Commonwealth Edison
1400 Opus Place
Downers Grove, Illinois 60515

July 8, 1993

Dr. Thomas E. Murley, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission

Attn: Document Control Desk

Subject: Byron Nuclear Station
Braidwood Nuclear Station
Proposed Exception to Regulatory Guide 1.47
NRC Docket Nos. 50-454, 50-455, 50-456 & 50-457

Dear Dr. Murley:

Commonwealth Edison (CECo) proposes to revise its UFSAR commitment by taking exception to Regulatory Guide 1.47, which requires a means of displaying, at the system level, indication of bypassed or inoperable equipment important to safety. This exception would apply to the Braidwood and Byron Nuclear Stations. The purpose of this letter is to request NRC concurrence with the proposed exception.

The purpose for the revision of the commitment to the subject Regulatory Guide is to allow CECo the option of deleting the requirement to comply with the Regulatory Guide and take advantage of the extensive human factors improvements and CECo programs/procedures implemented after the issuance of this Regulatory Guide to meet the Regulatory Guide's intent.

The deletion of the Regulatory Guide commitment will permit the removal of the present system and take credit for the substantial number of Control Room human factor improvements which have been completed. The present system has proven to be difficult to maintain and unreliable. CECo has evaluated the impact of deleting the requirements of this Regulatory Guide and has determined that the proposed relief is both appropriate and advantageous.

If you have any questions, please feel free to contact me at (708) 663-7279.

Sincerely,

Terrence W. Simpkin
T.W. Simpkin
Nuclear Licensing Administrator

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cc: J. Hickman - NRR
R. Assa - NRR
S. DuPont - SRI - Braidwood
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BACKGROUND

In May 1973, Regulatory Guide 1.47, Bypassed and Inoperable Status for Nuclear Power Plant Safety Systems, was issued, endorsing IEEE 279-1971. IEEE 279-1971 requires system level indication in the control room of bypassed or deliberately rendered inoperative protection systems. For Braidwood and Byron, these systems are the Reactor Protection System (RPS) and the Engineered Safeguards Actuation System (ESFAS). In addition to the protection systems Regulatory Guide 1.47 expanded the scope to include all systems that are important to safety. Both stations committed to meeting the Regulatory Guide in the FSAR prior to plant licensing. The Equipment Status Display (ESD) panel in the control room at Braidwood and Byron was designed and installed to satisfy the expanded scope of Regulatory Guide 1.47. This Regulatory Guide was intended to aid the operator's knowledge of plant status by supplementing administrative procedures with automatic indication of the bypass or inoperability of each redundant portion of a system that performs a function important to safety. The system is described in Section 7.1.2.10 of the B/B UFSAR.

The ESD panel displays, on a system level, the bypassed/inoperability status of systems that are important to safety. Indication is provided by means of a visual indicator and an audible alarm. The original design consisted of supplying information to the plant process computer by the use of limit switches, contacts and manual inputs. Information such as valve position, tank level, breaker position, pump status, etc. of the various systems is either directly wired or manually entered in the station's process computer. Computer software combines all inputs logically into a decision tree that indicates whether the system is operable and outputs this to the ESD panel in the control room. The intent of the ESD system design is to provide automatic indication of plant changes for systems that perform a function important to safety with a minimum of manual inputs.

Due to the complexity of the required computer software, the original design at the stations had approximately 397 total inputs with 233 automatic and 164 manual inputs as well as many internally generated intermediate status points. This large number of manual inputs has resulted in the task of updating the system to reflect current plant conditions becoming very manpower-intensive. The operators in the control room have found the ESD system difficult to maintain and more of a distraction than a help to them in operating the plant. If any one of these inputs would indicate a discrepancy, the computer would indicate which system was affected and the computer software would have to be interrogated to identify the computer point that caused the indication. No readily available indication exists to identify the discrepant condition.

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A major revision of the computer software and manual inputs was performed at Byron in an attempt to address the operators' concerns and make the ESD system more user friendly and automated. While this revision did make the ESD more user friendly and automated, it slowed down all operations on the plant process computer and prevented some programs, such as the plant calorimetric, from being executed.

CONTROL ROOM DESIGN FEATURES

Regulatory Guide 1.47 discusses the background for the need of an automatic indication system based on the history of relying solely on administrative procedures to determine the operating status of safety-related systems. Since this Regulatory Guide was issued in May of 1973 and the accident at Three Mile Island, great progress has been made in the area of human factors consideration for the design of plant systems and the layout of the control room. The NRC has issued several rules and regulations such as Regulatory Guide 1.97, NUREG-0700 and 0737 that resulted in significant changes in the design and operation of nuclear power plants. At Braidwood and Byron, these changes have been implemented and have resulted in improvements in the amount and utility of the information being made available to the operators.

In particular, six monitor light panels are provided in the control room to provide the operator with the information necessary to quickly assess the status of key remotely operated ESF valves, motors, or other essential components. Each monitor panel consists of an array of lights with a single light for each safety feature component monitored. When a monitor light is energized, the statement written on the window is true. Because all the lights in a particular grouping operate in the same manner, a component failure is readily apparent. A mechanism for testing light bulbs is provided in each light group.

The assignment of an ESF component to a light grouping is determined by that component's operation as follows:

Group 1 lights monitor those components whose status is essential for advance readiness to actuate the ESF. The vast majority of these lights should be dark during normal operation. An example of those lights lit during power operation are the RH miniflow valves, which will open when flow is less than 750 gpm.

Group 2 lights monitor those ESF components that must actuate during the injection phase of an accident. These lights should all light for an accident. Some of the lights associated with dual-function equipment, such as component cooling may be lit during normal operation.

Group 3 monitors those valves required to close for Phase A

Containment Isolation. They are separated to show pairs of redundant valves subject to closure by the A and B trains. These lights should all light for an accident. Again, some of these lights may be lit during normal operation (for instance, sample line isolation valves).

Group 4 monitors those components that must be realigned to achieve the cold-leg recirculation mode. The transition from injection mode to cold- leg recirculation is done manually by the plant operators. They use this group as a guide, realigning 18 valves and restarting the RHR pumps until all lights in this group are lit. Some of the lights may be lit during normal operation or non-accident cool downs (such as centrifugal charging and RHR pump lights).

Group 5 monitors those components that must be changed to achieve the hot- leg recirculation mode. The transition from cold-leg recirculation to hot- leg recirculation mode is done manually by the plant operators. They use this group as a guide, realigning eight valves and checking that the RHR pumps continue running until all lights in this group are lit. Some of the lights may be lit during normal operation or nonaccident cooldowns (such as centrifugal charging and RHR pump lights).

Group 6 monitors those components that actuate on a high-high or a high-high-high containment pressure signal, including the containment spray system components, containment isolation phase B components, and the main steam isolation valves. In nonaccident conditions, these lights will usually be all dark except during system testing or isolation of a steam generator.

While not all of the groups discussed above are useful to this discussion, all six groups are presented to highlight the fact that the pertinent information is displayed to the operator in an integrated fashion, arranged in a manner to facilitate the verification of the function being performed.

Other important control room indication design features include the following:

Bypass Permissive and Bistable lights which provide information to the operators on the status of the bypass permissive and trip bistable of the protection systems. Like the above monitor lights, these lights are arranged by function and serve to alert the operators of abnormal conditions.

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The Main Control Board panels have been arranged to provide for the grouping of controls of a system and the panel sections have been color coded to focus the operators attention to the control board panel on a system basis.

The Green Board concept has been designed into the main control boards which has the individual controls indicating green for normal lineup when above 30% power. This allows for immediate operator recognition of any red indication as an abnormal condition.

In order to quickly identify abnormal plant conditions, the control room annunciator system is designed to ensure that all annunciator windows are dark when at power and no abnormal condition exists.

The Sequence of Events Recorder has been upgraded to increase the reliability, speed, and the capability for information storage. This allows the operators to quickly review any abnormal indications throughout the stored information and take any appropriate action.

In addition to the above plant design changes, many administrative programs and procedures that were not envisioned at the time the Regulatory Guide was developed have been implemented. These programs and procedures are designed to aid the operator's knowledge of the plant status. These include the following:

- A locked valve program to control the position of critical manual valves to ensure safety functions will be fulfilled.

- An abnormal position log to manually track any equipment that is maintained in a position which differs from the normal at-power lineup.

- A Technical Specification LCO tracking system which consists of manually updated computer program to track the status of all LCOs.

- A degraded equipment log which is used to provide readily available information on important equipment that has experienced some form of degradation.

Additionally, the 10 CFR 50.59 process at each station requires screening or evaluations to be completed when system configuration is altered and the system is considered OPERABLE per Technical Specifications. Operators have been trained to be to be aware of and sensitive to system interactions due to cascading Technical Specification issues and the recognition that cross train checks are a necessary and prudent action to ensure that the loss of safety function is not introduced.

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Control room staffing has been upgraded since the issuance of the Regulatory Guide, as well as the level of training provided to the plant operators. For two-unit operations, both Braidwood and Byron are required to have six licensed operators, 3 of which are Senior Reactor Operators, on duty at any time. Four of these operators are stationed in the control room. These requirements are reflected in the plant's Technical Specifications.

The licensed operator training program utilizes the most recent approach endorsed by the NRC. Specific training is provided on the safety systems and system interactions. This training utilizes both classroom study and a dynamic training setting via the use of the plant-specific simulator.

CONCLUSION

CECo's evaluation of the impact of deleting the ESD system concludes that sufficient indications are available and that the ESD system does not provide the operator with a useful tool in determining the status of the safety systems. The human factors improvements, in addition to the enhanced training and upgraded control room staffing, have minimized the need for a system which meets Regulatory Guide 1.47.