-4 (PSB)
REQUIREMENTS ON MOTOR-OPERATED VALVES IN THE ECCS ACCUMULATOR LINES

A. BACKGROUND

For many postulated loss-of-coolant accidents, the performance of the emergency core cooling system (ECCS) in pressurized water reactor plants depends upon proper functioning of the safety injection tanks (also referred to as "accumulators" or "flooding tanks" in some applications). In these plants, a motor-operated isolation valve (MOIV) and two check valves are provided in series between each safety injection tank and the reactor coolant (primary) system.

The MOIVs must be considered to be "operating bypasses" because, when closed, they prevent the safety injection tanks from performing the intended protective function. IEEE Std 279 (Reference 5)[10] has a requirement for "operating bypasses" which states that the bypasses of a protective function will be removed automatically whenever permissive conditions are not met. This Branch Technical Position provides specific guidance in meeting the intent of IEEE Std 279 for safety injection tank MOIVs. See Reference 3 for further background information regarding this issue.[11]

~~It should be noted that BTP ICSB 18 (PSB), "Application of the Single Failure Criterion to Manually-Controlled Electrically-Operated Valves," also applies to these isolation valves and should be used in conjunction with this position.~~[12]

B. BRANCH TECHNICAL POSITION

The following features should be incorporated in the design of MOIV systems for safety injection tanks to meet the intent of IEEE Std 279:

1. Automatic opening of the valves when either primary coolant system pressure exceeds a preselected value (to be specified in the technical specifications), or a safety injection signal is present. Both primary coolant system pressure and safety injection signals should be provided to the valve operator.

2. Visual indication in the control room of the open or closed status of the valve.

3. An audible and visual alarm, independent of item 2., above, that is actuated by a sensor on the valve when the valve is not in the fully-open position.

4. Utilization of a safety injection signal to remove automatically (override) any bypass feature that may be provided to allow an isolation valve to be closed for short periods of time when the reactor coolant system is at pressure (in accordance with provisions of the technical specifications).

Conformance with the relevant criteria for operating bypasses described in IEEE Std 603 (Reference 4), as endorsed in Regulatory Guide 1.153, constitutes an acceptable alternative approach.[13]

It should be noted that BTP ICSB-18 (PSB), "Application of the Single Failure Criterion to Manually-Controlled Electrically-Operated Valves," (Reference 2) may also be applied to these isolation valves and should be used, where applicable, in conjunction with this Branch Technical Position.[14]

C. REFERENCES[15]

1. Regulatory Guide 1.153, "Criteria for Power, Instrumentation, and Control Portions of Safety Systems."[16]

~~3~~2. BTP ICSB-18[17] (PSB), "Application of the Single Failure Criterion to Manually Controlled Electrically Operated Valves."

~~1~~3. Arkansas 1, Unit 1, Safety Evaluation Report, January 23, 1973.

4. IEEE Std 603-1980, "Criteria for Safety Systems for Nuclear Power Generating Stations."[18]

~~2~~5. IEEE Std 279-1971[19], "Criteria for Protection Systems for Nuclear Power Generating Stations."

BRANCH TECHNICAL POSITION ICSB-8 (PSB)
USE OF DIESEL-GENERATOR SETS FOR PEAKING

A. BACKGROUND

General Design Criterion 17 requires that provisions be included to minimize the probability of losing electric power from any of the remaining supplies as a result of, or coincident with, loss of the main generator, loss of power from the grid, or loss of standby power supplies. Additionally, IEEE Std 308 (Reference 3), as endorsed in Regulatory Guide 1.32,[20] requires that the preferred (offsite) and standby power supplies shall not have a common failure mode. Common failure mode is defined as "a mechanism by which a single design basis event can cause redundant equipment to be inoperable." Although IEEE Std 308 does not preclude the use of emergency diesels for nonsafety purposes, the staff concludes that the potential for common failure modes should preclude interconnection of onsite and offsite power sources except for short periods for the purpose of load testing.

Review of the use of emergency diesel-generator sets for peaking service leads to the conclusion that the required frequent interconnection of the preferred and standby power supplies increases the probability of their common failure.

B. BRANCH TECHNICAL POSITION

~~General Design Criterion 17 and IEEE Std 308 should be interpreted as prohibiting t~~The staff's position regarding use of ~~plant~~onsite emergency power diesel-generator sets for purposes other than that of supplying standby power when needed is that such use should be prohibited[21]. In particular, emergency power diesel-generator sets should not be used for peaking service.

C. REFERENCES

1. 10 CFR Part 50, Appendix A, General Design Criterion 17, "Electric Power Systems."[22]

2. Regulatory Guide 1.32, "Criteria for Safety-Related Electric Power Systems for Nuclear Power Plants."[23]

3. IEEE S~~TD~~td 308-1974, "IEEE Standard Criteria for Class 1E Systems for Nuclear Power Generating Stations."[24]

BRANCH TECHNICAL POSITION ICSB-11 (PSB)
STABILITY OF OFFSITE POWER SYSTEMS

A. BACKGROUND

The staff has traditionally required each applicant to perform stability studies for the electrical transmission grid which would be used to provide the offsite power sources to the plant. The basic requirement is that loss of the largest operating unit on the grid will not result in loss of grid stability and availability of offsite power to the plant under consideration. In some cases, such as plants on the island of Puerto Rico, the plant is connected to an isolated power system of limited generating capacity. These kinds of isolated power systems are inherently less stable than equivalent systems with supporting grid interties. It is also obvious that limited systems are more vulnerable to natural disasters such as tornadoes or hurricanes.

B. BRANCH TECHNICAL POSITION

1. The staff has concluded, from a review of appropriate reliability data, that power systems with supporting grid interties meet the grid availability criterion with some margin. This conclusion is applicable to the review of most plants located on the U.S. mainland.

2. There is also strong indication that an isolated system large enough to justify inclusion of a nuclear unit will also meet this criterion. However, as a conservative approach, the staff will examine the available generating capacity of a system, including interties if available, to withstand outage of the largest unit. If the available capacity is judged marginal to provide adequate stability of the grid, additional measures should be taken. These may include provisions for additional capability and margin for the onsite power system beyond the normal requirements, or other measures as may be appropriate in a particular case. The additional measures to be taken should be determined on an individual case basis.

C. REFERENCES

None.

~~BRANCH TECHNICAL POSITION ICSB-15 (PSB)~~
~~REACTOR COOLANT PUMP BREAKER QUALIFICATION~~
~~(BTP ICSB-15 (PSB) has been Deleted)~~[25]

~~BRANCH TECHNICAL POSITION ICSB-17 (PSB)~~
~~DIESEL-GENERATOR PROTECTIVE TRIP CIRCUIT BYPASSES~~

~~BTP ICSB-17 (PSB) has been Superseded by~~
~~Position 7 of Regulatory Guide 1.9 (Revision 2)~~[26]

BRANCH TECHNICAL POSITION ICSB-18[27] (PSB)
APPLICATION OF THE SINGLE FAILURE CRITERION TO MANUALLY-CONTROLLED ELECTRICALLY-OPERATED VALVES

A. BACKGROUND

Where a single failure in an electrical system can result in loss of capability to perform a safety function, the effect on plant safety must be evaluated. This is necessary regardless of whether the loss of safety function is caused by a component failing to perform a requisite mechanical motion, or by a component performing an undesirable mechanical motion.

This position establishes the acceptability of disconnecting power to electrical components of a fluid system as one means of designing against a single failure that might cause an undesirable component action. These provisions are based on the assumption that the component is then equivalent to a similar component that is not designed for electrical operation, e.g., a valve that can be opened or closed only by direct manual operation of the valve. They are also based on the assumption that no single failure can both restore power to the electrical system and cause mechanical motion of the components served by the electrical system. The validity of these assumptions should be verified when applying this position.

B. BRANCH TECHNICAL POSITION

1. Failures in both the "fail to function" sense and the "undesirable function" sense of components in electrical systems including valves and other fluid system components should be considered in designing against a single failure, even though the valve or other fluid system component may not be called upon to function in a given safety operational sequence.

2. Where it is determined that failure of an electrical system component can cause undesired mechanical motion of a valve or other fluid system component and this motion results in loss of the system safety function, it is acceptable, in lieu of design changes that also may be acceptable, to disconnect power to the electric systems of the valve or other fluid system component. The plant technical specifications should include a list of all electrically-operated valves, and the required positions of these valves, to which the requirement for removal of electric power is applied in order to satisfy the single failure criterion.

3. Electrically operated valves that are classified as "active" valves, i.e., are required to open or close in various safety system operational sequences, but are manually controlled, should be operated from the main control room. Such valves may not be included among those valves from which power is removed in order to meet the single failure criterion unless: (a) electrical power can be restored to the valves from the main control room, (b) valve operation is not necessary for at least ten minutes following occurrence of the event requiring such operation, and (c) it is demonstrated that there is reasonable assurance that all necessary operator actions will be performed within the time shown to be adequate by the analysis. The plant technical specifications should include a list of the required positions of manually controlled, electrically operated valves and

should identify those valves to which the requirement for removal of electric power is applied in order to satisfy the single failure criterion.

4. When the single failure criterion is satisfied by removal of electrical power from valves described in 2. and 3., above, these valves should have redundant position indication in the main control room and the position indication system should, itself, meet the single failure criterion.

5. The phrase "electrically-operated valves" includes both valves operated directly by an electrical device (e.g., a motor-operated valve or a solenoid-operated valve) and those valves operated indirectly by an electrical device (e.g., an air-operated valve whose air supply is controlled by an electrical solenoid valve).

C. REFERENCES

None.

BRANCH TECHNICAL POSITION ICSB-21
SUPPLEMENTAL GUIDANCE FOR ~~APPLICATION OF REGULATORY GUIDE 1.47~~BYPASS AND INOPERABLE STATUS INDICATION FOR ENGINEERED SAFETY FEATURES SYSTEMS[28]

A. BACKGROUND

The guidance of Regulatory Guide 1.47 needs further detailing as to methods of providing an acceptable design for the bypass and inoperable status indicators for engineered safety feature (ESF) systems. The purpose of this Branch Technical Position is to provide supplemental guidance for implementation of the guidance of Regulatory Guide 1.47. This Branch Technical Position also supplements the criteria for bypass and inoperable status indication described in IEEE Std 603 (Reference 3) as endorsed by Regulatory Guide 1.153.[29]

B. BRANCH TECHNICAL POSITION

The design criteria for bypass and inoperable status indication systems for ESF should reflect the importance of providing accurate information for the operator and reducing the possibility for the indicating equipment to ~~affect adversely~~adversely affect[30] the monitored safety systems. In developing the design criteria, the following should be considered:

1. The bypass indicators should be arranged to enable the operator to determine the status of each safety system and determine whether continued reactor operation is permissible.

2. When a protective function of a shared system can be bypassed, indication of that bypass condition should be provided in the control room of each affected unit.

3. Means by which the operator can cancel erroneous bypass indications, if provided, should be justified by demonstrating that the postulated cases of erroneous indications cannot be eliminated by another practical design.

4. Unless the indication system is designed in conformance with criteria established for safety systems, it should not be used to perform functions that are essential to safety. Administrative procedures should not require immediate operator action based solely on the bypass indications.

5. The indication system should be designed and installed in a manner which precludes the possibility of adverse effects on plant safety systems. Failure or bypass of a protective function should not be a credible consequence of failures occurring in the indication equipment, and the bypass indication should not reduce the required independence between redundant safety systems.

6. The indication system should include a capability of assuring its operable status during normal plant operation to the extent that the indicating and annunciating function can be verified.

C. REFERENCES

1. Regulatory Guide 1.47, "Bypassed and Inoperable Status Indication for Nuclear Power Plant Safety Systems."

2. Regulatory Guide 1.153, "Criteria for Power, Instrumentation, and Control Portions of Safety Systems."[31]

3. IEEE Std 603-1980, "Criteria for Safety Systems for Nuclear Power Generating Stations."[32]

BRANCH TECHNICAL POSITION PSB-1
ADEQUACY OF STATION ELECTRIC DISTRIBUTION SYSTEM VOLTAGES

A. BACKGROUND

Events at the Millstone station have shown that adverse effects on the Class 1E loads can be caused by sustained low grid voltage conditions when the Class 1E buses are connected to offsite power. These low voltage conditions will not be detected by the loss of voltage relays (loss of offsite power) whose low voltage pickup setting is generally in the range of .7 per unit voltage or less. See Reference 2 for further background information regarding these events.[33]

The above events also ~~determined~~demonstrated[34] that improper voltage protection logic can itself cause adverse effects on the Class 1E systems and equipment such as spurious load shedding of Class 1E loads from the standby diesel generators and spurious separation of Class 1E systems from offsite power due to normal motor starting transients.

An ~~more recent~~ event[35] at Arkansas Nuclear One (ANO) station and the subsequent analysis performed disclosed the possibility of degraded voltage conditions existing on the Class 1E buses even with normal grid voltages, due to deficiencies in equipment between the grid and the Class 1E buses or by the starting transients experienced during certain accident events not originally considered in the sizing of these circuits. See Reference 3 for further background information regarding this event.[36]

B. BRANCH TECHNICAL POSITION

1. In addition to the undervoltage scheme provided to detect loss of offsite power at the Class 1E buses, a second level of undervoltage protection with time delay should also be provided to protect the Class 1E equipment; this second level of undervoltage protection shall satisfy the following criteria:

   a) The selection of undervoltage and time delay setpoints shall be determined from an analysis of the voltage requirements of the Class 1E loads at all onsite system distribution levels;

   b) Two separate time delays shall be selected for the second level of undervoltage protection based on the following conditions:

      1) The first time delay should be of a duration that establishes[37] the existence of a sustained degraded voltage condition (i.e., something longer than a motor starting transient). Following this delay, an alarm in the control room should alert the operator to the degraded condition. The subsequent occurrence of a safety injection actuation signal (SIAS) should immediately separate the Class 1E distribution system from the offsite power system.[38]

2) The second time delay should be of a limited duration such that the permanently connected Class 1E loads will not be damaged. Following this delay, if the operator has failed to restore adequate voltages, the Class 1E distribution system should be automatically separated from the offsite power system.[39] Bases and justification must be provided in support of the actual delay chosen.

c) The voltage sensors shall be designed to satisfy the following applicable requirements derived from IEEE Std~~.~~ 279~~-1971, "Criteria for Protection Systems for Nuclear Power Generating Stations"~~ (Reference 4) and/or IEEE Std 603 (Reference 5) as endorsed by Regulatory Guide 1.153[40]:

1) Class 1E equipment shall be utilized and shall be physically located at and electrically connected to the Class 1E switchgear.

2) An independent scheme shall be provided for each division of the Class 1E power system.

3) The undervoltage protection shall include coincidence logic on a per bus basis to preclude spurious trips of the offsite power source;

4) The voltage sensors shall automatically initiate the disconnection of offsite power sources whenever the voltage set point and time delay limits (cited in item 1.b.2 above) have been exceeded;[41]

5) Capability for test and calibration during power operation shall be provided.

6) Annunciation must be provided in the control room for any bypasses incorporated in the design.

d) The Technical Specifications shall include limiting conditions for operations, surveillance requirements, trip setpoints with minimum and maximum limits, and allowable values for the second-level voltage protection sensors and associated time delay devices.

2. The Class 1E bus load shedding scheme should automatically prevent shedding during sequencing of the emergency loads to the bus. The load shedding feature should, however, be reinstated upon completion of the load sequencing action. The technical specifications must include a test requirement to demonstrate the operability of the automatic bypass and reinstatement features at least once per 18 months during shutdown.

In the event an adequate basis can be provided for retaining the load shed feature during the above transient conditions, the setpoint value in the Technical Specifications for the first level of undervoltage protection (loss of offsite power) must specify a value having

maximum and minimum limits. The basis for the setpoints and limits selected must be documented.

3. The voltage levels at the safety-related buses should be optimized for the maximum and minimum load conditions that are expected throughout the anticipated range of voltage variations of the offsite power sources by appropriate adjustment of the voltage tap settings of the intervening transformers. The tap settings selected should be based on an analysis of the voltage at the terminals of the Class 1E loads. The analyses performed to determine minimum operating voltages should typically consider maximum unit steady state and transient loads for events such as a unit trip, loss-of-coolant accident, startup or shutdown; with the offsite power supply (grid) at minimum anticipated voltage and only the offsite source being considered available. Maximum voltages should be analyzed with the offsite power supply (grid) at maximum expected voltage concurrent with minimum unit loads (e.g. cold shutdown, refueling). A separate set of the above analyses should be performed for each available connection to the offsite power supply.

4. The analytical techniques and assumptions used in the voltage analyses cited in item 3 above must be verified by actual measurement. The verification and test should be performed prior to initial full-power reactor operation on all sources of offsite power by:

   a) loading the station distribution buses, including all Class 1E buses down to the 120/208 v level, to at least 30%;

   b) recording the existing grid and Class 1E bus voltages and bus loading down to the 120/208 volt level at steady state conditions and during the starting of both a large Class 1E and non-Class 1E motor (not concurrently);

      Note: To minimize the number of instrumented locations, (recorders) during the motor starting transient tests, the bus voltages and loading need only be recorded on that string of buses which previously showed the lowest analyzed voltages from item 3 above.

   c) using the analytical techniques and assumptions of the previous voltage analyses cited in item 3 above, and the measured existing grid voltage and bus loading conditions recorded during conduct of the test, calculate new set of voltages for all the Class 1E buses down to the 120/208 volt level;

   d) compare the analytically derived voltage values against the test results.

   With good correlation between the analytical results and the test results, the test verification requirement will be met. That is, the validity of the mathematical model used in performance of the analyses of item 3 will have been established; therefore, the validity of the results of the analyses is also established. In general the test results should not be more than 3% lower than the analytical results; however, the difference between the two when subtracted from the voltage levels determined in the original analyses should never be less than the Class 1E equipment rated voltages.

C. REFERENCES

~~1. General Design Criterion 17, "Electric Power Systems."~~[42]

1. Regulatory Guide 1.153, "Criteria for Power, Instrumentation, and Control Portions of Safety Systems."[43]

~~3~~2. Millstone Unit No. 2, Safety Evaluation Supporting Amendment No. 16 to License No. DPR-65.

~~4~~3. NRC Summary of Meeting for Arkansas Nuclear One Incident of September 16, 1978, dated February 9, 1979.

~~2~~4. IEEE Std. 279-1971[44], "Criteria for Protection Systems for Nuclear Power Stations."

5. IEEE Std 603-1980, "Criteria for Safety Systems for Nuclear Power Generating Stations."[45]

BRANCH TECHNICAL POSITION PSB-2

CRITERIA FOR ALARMS AND INDICATIONS ASSOCIATED WITH DIESEL-GENERATOR UNIT BYPASSED AND INOPERABLE STATUS[46]

~~1~~A. BACKGROUND

Regulatory Guide 1.47~~, "Bypassed and Inoperable Status Indication for Nuclear Power Plant Safety Systems,"~~[47] and IEEE Std 603 (Reference 7), as endorsed by Regulatory Guide 1.153, describe~~s an~~ acceptable methods[48] for complying with the requirements of IEEE 279~~, "Criteria for Protection Systems for Nuclear Power Generating Stations,"~~ (Reference 6)[49] with respect to indicating the bypass or inoperable status of portions of the protection system, systems actuated or controlled by the protection system, and auxiliary or supporting systems that must be operable for the protection system and the system it actuates to perform their safety-related functions. Branch Technical Position ICSB-21 (Reference 4) describes supplemental guidance for engineered safety features system bypass or inoperable status indication. This Branch Technical Position (PSB-2) describes~~This appendix gives~~[50] more specific guidance on meeting the provisions of Regulatory Guide 1.47 as they pertain to diesel-generator units. Diesel-generator units~~, as defined in Regulatory Guide 1.108, "Periodic Testing of Diesel Generator Units Used as Onsite Electric Power Systems at Nuclear Power Plants,"~~ as reflected in Regulatory Guide 1.9,[51] consist of the engine, governor, exhaust system, generator, associated excitation and voltage regulation system, combustion air system, cooling water system up to the supply, fuel supply system, lubricating oil system, starting energy sources, starting system and autostart/load features, auto~~start~~matic ~~controls,~~and manual controls, test features, protective trip and lockout features, local/remote control transfer features, and the diesel-generator breaker.[52]

Operating experience (see Reference 5)[53] has shown that there have been incidents where diesel-generator units failed to respond to an automatic start signal because control switches or lockout and shutdown relays (which require manual reset) were left in the shutdown condition without control room operators being aware of their status. The principal reasons for this lack of awareness were the (a) sharing of annunciator stations for both disabling and nondisabling alarm conditions; (b) wording on annunciator windows for disabling conditions that did not specifically say a diesel-generator unit was unavailable for an~~ automatic~~ emergency ~~start~~demand[54]; and (c) disabling conditions that were not annunciated in the control room.

Examples of bypass or deliberately induced inoperable conditions that can render diesel-generator units incapable of adequate response to an emergency demand include nonreset of trips/lockouts, improper mode or control switch positioning, loss of control voltage, and low starting air pressure.[55]

In order that the operator can act appropriately to supply emergency power when required in the operation of diesel-generator units, it is essential that~~ he has~~ accurate and sufficient information about the status of the units (e.g., is a unit under test; is a unit locked out for repair, maintenance, or otherwise unavailable) be available on which to base~~ his~~ decisions.[56]

~~2~~B. BRANCH TECHNICAL POSITION

~~2.~~1. Diesel-generator unit bypass or deliberately induced inoperability status should be automatically indicated in the control room where the bypass or deliberately induced inoperable condition can be expected to occur more frequently than once per year and can render the unit unavailable to adequately respond to an automatic or operator-initiated emergency ~~start~~demand[57] ~~signal (e.g., nonreset, mode switch position, loss of control voltage, low starting air pressure)~~.[58] Manually induced indication may be desirable and is permitted for diesel-generator unit bypass or deliberately induced inoperability status for those conditions expected to occur less frequently than once per year.

~~2.~~2. All status indication should be sufficiently precise to prevent misinterpretation. Further, disabling or bypass indicators should be separate from nondisabling indicators and should be physically arranged to enable the operator to clearly determine the status of each diesel-generator unit. An acceptable design would include a separate alarm for each disabling condition or a single shared alarm with reflash capability. The alarms should be displayed in the control room and at the diesel-generator unit for all disabling conditions, with wording that indicates that the diesel-generator unit is incapable of adequately responding to an ~~automatic start signal~~emergency demand[59].

~~2.~~3. When a shared diesel-generator unit can be bypassed, indication of that bypass condition should be provided in the control room of each affected unit.

~~2.~~4. The indication system should be designed and installed in a manner that precludes the possibility of adverse effects on the diesel-generator units. Failures in the indication equipment should not result in diesel-generator unit failure or bypass of the diesel-generator unit, and the bypass indication should not reduce the required independence between redundant diesel-generator units.

~~2.~~5. The indication system should include a capability of ensuring its operable status during normal plant operation to the extent that the indicating and annunciating function can be verified.

6. Regulatory Guide 1.9, positions C.1.6 through C.1.8 contain further guidance that should also be addressed regarding status and anomalous conditions indication and alarms for diesel-generators.[60]

~~3~~C. REFERENCES[61]

1. Regulatory Guide 1.9, "Selection, Design, Qualification, and Testing of Emergency Diesel Generator Units Used as Class 1E Onsite Electric Power Systems at Nuclear Power Plants."[62]

~~a~~2. Regulatory Guide 1.47, "Bypassed and Inoperable Status Indication for Nuclear Power Plant Safety Systems."

3. Regulatory Guide 1.153, "Criteria for Power, Instrumentation, and Control Portions of Safety Systems."[63]

~~c~~4. Branch Technical Position ICSB-21, "Supplemental Guidance for ~~Application of Regulatory Guide 1.47~~Bypass and Inoperable Status Indication for Engineered Safety Features Systems," Appendix 8-A to Standard Review Plan ~~Section 8.1~~Chapter 8, and Appendix 7-A to Standard Review Plan ~~Section 7~~Chapter 7.[64]

~~b~~5. IE Circular 77-16, "Emergency Diesel Generator Electrical Trip Lock-Out Features," December 13, 1977.

6. IEEE Std 279-1971, "Criteria for Protection Systems for Nuclear Power Stations."[65]

7. IEEE Std 603-1980, "Criteria for Safety Systems for Nuclear Power Generating Stations."[66]

SRP Draft Section recommendations
Attachment A - Proposed Changes in Order of Occurrence

Item numbers in the following table correspond to superscript numbers in the redline/strikeout copy of the draft SRP section.

Item	Source	Description
1.	SRP-UDP format item, updating branch responsibilities for Branch Technical Positions	Revised to reflect that EELB is currently the PRB responsible for these Branch Technical Positions.
2.	Editorial	Revised to discuss the BTPs as included herein rather than characterize them by number/PRB responsibility for clarity.
3.	SRP-UDP format item, updating branch responsibilities for Branch Technical Positions	Revised to reflect that EELB is currently the PRB responsible for these Branch Technical Positions.
4.	SRP-UDP format item, updating branch responsibilities for Branch Technical Positions	Revised to reflect that these Branch Technical Positions are included herein rather than who is associated with them or responsible for them.
5.	Editorial	Deleted from list to reflect that all reference to this BTP has been stricken in this revision.
6.	Editorial	Deleted from list to reflect that all reference to these BTPs have been stricken in this revision.
7.	Editorial	Revised for consistency with the title of this BTP.
8.	Editorial	Revised for consistency with the title of this BTP.
9.	Editorial	Deleted this page and all reference to this BTP as no longer necessary, RG 1.9 addresses the staff's positions for such testing.
10.	SRP-UDP format item	Added identification by reference number for the first citation of this non-CFR/RG reference citation.
11.	Editorial	Revised to refer to a listed reference regarding the described issue.
12.	Editorial	Relocated to the end of section B since this paragraph appears to direct reviewer action to use another BTP in conjunction with this one.
13.	**Integrated Impact 1528**	Revised to reflect RG 1.153/IEEE 603 as an acceptable alternative to conformance with this BTP.
14.	Editorial	Relocated from section A and editorially revised to reflect contingent applicability. Also added dash for number format consistency with the other BTPs covered in Appendix A.
15.	SRP-UDP format item	Rearranged the order of references in accordance with SRP-UDP format requirements and renumbered where applicable.

Item	Source	Description
16.	**Integrated Impact 1528**	Added reference listing for RG 1.153 since it is now cited in the text of this BTP.
17.	Editorial	Added dash for number format consistency with the other BTPs covered in Appendix A.
18.	**Integrated Impact 1528**	Added reference listing for IEEE 603 since it is now cited in the text of this BTP.
19.	**Integrated Impact 1528**	Revised to reflect the version of IEEE 279 required for protection systems in 10 CFR 50.55a(h).
20.	Editorial, SRP-UDP format item, See ROC 1518 for SRP Section 8.1	Added identification of IEEE 308 by reference number for the first citation of this non-CFR/RG reference citation. Also added reference to the regulatory endorsement of IEEE 308 to clarify the regulatory basis and relevance to the assertion that IEEE 308 "requires that the preferred (offsite) and standby power supplies shall not have a common failure mode."
21.	Editorial	Revised to eliminate apparent direction to "interpret" GDC 17 and IEEE 308. Replaced "plant" with "onsite" for consistency with terminology used in GDC 17 and IEEE 308 to describe the power system which includes the discussed diesel-generator sets.
22.	SRP-UDP format item	Added reference listing for GDC 17 since it is cited in this BTP.
23.	SRP-UDP format item	Added reference listing for RG 1.32 since it is now cited in this BTP as the basis for discussing IEEE Std 308 as regulatory guidance.
24.	SRP-UDP format item, Editorial, also see ROC 1518 for SRP Section 8.1	Revised title for consistency with the actual title of the publication discussed and replaced "STD" with "Std" for consistency with other IEEE standard citations in SRP Chapter 8. Also revised to reflect that the endorsed version of IEEE Std 308 is the 1974 version.
25.	Editorial	Deleted this page and all reference to this BTP as no longer necessary.
26.	Editorial	Deleted this page and all reference to this BTP as no longer necessary, RG 1.9 addresses the staff's positions for this issue.
27.	Editorial	Added dash for consistency with numbering of other BTPs included in this Appendix.
28.	Editorial	Revised to reflect that this BTP no longer supplements only RG 1.47.
29.	**Integrated Impact 1530**	Added discussion of RG 1.153 and IEEE 603 as containing relevant guidance.

Item	Source	Description
30.	Editorial	Reversed the order of wording for better sentence structure.
31.	**Integrated Impact 1530**	Added reference listing for RG 1.153 since it is now cited in the text of this BTP.
32.	**Integrated Impact 1530**	Added reference listing for IEEE 603 since it is now cited in the text of this BTP.
33.	Editorial	Revised to refer to a listed reference regarding the described event.
34.	Editorial	Substituted a more appropriate word characterizing the outcome of the alluded to events.
35.	Editorial	Revised to eliminate characterization such as "more recent" since none of the events discussed are recent with respect to current time.
36.	Editorial	Revised to refer to a listed reference regarding the described event.
37.	Editorial	Revised to convey appropriate present and future tense.
38.	No change	This position only requires the Class 1E bus(es) to be separated from offsite power by the second level of undervoltage protection. The PRB should consider whether this position should also discuss what is acceptable with respect to initiation, capability for subsequent connection of emergency onsite sources, and non-interference with onsite source operation. If, for example, the second level voltage protection locks out the Class 1E bus upon separation from offsite power, thus preventing reconnection of any source, it would obviously be unacceptable but would technically satisfy the position for separation from offsite power as now stated.
39.	No change	This position only requires the Class 1E bus(es) to be separated from offsite power by the second level of undervoltage protection. The PRB should consider whether this position should also discuss what is acceptable with respect to initiation, capability for subsequent connection of emergency onsite sources, and non-interference with onsite source operation. If, for example, the second level voltage protection locks out the Class 1E bus upon separation from offsite power, thus preventing reconnection of any source, it would obviously be unacceptable but would technically satisfy the position for separation from offsite power as now stated.

Item	Source	Description
40.	**Integrated Impact 1531**, SRP-UDP format item	Added reference to RG 1.153 and IEEE 603 as relevant. Added identification of IEEE 279 by reference number for the first citation of this non-CFR/RG reference citation. Also revised to reflect the applicable version and title of IEEE 279 in the reference listing rather than in the body text of the BTP.
41.	No change	This position only requires the Class 1E bus(es) to be separated from offsite power by the second level of undervoltage protection. The PRB should consider whether this position should also discuss what is acceptable with respect to initiation, capability for subsequent connection of emergency onsite sources, and non-interference with onsite source operation. If, for example, the second level voltage protection locks out the Class 1E bus upon separation from offsite power, thus preventing reconnection of any source, it would obviously be unacceptable but would technically satisfy the position for separation from offsite power as now stated.
42.	SRP-UDP format item	Deleted listing for GDC 17 since it is not cited or explicitly discussed in this BTP.
43.	**Integrated Impact 1531**	Added reference listing for RG 1.153 since it is now cited in the text of this BTP.
44.	SRP-UDP format item, Editorial	Revised to reflect the applicable version of IEEE 279 in the reference listing rather than in the body text of the BTP.
45.	**Integrated Impact 1531**	Added reference listing for IEEE 603 since it is now cited in the text of this BTP.
46.	Editorial	Revised the section/subsection numbering scheme throughout this BTP for consistency with other BTPs included in this Appendix.
47.	Editorial, SRP-UDP format item	Revised to reflect cited document titles in the reference listing rather than in the body text of the BTP for standardization of citations.
48.	**Integrated Impact 1532**	Added discussion of IEEE 603 (endorsed by RG 1.153) as also describing acceptable methods for bypass and inoperable status indication.
49.	Editorial, SRP-UDP format item	Deleted title and added identification of IEEE 279 by reference number for the first citation of this non-CFR/RG reference citation.
50.	SRP-UDP format item	Revised to discuss why BTP-21 is relevant to this branch position and therefore listed as reference 4.

Item	Source	Description
51.	**Integrated Impact 1532**, Reference verification	Updated reference to where a diesel generator unit is defined noting that RG 1.108 which was withdrawn with the issuance of RG 1.9, Rev. 3.
52.	**Integrated Impact 1532**	Added listing of features that are part of a diesel generator unit as reflected in RG 1.9 and IEEE Std 387-1984.
53.	SRP-UDP format item	Added citation of the IE Circular listed as reference 5.
54.	**Integrated Impact 1532**, Editorial Global Change throughout this BTP	Revised to reflect that bypass/inop conditions that might not prevent starting the engine but that could cause subsequent failure to achieve/maintain proper speed, failure to connect to the bus, failure to sequence loads, and/or failure to supply adequate power to the Class 1E bus should also be considered. It should be noted that Regulatory Guide 1.9, Rev 3 reliability and testing program guidance reflects evaluation of diesel-generator performance and operability in terms of the overall demand, not just the ability to start the engine.
55.	Editorial	Moved (from position 1) the list of examples of inop/bypass conditions to the background section because the list may have been incomplete and therefore misleading when provided in conjunction with a position addressing inop/bypass indication. The list could have been interpreted to constitute a default minimum acceptable compliment of inputs to inop/bypass indication for a diesel-generator when provided as it was in conjunction with a position. Items such as autostart or load shed/sequence channel logic bypassed and generator output breaker not ready are also obvious inop/bypasses that should be considered for indication (the PRB should consider adding them). No new regulatory positions were identified under the SRP-UDP to support listing of a minimum acceptable compliment of inputs to the inop/bypass indication for diesel-generators, however. The PRB should consider further revisions to this list of examples that would be appropriate to provide a more complete list of conditions that should be covered by the inop/bypass indications for diesel-generators.
56.	Editorial	Revised to eliminate gender specific characterization of the operator.
57.	Editorial	Revised to reflect that bypass/inop conditions that might not prevent starting the engine but that could cause subsequent failure to achieve/maintain adequate speed, failure to connect to the bus, and/or failure to supply adequate power to the Class 1E bus should also be considered.

Item	Source	Description
58.	Editorial	Moved the list to the background section because the list may be incomplete and therefore misleading. The list could be interpreted to constitute a default minimum acceptable compliment of indications when provided as such in conjunction with a position. Items such as fuel supply shutoff, autostart or load shed/sequence channel bypassed, generator output breaker not racked in, etc. are also obvious inop/bypasses that should be considered for indication.
59.	Editorial	Revised to reflect that bypass/inop conditions that might not prevent starting the engine but that could cause subsequent failure to achieve/maintain adequate speed, failure to connect to the bus, and/or failure to supply adequate power to the Class 1E bus should also be considered.
60.	**Integrated Impact 1532**	Added citation of relevant RG 1.9 positions for further guidance.
61.	Editorial	Added Underlining for format consistency with other sections.
62.	**Integrated Impact 1532**	Added reference listing for RG 1.9 since it is now cited in the text of this BTP.
63.	**Integrated Impact 1532**	Added reference listing for RG 1.153 since it is now cited in the text of this BTP.
64.	Reference verification, Editorial	Revised for consistency with the number, title, and locations of this BTP.
65.	SRP-UDP format item	Added reference listing for IEEE Std 279 since it is cited in this BTP.
66.	**Integrated Impact 1532**	Added reference listing for IEEE 603 since it is now cited in the text of this BTP.

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SRP Draft Section recommendations
Attachment B - Cross Reference of Integrated Impacts

Integrated Impact No.	Issue	SRP Subsections Affected
1528	Consider revising BTP ICSB-4 (PSB) to permit compliance with Regulatory Guide 1.153 guidance as an acceptable alternative and also consider eventually deleting the BTP as superseded by Regulatory Guide 1.153 (IPD 7.0 Form 8-A-1.	BTP ICSB-4 (PSB) B-next to last paragraph, C.1, and C.4
1530	Consider revising BTP ICSB-21 (PSB) to acknowledge/reflect Regulatory Guide 1.153 guidance and also consider withdrawing Regulatory Guide 1.47 as superseded by Regulatory Guide 1.153 (IPD 7.0 Form 8-A-2).	BTP ICSB-21 (PSB) A-last sentence, C.2, and C.3
1531	Consider revising BTP PSB-1 to reflect Regulatory Guide 1.153 guidance.	BTP PSB-1, B.1.c), C.1, C.5
1532	Consider revising BTP PSB-2 to reflect the relevant guidance of Regulatory Guides 1.9, Rev. 3 and 1.153.	BTP PSB-2, global change, replaced "automatic start" with "emergency demand," A-first paragraph, B.6, C.1, C.3, and C.7