KANSAS GAS AND ELECTRIC COMPANY

GLENN L. KOESTER
VICE PRESIDENT - NUCLEAR

January 21, 1983

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

KMLNRC 83-011
Re: Docket No. STN 50-482
Ref: 1) Letter KMLNRC 83-002 dated 1/12/83 from GLKoester, KG&E, to HRDenton, NRC
2) Letter dated 12/6/82 from BJYoungblood, NRC, to GLKoester, KG&E
Subj: Additional Information for the Review of the Wolf Creek Emergency Plan

Dear Mr. Denton:

The Reference 1) letter transmitted responses to NRC questions concerning the Wolf Creek Generating Station Emergency Plan. Transmitted herewith is the outstanding response to Item D.1 of the NRC questions Reference 2). This response provides a more detailed description of the emergency classification scheme for Wolf Creek.

This information will be formally incorporated into the Wolf Creek Generating Station, Unit No. 1, Final Safety Analysis Report in Revision 10. This information is hereby incorporated into the Wolf Creek Generating Station, Unit No. 1, Operating License Application.

Yours very truly,

Glenn L Koester

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GLK:bb
Attach

cc: JHolonich (2)
TVandel/SSchum

OATH OF AFFIRMATION

STATE OF KANSAS)
) SS:
COUNTY OF SEDGWICK)

I, Glenn L. Koester, of lawful age, being duly sworn upon oath, do depose, state and affirm that I am Vice President - Nuclear of Kansas Gas and Electric Company, Wichita, Kansas, that I have signed the foregoing letter of transmittal, know the contents thereof, and that all statements contained therein are true.

KANSAS GAS AND ELECTRIC COMPANY

ATTEST:

By Glenn L Koester
Glenn L. Koester
Vice President - Nuclear

W.B. Walker, Secretary

STATE OF KANSAS)
) SS:
COUNTY OF SEDGWICK)

BE IT REMEMBERED, that on this 21st day of January, 1983, before me, Barbara W. Aley, a Notary, personally appeared Glenn L. Koester, Vice President - Nuclear of Kansas Gas and Electric Company, Wichita, Kansas, who is personally known to me and who executed the foregoing instrument, and he duly acknowledged the execution of the same for and on behalf of and as the act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my seal the date and year above written.

BARBARA W. ALEY
SEDGWICK CO.

Barbara W. Aley
Notary

My Commission expires June 30, 1983

D. Emergency Classification System

Q.D.1. The emergency classification scheme does not conform to the criteria of NUREG-0654, Appendix 1. Numerous initiating conditions are absent and also absent are most of the actual plant system parameters. The licensee's plan should be upgraded to conform with NUREG-0654 (see also NUREG-0818 for guidance) or describe an alternative scheme that meets the intent of the planning standard.

R.D.1. Event Classification

Overview

Appendix 1 to NUREG-0654, Revision 1, presents the guidance that four emergency action levels should be established and provides a description of each event class. Those event classes and their asscciated descriptions are:

Unusual Event	Unusual events are in process or have occurred which indicate a potential degradation of the level of safety of the plant. No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of safety systems occurs.
Alert	Events are in process or have occurred which involve an actual or potential substantial degradation of the level of safety of the plant. Any release is expected to be limited to small fractions of the EPA Protective Action Guideline exposure levels.
Site Area Emergency	Events are in process or have occurred which involve actual or likely major failures of plant functions needed for protection of the public. Any release is not expected to exceed EPA Protective Action Guideline exposure levels except near site boundary.
General Emergency	Events are in process or have occurred which involve actual or imminent substantial core degradation or melting with potential for loss of containment integrity. Release can be reasonably expected to exceed EPA Protective Action Guideline exposure levels offsite.

The classificaton scheme of four specific levels of emergencies is required by 10 CFR Part 50, Appendix E, Section IV.C. NUREG-0654, Revision 1, is identified within the regulation as a reference for additional guidance as to the classification of emergencies within a nuclear power plant.

The event classification scheme presented in the Wolf Creek Generating Station Radiological Emergency Response Plan (Plan) is responsive to the requirements of the regulations and consistent with the class descriptions for each event class as described within NUREG-0654, Revision 1. The four specific event classes are addressed within the Plan, as are specific physical conditions within the plant which correspond to the criteria on event classification. The event classification scheme presented in the Plan provides unambiguous criteria which correspond to the fundamental design features of the plant. These design features exist to contain products of the nuclear fission process such that the public and plant personnel are not subjected to radioactive materials in concentrations which present hazards beyond prescribed allowable values. In addition, the classification scheme lends itself to the continuous evaluation of in-plant conditions to ascertain if reclassification of an event is warranted due to continued degradation, additional failures, or errors.

The event classification system includes the provision for event classification based upon anticipated or projected loss of fission product barriers. This is accomplished through consideration of degrading conditions which, unless mitigated, would result in functional loss of one or more fission product barriers. It is assumed that unavoidable mechanistic means to subsequent failure of a fission product barrier exist and that failure will occur within the time required for notification and evacuation of the public. The simple existence of potential for a breach of a fission product barrier to yield an offsite release of radioactive material is insufficient to result in the escalation of emergency classification in the absence of a means to mechanistically cause the breach. Should a mechanism for barrier breach exist and not be mitigated by operation of safety systems so as to prevent release of radioactive material in the future, the criterion requires the barrier to be deemed to be breached when the time estimated to reach the actual condition in which the barrier will lose function equals the time required to implement actions to protect the public.

Discussion of the Model

The event classification model proposed for WCGS consists of two phases. Phase one addresses the immediate conditions present, and yields a "snapshot" classification which accurately describes the plant condition as it exists. Phase

two considers future condition projections and event reclassification which allows initiation of protective measures while time remains to complete their implementation.

Phase 1

Two objectives are achieved in Phase 1. First, with exception of the Notification of Unusual Event (NUE), events are classified through the analysis of their symptoms as they apply to the challenge or breach of the three fission product barriers (fuel cladding, reactor coolant system, containment). NUE classification remains as presented in NUREG-0654, Appendix 1 and as per Table 2.2-2 of the Plan.

The logic for the fission product barrier approach is predicated upon 10 CFR 50, Appendix A, General Design Criteria and NUREG-0654, Appendix 1, where specific reference to barrier integrity, as applied to designed safety systems and emergency classes, appears. This concept was fitted to a model where the challenge or breach of a single barrier is equated to classification of an Alert, challenge or breach of any two barriers yields a Site Area Emergency, and challenge or breach of all three barriers yields a General Emergency. The end product is a classification system which encompasses the entire spectrum of events yet eliminates reliance upon unwieldly event indicator notebooks.

A detailed description of this mechanism is provided in Section 2.0 of the WCGS Plan. Table 2.2-3 of the Plan lists the permutations of barrier challenge or breach and identifies the process and radiation instrument indicators associated with each. The table, designed to stand alone, provides the chief guidance which is used to classify events.

A second objective fulfilled by Phase 1 is the integration of event classification activities with those performed by plant operations personnel for purposes of event recognition, diagnosis and implementation of corrective measures. This is achieved by use of the Westinghouse Owners Group Critical Safety Functions Status Trees (Trees).

The Trees represent a post-TMI refinement in the process used to diagnose and respond to plant transients. Similar to the WCGS event classification system, and as recommended by analysis of the TMI operator response, the Trees are constructed around a symptomatic vs. event specific approach. Six critical safety functions (subcriticality, coolant system integrity, core cooling, reactor coolant inventory, heat sink and containment integrity) are identified as necessary for maintenance of the fission product barriers. The Trees, patterned after those of WASH 1400 and employing plant specific parameters at the branch points are fabricated for each of the critical safety functions such that the unique characteristics of an event are defined by passage through the Trees. Endpoints of each Tree provide

reference to a response (functional restorative) procedure and are color coded to define the magnitude of challenge which the critical safety function is experiencing.

Upon initiation of an event, the Critical Safety Function Status Trees may be used to provide a rapid, accurate and integrated event analysis leading to selection of the most appropriate functional restorative procedure and identification of the fission product barriers which are in jeopardy, or have been breached. Divergence of plant response vs. event classification occurs at this point as the fission product barrier status is checked against Table 2.2-3 to yield declaration of one of the four emergency classifications.

Phase 2

The second phase of emergency evaluation employs the Critical Safety Function Status Trees to determine the magnitude of challenge to the remaining functional fission product barriers. This second phase includes a continuing assessment of the plant conditions which indicate the status of the fission product barriers and monitoring of the Critical Safety Function Status Trees to anticipate subsequent barrier failures such that mitigation activities would be implemented and assessments of time remaining to failure of the remaining barriers might be performed.

During the second phase of event classification, the Critical Safety Function Status Trees provide a systematic means to assess the degree of hazard to the remaining fission product barriers. A review of the Trees employing information from the plant process monitoring equipment will enable the Technical Support staff to advise the Duty Emergency Director (DED) as to the magnitude of hazard to the remaining fission product barriers. The Critical Safety Function Status Trees also highlight the most significant hazards by color coding such that responses by emergency personnel may be ordered appropriately according to their respective priorities.

Because the use of Critical Safety Function Status Trees allows identification of the hazards to fission product barriers, and the use of plant process monitors enables the evaluation of trends in plant system performance during the course of an emergency, it is possible for Technicl Support Center staff to advise the DED as to the status of the plant as it changes throughout the course of an event. This continuing evaluation of process parameters provides an insight as to mechanistic means for system failure, i.e., it is possible to identify specific equipment which may fail via a verified and probable mechanism prior to actual failure. This identification of probable mechanistic failure of a system allows further identification of whether an additional failure of fission product barriers will result.

Utilizing the WCGS-Emergency Classification System (ECS), the DED is therefore made aware of both the current status of fission product barriers (intact/not intact) and is made aware of probable mechanisms for subsequent unavoidable failures of additional fission product barriers. The Technical Support Center staff, having determined probable and unavoidable mechanisms leading to subsequent barrier failure, can also estimate the time to failure. Once the DED has been apprised of a probable, credible, subsequent barrier failure, and the estimated time to failure, he may consult the evacuation time estimates to determine the amount of time required to complete a precautionary evacuation of the general public within the plume exposure emergency planning zone.

For those events in which conditions degrade rapidly such that a significant release would mechanistically occur within the interval to implement evacuation, a reclassification of the event will be accomplished upon recognition of the degradation.

Summary

The key feature of the Plan's event classification scheme is the number of fission product barriers which have been degraded. The Regulations in 10 CFR Part 50, Appendix A, require three barriers to fission product release to the environment. The specific General Design Criteria are numbers 10 through 16 and the respective barriers are the fuel cladding, the reactor coolant system and the containment. The existence of complete function of any two barriers will limit the radioactive material release to the environment such that EPA Protective Action Guideline exposure levels are not approached, even with adverse meteorology. The existence of complete function of any one of these three barriers will prevent the release of radioactive material in quantities sufficient to exceed the EPA Protective Action Guideline exposure levels except within the exclusion area of WCGS. A loss of two fission product barriers does represent a major reduction in the level of protection to the public from radioactive material. The substantive degradation of all the barriers will result in offsite dose projections which may exceed EPA Protective Action Guideline exposure levels.

The Plan's classification scheme is independent of the initiating event and does not require the identification of the failure sequence or cause to properly classify the hazard level in relationship to public health and safety. The specific indications of barrier degradation are described in Section 2.4 and Table 2.2-3 of the Plan. Since barrier degradation indication is not dependent upon any specific indication but tends to exhibit numerous conditions throughout the plant, operators will be able to properly classify

the emergency level throughout an event with high probability of accurate classification. In comparison, when event-related classification schemes are employed, proper classification is dependent upon proper identification of the event. The Westinghouse Owners Group has developed and is continuing to refine operator functional restorative guidelines (guidelines) which are also independent of events. Those guidelines are directed at the maintenance of functions required for safety by mitigating the consequences of fission product barrier failures which have occurred and by providing necessary support functions vital to the prevention of subsequent damage to the intact fission product barriers. The guidelines are not related to event identification, but are specifically oriented to respond to physical conditions within the plant. The combination of the guidelines and the emergency classification criteria described in Table 2.2-3 of the Plan provide direction to the operators relative to any event regardless of cause and provide a criterion upon which to base judgments as to whether mitigating efforts have been successful in retaining those fission product barriers not compromised by the event. The classification scheme also provides a means to categorize the event such that the appropriate offsite response may occur.

In the text which follows, each of the examples provided in NUREG-0654, Revision 1, for Alert, Site Area Emergency and General Emergency events are compared for the WCGS design to the event classification system presented in Section 2.4 of the Plan. The events are evaluated to identify the fission product barriers which have been breached and which barriers are subject to subsequent damage under specific conditions.

ALERT

NUREG-0654, Revision 1, Appendix 1 Event Description and WCGS-ECS Evaluation

1. Severe loss of fuel cladding

The Wolf Creek Generating Station Emergency Classification System (WCGS-ECS) specifically identifies a severe loss of fuel cladding integrity corresponding to five times the allowable gross specific activity of the Reactor Coolant System radioactive material inventory per the Technical Specifications, as a loss of the cladding as a fission product barrier. In the absence of no other fission product barrier failures, an Alert condition would be declared using the WCGS-ECS.

2. Rapid gross failure of one steam generator tube with loss of offsite power

The SNUPPS design includes control air accumulators for control air associated with auxiliary feedwater and main steam atmospheric steam dump valves. The loss of offsite power will result only in the prevention of steam dump to the condenser. The gross failure of one steam generator tube will exceed the threshold for leakage from the Reactor Coolant System; this situation is identified in the WCGS-ECS as basis for considering the Reactor Coolant System to be breached. In addition when substantial amounts of steam are released from a steam generator which has been subject to tube failure, the function of containment is defeated. If a steam generator tube fails rapidly at power, steam relief from the affected generator will occur either directly to the atmosphere or through the condenser to the air removal system through filters to the atmosphere. In the event of a safety injection signal the condenser air removal system is isolated, which will result in subsequent loss of condenser steam dump due to high back pressure. Either pathway allows for release of radioactive material until an extended steam relief from the affected steam generator is terminated by removal of heat by the other steam generators and maintenance of pressure in the affected steam generator below the relief setpoint and the safety valve lift pressure. For a rapid steam generator tube failure event with leakage rates well in excess of Technical Specifications limits, the WCGS-ECS would result in declaration of a Site Area Emergency due to two barriers being degraded. The isolation of the affected steam generator to restore one barrier to fission product release would permit the reclassification of the event to an Alert.

3. Rapid failure of steam generator tubes

The functional response of the plant would be the same as for the rapid failure of one tube. Isolation of the condenser air removal system would occur within seconds of the tube failure resulting in loss of condenser steam dump at some time later. The WCGS-ECS would classify this event as a Site Area Emergency until isolation of the damaged steam generator was accomplished. Upon isolation of the damaged steam generator to restore one fission product barrier, the event would be reclassified as an Alert.

4. Steam line break with primary to secondary leak

If the steam line break is within the containment and the containment response to the large energy deposition within the structure does not exceed the containment design, and primary to secondary leakage is less than the capacity of one charging pump, no fission product barriers would have been breached. Without fission product barrier breach, an Unusual Event exists.

If the steam line break is outside of containment and the reactor coolant system leakage rate is less than one charging pump can make up, one fission product barrier is breached by the criteria of the WCGS-ECS and an Alert exists.

If the steam line break is outside of containment and the reactor coolant system leakage rate is greater than the make up capacity of one charging pump on the steam generator with the broken steam line, two connected barriers to fission product release have been breached. When two fission product barriers have been breached, only one barrier remains intact, and the WCGS-ECS classifies the event as a Site Area Emergency.

(Note: If the line break and primary to secondary leakage are not in the same generator, two effective barriers remain intact and an Alert condition exists by the WCGS-ECS.)

5. Primary coolant leak rate greater than 50 gpm

The WCGS-ECS identifies the capacity of one charging pump as the criterion for the leakage which exceeds the threshold for breach of the Reactor Coolant System as a fission product barrier. Upon determination that leakage exceeds the capacity of the charging pump, an Alert condition would exist.

6. Radiation levels or airborne contamination which indicates a severe degradation in the control of radioactive materials

The WCGS-ECS addresses radiation level increases which correspond to degradation of fission product barriers. Dependent upon the specific location and conditions related to an increase in radiation level, unambiguous indication of fission product barrier degradation may well exist, i.e., the normal gross specific activity in letdown increases by a factor of 1000 is indicative of the degradation of a significant amount of fuel clad and may exceed the threshold for declaration of an Alert. Other local conditions due to auxiliary equipment failures may exist within a nuclear power plant which are unrelated to fission product barriers associated with the reactor. Due to design features and limiting conditions for operation per Technical Specifications, such failures have limited consequences but may result in major increases in local contamination levels. Such conditions do not include potential for escalation of event consequences and therefore do not warrant classification above the Unusual Event category.

7. Loss of offsite power and loss of all onsite AC power

The SNUPPS design includes a turbine-driven auxiliary feedwater pump which is sized to provide a sufficient water supply to the steam generators should all AC power be lost. The loss of all AC power will not immediately result in degradation of any fission product barrier. (See discussion under Site Area Emergency, Item 6, for more information as to subsequent response.)

8. Loss of all onsite DC power

The loss of DC power does not directly result in the loss of any of the fission product barrier functions. The loss of DC power is discussed in detail under Item 7 of Site Area Emergency. Unless subsequent failures occur, loss of DC power should not result in loss of fission product barriers and would be classified as an Unusual Event.

9. Coolant pump seizure leading to fuel failure

The failure of fuel cladding of sufficient magnitude to result in five times the Technical Specification limit on primary coolant gross specific activity satisfies the threshold criteria for the fuel cladding fission product barrier to be considered breached. The analysis of Chapter 15 of the SNUPPS FSAR

for a locked rotor event indicates that the pressurizer safety valves will open. If those valves properly reclose only the cladding would be considered failed upon indication of high radioactive material concentration in the reactor coolant, yielding an Alert classification. If the safety valves remained open following pressure reduction a second barrier would be breached, yielding a Site Area Emergency classification.

10. Complete loss of any function needed for plant cold shutdown

There is no direct relationship between cold shutdown functional requirements and fission product barriers. The establishment of a cold shutdown condition typically precludes use of the steam generators as a means to remove decay heat and, in comparison to a hot shutdown condition, provides less diversity in regard to means to remove decay heat. The heat generated by core decay heat provides the largest energy source and hazard to fission product barriers when the reactor is shut down. The removal of decay heat and the maintenance of shutdown reactivity margin are the only two functions necessary to protect the public in either a cold or hot shutdown condition. On a PWR reduction of shutdown margin to below minimum requirements would necessitate addition of non-borated water to the reactor coolant system, which requires pumping of water. It is unrealistic to assume that pumping of non-borated water cannot be terminated. Thus, the loss of the reactivity shutdown function is not a reasonable condition.

The function of decay heat removal in the cold shutdown condition is accomplished by use of the residual heat removal system, component cooling system, essential service water system and their associated power sources and necessary auxiliary support systems. In a hot shutdown condition the function of decay heat removal can be accomplished by the same configuration of systems as necessary for cold shutdown heat removal and in addition, the steam generators plus auxiliary feedwater can be used. Should all heat removal means be non-functional in a cold shutdown configuration, the reactor coolant system will heat up to a hot shutdown condition without the degradation of any of the fission product barriers. Should heat removal means not be available in hot shutdown condition, (this is only possible if the steam generators were dry on the secondary side and no means existed to supply water to the steam generators) the reactor coolant system would continue to increase in temperature until the

expansion of reactor coolant resulted in the opening of relief or safety valves on the pressurizer. At this time the reactor coolant system pressure barrier would be breached and an Alert condition exists. The time interval for transition from cold shutdown to relief from the reactor coolant system would be many hours, if not mitigated by operator action.

11. Failure of the reactor protection system to initiate and complete a scram which brings the reactor subcritical

A failure of the reactor protection system to trip the reactor does not necessarily result in a breach of any of the three fission product barriers. The failure of the reactor protection system would require a unit shutdown in accordance with the conditions of the Technical Specifications. The complete failure to generate a trip signal and complete the trip automatically would be reportable to the NRC per 10 CFR 50.72 and per the Technical Specifications within one hour. Should the event result in response as described in Table 2.2-3 of the Plan for failure of one barrier an Alert would exist.

12. Fuel damage accident with release of radioactivity to containment or fuel handling building

Fuel handling accidents involving irradiated fuel damage one fission product barrier although that barrier may be the only barrier in existence at the time. The consequences of fuel handling accidents have been evaluated and are consistent with the objective of the Alert classification of the NUREG-0654, Revision 1. The WCGS-ECS classifies fuel handling accidents as Alerts. (See Table 2.2-1 of the Plan.)

13. Fire potentially affecting safety systems

All safety systems are redundant and have been evaluated in regard to fire damage potential in the WCGS Fire Hazard Analysis. The SNUPPS design conforms to the requirements of 10 CFR 50.48 and Appendix R to 10 CFR Part 50, which require that safe shutdown and protection of the fission product barriers be accomplished in the event of any potential fire within the plant. In the absence of damage to any fission product barriers, a fire, regardless of magnitude, would be classified as an Unusual Event.

14. Most or all alarms (annunciators) lost

The annunciators are not safety grade equipment which is necessary to maintain safe conditions within the plant. No fission product barriers are directly linked to operability or existence of the annunciators. The function of the annunciators is not assumed in the accident analyses nor is it vital to normal plant operation. An Unusual Event would exist for such an event.

15. Radiological effluents greater than 10 times Technical Specification instantaneous limits

The standard Technical Specifications do not include a limitation upon instantaneous release of radioactive material. Assuming the inventory of radioactive material is in accordance with the limits of the Technical Specifications, the only potential sources of offsite dose as suggested in NUREG-0654, Revision 1 (1 mr for average meteorological conditions for a 2-hour event), are the waste gas decay tanks rupturing, a fuel handling accident or multiple fission product barrier breach. No other sources contain a sufficient inventory of radioactive materials which can be transported offsite to yield a 1 mr dose in 2 hours. Table 2.2-1 of the Plan identifies a waste gas tank rupture as an Unusual Event. Item 12 above addresses the fuel handling accident and indicates that it constitutes an Alert condition. Multiple fission product barrier breach is discussed in the Plan as a condition which should be classified as Site Area Emergency or General Emergency.

16. Ongoing security compromise

A compromise of security requirements does not directly relate to breach of the fission product barriers. All fission product barriers should be contained within vital areas per the requirements of 10 CFR 73.55. Unless access is obtained to such vital areas the compromise of security would not present a means to compromise the fission product barriers. Unless the security compromise was of sufficient magnitude to consider a barrier in danger of breach, the event would be an Unusual Event by the classification scheme of the Plan. It should be noted that during such an event as a security compromise the local law enforcement agency (LLEA), the county sheriff, would be responding per the requirements of 10 CFR 73.55 and per the security plan and that the sheriff is the lead local respondant in

radiological emergencies also. As a practical matter, in terms of mobilization of local resources, the offsite LLEA response to a security event would exceed the initial offsite response for an Alert condition, but that response is due to NRC security requirements.

17. Severe natural phenomena being experienced or projected

Unless the natural phenomena were to compromise a fission product barrier there would not be a situation which would present a direct hazard to the public or to plant personnel from radioactive material. Should safety systems be damaged, conditions such as discussed in Items 7, 8, 10, 13 and 14 above may exist which typically are Unusual Events by the classification scheme of the Plan. It is unlikely that such events will compromise function of the fission product barriers due to the various design features of the facility per the requirements of 10 CFR 50, Appendix A, General Design Criterion No. 2.

18. Other hazards being experienced or projected

Each of these events constitute Unusual Events which are unlikely to compromise the fission product barriers. Should any fission product barrier be nonfunctional due to such an event, an Alert classification would be required by the Plan; however, it is most unlikely that such events would compromise any fission product barriers due to the plant design per 10 CFR 50, Appendix A, General Design Criteria Nos. 3 and 4.

19. Other plant conditions exist that warrant precautionary activation of technical support center and placing nearsite Emergency Operations Facility and other key emergency personnel on standby

The classification criteria of the Plan is specific as to when an Alert exists regardless of the cause or combination of conditions. The licensee's management can activate personnel at any time judged appropriate. There is no link between activating the licensee's resources and the classification of events. Creating such a link which is not functionally related to a specific criterion or creating a link which is strictly administrative in nature is without utility.

20. Evacuation of control room anticipated or required with control of shutdown systems established from local stations

General Design Criterion No. 19 of 10 CFR 50, Appendix A, requires the inclusion of design features which enable shutdown from outside the control room. Each licensee is required to demonstrate that such features are functional by actual performance of such a shutdown from above 10% power during initial testing. The fission product barriers are demonstrated to be maintained intact and functional during such events. The evacuation of the control room would be classified as an Unusual Event.

3. Rapid failure of steam generator tubes with loss of offsite power

The functional design criteria of emergency safety features is to be able to satisfy function assuming a single failure. The onsite power system is required to be able to assure safety in the face of postulated accidents assuming the worst single failure of any component including an onsite emergency power generator (a diesel).

The result of the loss of offsite power will be the unavailability of the condenser to receive steam dump, which will result in steam release to atmosphere from all steam generators including the affected generator. Dependent upon operator action, the heat removal function can be transferred from the affected steam generator to the remaining steam generators which provide an intact reactor coolant system barrier. The dumping of steam to atmosphere from the damaged steam generator means that only the fuel cladding exists as a barrier to fission product release. This event is a small break LOCA outside of containment until the operator terminates steam release from the damaged steam generator by significantly increasing the heat rejection by the undamaged steam generators. According to the classification scheme of the Plan this event is a Site Area Emergency.

Upon transfer of heat removal by undamaged steam generators and isolation of the damaged steam generator the event is similar to a contained small LOCA. Upon completion of such a transfer and isolation of the damaged steam generator, containment would be reestablished warranting reclassification of the event as an Alert.

It should be noted that with offsite power and availability of the condenser, the existence of steam dump from the damaged steam generator to the condenser does not constitute containment. Operability of the condenser requires removal of non-condensible gases, i.e., fission gas, contained within the reactor coolant system. Non-condensible gases from the condenser are ultimately released to the environment. Therefore, regardless of the existence of offsite power, containment does not exist until the damaged steam generator is isolated.

4. Not applicable

5. PWR steam line break with greater than 50 gpm primary to secondary leakage and indication of fuel damage

Main steam line break events do not include a mechanism for fuel failure. During such events the ability to cool the reactor is not compromised and the cladding is therefore not subject to significant damage if safety features function per design.

A primary to secondary leakage rate in excess of 50 gpm constitutes a tube rupture event and the steam line break is comparable functionally to open atmospheric dump valves or safety valves addressed in Site Area Emergency, Item 3.

The broken steam line with 50 gpm primary to secondary system leak provides a direct path to the environment from the reactor coolant system. Should significant fuel damage occur during such events, the limits of 10 CFR 100 may be exceeded and an evacuation would be a serious consideration since confinement of the release pathway is not possible until the reactor coolant system is totally depressurized. Typical noble gas activity within the fuel clad gap for a PWR is 7.5×10^{5} Ci/1000 MWth for fuel which has not been overheated due to an accident. If one considers only this gap activity, then upon loss of approximately 20% of the fuel rods through rupturing, 10 CFR 100 limits would be exceeded offsite with no dose contributions other than from noble gas.

The suggested conditions may warrant consideration of evacuation of nearsite area; if fuel damage is significant (5 to 10 times design limits), General Emergency conditions exist.

6. Loss of offsite power and loss of onsite AC power for more than 15 minutes

The loss of both onsite and offsite power does not necessarily mean that any release of radioactive material will result. The availability of a turbine driven auxiliary feedwater pump to supply auxiliary feedwater to the steam generators would provide a means of decay heat removal by either manual operation of atmospheric steam dump or by reliance upon the steam generator safety valves. The turbine driven auxiliary feedwater pump can be manually started by opening the steam supply valves to the turbine and the feedwater flow control/isolation valves to the steam generators. Westinghouse designed NSSS's include a steam generator design which has sufficient water inventory at all power levels

to provide decay heat removal for approximately 30 minutes. Sufficient time exists to enable operators to supply feedwater by means of the turbine driven pump prior to loss of steam pressure for the turbine due to steam generator dryout. Once the turbine driven auxiliary feedwater pump is supplying water to the steam generators, a sufficient water supply to remove decay heat can be assured due to the required volume in the condensate storage tank per Technical Specifications.

The potential source of a problem is the reactor coolant pump seal assembly which is not designed to be without cooling supplied either by seal injection or labyrinth cooling from the component cooling system. Neither system would be operable without electrical power. Reactor coolant pump seals will have a finite interval of adequate operation without cooling. This interval will be aided by the fact that without power the reactor coolant pumps will not be rotating.

Degradation of any fission product barriers will be indicated on plant instruments since vital instrumentation is DC powered by means of DC/AC inverters per the Technical Specifications. The first fission product barrier to be subject to degradation will be the reactor coolant system barrier, due either to pump seal degradation or failure to remove decay heat by the steam generators resulting from the loss of water inventory.

Should the reactor coolant system begin to lose mass either through a pump seal failure or by an open pressurizer safety valve the inventory of the system is adequate to cool the reactor for a significant period of time following either event. Once continuous mass loss has begun, unless a means is provided to replace the coolant at a rate which exceeds the boil-off rate of the core in a pool boiling mode of heat removal, core damage will result when insufficient fluid is available for core heat removal.

Upon the loss of all AC power a number of hours should exist prior to core damage if auxiliary feedwater is unavailable. If auxiliary feedwater is available and degradation of reactor coolant pump seals is limited to low rates of leakage, a period of days will exist prior to fuel damage.

During the initial stages of the event no fission product barriers would be breached; however, the subsequent degradation potential is significant and warrants continuous evaluation for potential up-

grading of emergency classification as required by the classification scheme of the Plan. The event classification would be an Unusual Event subject to reclassification due to response within the system. Since significant inventory exists for heat removal once the first barrier is breached, premature upgrading of the event's classification would not be necessary to assure protection of the public.

7. Loss of all vital onsite DC power for more than 15 minutes

The loss of all onsite DC power will not generally result in the loss of AC power since DC power is necessary to trip major AC breakers (high voltage switchgear) while low/intermediate voltage switchgear is typically AC-controlled. If AC power is not lost, major pumps will be available to the operators, although manual operation of the circuit breakers will be necessary. Instrumentation will also be available in Westinghouse plants since electrical power for instrumentation is backed up by emergency safety features AC power in addition to the DC inverter, which is the primary source. A reactor trip will occur due to the use of a DC undervoltage trip mechanism in the 480 volt breaker supplying rod drive power.

While the loss of DC power within a plant will complicate the recovery from the automatic reactor trip, vital services can be restored by operator action since AC power will be available. Unless feeder breakers trip, the charging pump, component cooling pump, auxiliary feedwater pumps, motor-operated valves, etc., will be operable in the normal mode, as well as control valves for steam dump control. The loss of DC power may not result in significant problems with stabilization of the plant. Should DC loss compromise AC power supply to the extent that AC power is not available, a condition similar to Site Area Emergency Item 6 exists.

The loss of DC power does not result in direct loss of any of the fission product barriers and would be classified by the Plan as an Unusual Event. Subsequent degradation of plant conditions, if any, would be observable by the Technical Support Center personnel in sufficient time to implement reclassification, including consideration for an anticipatory declaration of a Site Area Emergency or General Emergency as warranted by the criteria of the Plan.

8. Complete loss of any function needed for plant hot shutdown

The necessary functions to maintain the plant in a hot shutdown condition are specified within the Technical Specifications for Mode 3 or Mode 4 operation. However, the Technical Specifications do not simply address the minimum functional requirements as required by 10 CFR 50.36 (c) (2). The standard Technical Specifications require all components to be functional to satisfy the requirements. If the items which define specific functional requirements for Modes 3 and 4 define the requirements which must be satisfied, then the inability to satisfy the limiting condition for operation and the action statement of any Mode 3 or 4 Technical Specifications would be a Site Area Emergency, due to current interpretations of license requirements and Emergency Plan commitments. Rather than employ Technical Specifications, a set of absolutely required functions would have to be defined to properly classify the hazard of such an event.

Absolutely necessary functions should be those functions which are addressed in the Fire Hazards analysis or contained on the remote shutdown control panel. In the absence of any other problems (accident conditions) the following functions are required:

a. Auxiliary feedwater supply to steam generators and steam dump if Mode 3 or residual heat removal system operation with component cooling and service water if Mode 4.

b. Reactor coolant pump seal protection either by seal injection or component cooling flow to the labyrinth cooler.

c. Reactor coolant mass control by either charging pump operation or safety injection.

d. Reactivity control by either the charging or safety injection pump injection of borated water.

e. Electrical power supply for major pumps (onsite or offsite).

f. Instrumentation for monitoring plant condition.

   1. Pressurizer level
   2. Reactor coolant system pressure
   3. Steam generator levels
   4. Steam generator pressures

None of the above functions are directly linked to failure of a barrier to fission product release. The absence of the performance of those functions may lead to the degradation of one or more of the barriers; however, as discussed in Items 6 and 7 above, significant inventory does exist within the steam generators and reactor coolant system to subsequentially upgrade the classification once the first barrier has indicated degradation. The initial classification of the event would be an Unusual Event, per the classification scheme of the Plan.

9. Transient requiring operation of shutdown systems with failure to scram (no core damage [illegible]ent)

If a reactor trip should have occurred during a transient, but did not for some unknown reason, and no core damage has occurred, the key issue would appear to be the determination if the safety limits of the plant were exceeded. The safety limits for WCGS are reactor coolant system pressure > 2735 psig and the DNB limit curve relating power to temperature and pressure. If safety limits were not exceeded and no indications of fuel damage exist, then the Technical Specifications addressing operation with instruments out of service would apply since the failure to trip indicates a failure in instrumentation or reactor trip circuitry. If conditions exceed allowable conditions per the Technical Specifications, a manual trip should be activated or the removal of electrical power to the rod drive system should be accomplished if the trip breakers fail to open on a manual trip signal. Should plant conditions not be exceeded at the time of operator assessment, an orderly shutdown should be implemented until the associated instrumentation which failed to function can be proven operable as required by Technical Specifications. Technical Specifications govern the rate of power reduction.

Should safety limits be exceeded, the provisions of 10 CFR 50.36 (c) (1) apply and require immediate shutdown and NRC approval for restart.

In the absence of indication of core damage and the establishment of acceptable plant conditions by either stabilization of the transient or reactor trip by operator action means, the threat to safety has passed and no need exists to activate the Plan. (i.e., If a reactor trip does not occur on high flux on the source range instruments in a low power transient, the safety analysis does not credit the source range trip. Or, if steam generator level during a system transient caused by the turbine

controller dropped below setpoint by 10% without a trip and the overtemperature trip margin did not decrease during the event, there is no DNB-related need to trip.) There is no continuing threat to core safety nor do there exist other means to transport fission products to the environment which would warrant classification above Unusual Event, as the Plan would classify this event.

10. Major damage to spent fuel in containment or fuel handling building

During the first month following unit shutdown a major fuel handling accident involving numerous assemblies would present an increased hazard to offsite areas. Events within the containment can be mitigated since the containment structure should prohibit release to the environment of substantial amounts of radioactive material; however, accidents involving movements of equipment and assemblies over fuel with the equipment hatch open could occur and result in substantial releases if administrative controls are not adhered to. The nearsite consequences of spent fuel accidents, assuming iodine release is mitigated by capture in water, would exceed the limits of 10 CFR 20 for annual exposures if more than three elements were involved > 100 hours after shutdown. Implementation of offsite protective actions is dependent on whether or not EPA PAGs might be exceeded at the site boundary.

11. Fire compromising the function of safety systems

The phrase "compromising the fuction of safety systems" is ambiguous in light of the designed redundancy and diversity of systems within a nuclear power plant which accomplish safety functions. The current Technical Specifications for newly licensed operating facilities in essence requires all safety components operable as a limiting condition for operation. Should any component of a safety system be non-functional or degraded the function of the system is considered by the Technical Specifications to be compromised. The total loss of function required to maintain the plant in a stable and safe configuration was addressed in Item 8, Site Area Emergency.

The condition wherein a fire has damaged systems employed in accident response to mitigate the event or to provide information to operators during accident response may not compromise the ability to safely shut down the unit. While continued operation with inoperable accident mitigating systems

should be prohibited by Technical Specifications, such inoperability may present no direct hazard in the absence of an accident, (i.e., loss of emergency shutdown instruments, loss of post-accident cleanup filters, loss of high head injection while maintaining operability of charging pumps, or loss of one diesel generator due to exhaust system fire). The conditions which exist with a specific fire and the specific functions which may be totally compromised would determine the level of danger to the personnel, facility and public. There is no direct relationship between a fire which involves safety systems and loss of function necessary to maintain safe conditions within the plant.

If a fire resulted in the total loss of function which is necessary for the maintenance of safe conditions within the unit, then an emergency would exist. The importance of the function would be the key determinant of the level of the emergency condition. Functionally, the fire-related condition was discussed in Item 8, above, and should not be evaluated differently due to a fire being the cause.

The initial classification of an event involving a fire per the criteria of the Plan, would be an Unusual Event, with subsequent evaluation considering the functions of the three fission product barriers as discussed in Item 8 above.

12. Most or all alarms (annunciators) lost and plant transient initiated or in progress

Alarms within a nuclear power plant are typically control-related equipment and are not assumed functional to aid operators during accidents or transients. Protection of the reactor and mitigation actions are not dependent upon annunciators. The current direction of the industry is to establish the key indicators of safety function, namely the process monitors, which operators and Technical Support Center personnel may monitor to assess the safety of the plant and verify that the safety functions are effective. General Design Criterion No. 13 is completely silent in regard to annunciators. During transients the existence of several alarms can result in increasing operator confusion and distract operators from the key indicators of safety.

It is inconsistent with the regulation's intent to assert that the loss of function of non-redundant control-grade equipment within a nuclear power plant presents a safety hazard.

Loss of annunciators would be classified as an Unusual Event per the classification criteria of the Plan.

13. EPA Protective Action Guidelines are projected to be exceeded outside the site boundary

Item 15 of Alert-related examples discussed sources of radioactive material release and noted that large offsite doses or high effluent concentrations are possible only if multiple fission product barriers are non-functional or breached. The requirement that one fission product barrier remain intact for Site Area Emergencies limits the dose rate for the site boundary to values within the range of action threshold values of the EPA Protective Action Guidelines. To exceed EPA Protective Action Guidelines at the site exclusion area boundary, three fission product barriers must be breached. Use of the criteria of the Plan for barrier function results in limiting dose rates for any combination of barrier breach, and is consistent with EPA Protective Action Guidelines at the site boundary.

14. Imminent loss of physical control of the plant

The declaration of emergencies of higher levels than Unusual Events requires the existence of actual degradation of fission product barriers or a condition in which unavoidable degradation will occur. In this context the term "imminent" would be interpreted to be "unavoidable" rather than the typical interpretation of "imminent" which is "threatened."

If physical control of the facility is lost, the ability to protect the fission product barriers may be impaired by actions of the group which has seized control of the facility. It would appear that two fundamental divisions exist in terms of objectives of groups which may attempt seizure of a nuclear facility either destruction of the facility including major radioactive release or taking the facility and its personnel hostage. Should the objective appear to be destruction, the anticipatory considerations of the classification system would warrant an immediate General Emergency classification. If the objective is extortion, then there would be no reason to assume that the fission product barriers would be subject to damage, thus the classification would be an Unusual Event. Should the objective of the seizure be indeterminate, the worse should be assumed resulting in the Site Area Emergency classification. Actions by operators prior to loss of

control will significantly influence the time interval to loss of all three fission product barriers and thereby the time to declaration of General Emergency.

15. Severe natural phenomena being experienced or projected with plant not in cold shutdown

The occurrence of natural phenomena which exceeds minimum design requirements would not necessarily result in loss of any of the fission product barriers. The classification criteria of the Plan include consideration of unique conditions regarding safety system inoperability which may at a later time result in failure of a fission product barrier. The Technical Support Center staff's responsibility following severe natural phenomena would be to determine which safety systems are functional. Should no degradation of fission product barriers result and safety systems retain their functions, a severe natural phenomena event would be classified as an Unusual Event.

16. Other hazards being experienced or projected with plant not in cold shutdown

The discussion in regard to Item 18 under Alert is applicable to these events. Unless the fission product barriers are directly rendered nonfunctional, an event would be initially classified as an Unusual Event. Following evaluation of actual conditions by the Technical Support staff it may be determined that loss of one or more fission product barriers will occur within the time interval of the classification scheme resulting in an escalation in classification. Due to the design margins associated with the engineering of nuclear facility safety systems and the physical separation of redundant components, it is unlikely that missiles, explosions, flammable gas intrusion, etc., would affect both safety trains so as to present a hazard to the integrity of the fission product barriers which would correspond to a declaration of higher emergency classification levels.

17. Other plant conditions exist that warrant activation of emergency centers and monitoring teams or a precautionary notification to the public near the site

The classification criteria of the Plan provide a functional criteria to classify emergencies regardless of cause. See the comments for Alert, Item 19.

18. Evacuation of control room and control of shutdown systems not established from local stations in 15 minutes

Item 20, Alert, comments are applicable. The steam generators contain approximately thirty minutes of decay heat removal following unit trip. Auxiliary feedwater will be automatically supplied to the steam generators following the trip. The ability to establish local control prior to development of loss of functions required for safe shutdown will be demonstrated by plant startup tests.

GENERAL EMERGENCY

NUREG-0654, Revision 1, Appendix 1, Event Description and WCGS-ECS Evaluation

1.a. Effluent monitors detect levels corresponding to 1 rem/hr W.B. or 5 rem/hr thyroid at the site boundary under actual meteorological conditions

1.b. These dose rates are projected based on other plant parameters or are measured in the environs

The WCGS-ECS requires for a General Emergency the loss of all three fission product barriers or the anticipation of the loss of the third barrier due to unavoidable circumstances or conditions. The specific criteria for barrier function for each of the three barriers result in physical limits for the transport of radioactive material to the environment. Those limits are such that with the existence and continued function of any one of the barriers, the EPA Protective Action Guideline exposure levels would not be exceeded beyond the site boundary.

2. Loss of 2 of 3 fission product barriers with a potential loss of third barrier

The classificaton criteria of the Plan specifically identify that, upon determination that the last remaining fission product barrier will be subject to subsequent failure within the time interval to accomplish evacuation, a General Emergency exists. The key requirement of such a classification is that a mechanistic failure mode must be identified in process. If the physical conditions associated with stress, temperatures, pressures, etc., of the remaining barrier are within the design limits of the barrier, the barrier will not be assumed to fail until such design limits are exceeded. (i.e., Containment vessels are tested for leakage at design pressures per the requirements of 10 CFR 50, Appendix J. Should an accident occur resulting in temperatures and pressures within the containment which do not exceed the design and no indication of leakage of radioactive material from the containment to the environment exists, the containment would be considered functional and a General Emergency condition would not exist.)

The anticipatory evaluations of the criteria are directed at actual conditions resulting in degradation of the barriers which cannot be mitigated such that barrier function may be retained. A future unavoidable degradation of a barrier due to unique conditions or equipment inoperability will be cause

to assume the barrier to be non-functional provided the degradation is actually in progress or necessary equipment has failed and the interval for fission product barrier failure is less than the time interval required for evacuation.

3. Loss of physical control of the facility

Item 14 of Site Area Emergency provides a discussion of this issue. Should the loss of physical control of the facility appear to be for the purpose of facility destruction, a General Emergency condition would exist, per the classification criteria of the Plan. All barriers could be breached within the time interval for evacuation should destruction of equipment and systems be the mechanism for barrier breach.

4. Other plant conditions exist from whatever source, that make release of large amounts of radioactivity in a short time period possible, e.g., any core melt situation

The classification criteria functionally identify means by which a release of large amounts of radioactivity in a short time period would be possible. Any fission product barrier retaining function will prevent a release of large amounts of radioactivity. The important issue is one of function. Containment is not limited to the existence of the building as a barrier but includes integrity of all penetrations, integrity of all systems which process liquids and gases from systems or areas within the containment building such that radioactive material is maintained within the envelope of containment systems, and the functional integrity of the energy removal systems for the containment. Should the containment exhibit characteristics of remaining functional, i.e., temperatures and pressures within design limits, the absence of detection of large amounts of radioactive material outside the boundary of containment including its associated systems plus the ability to remove heat from the building by use of the emergency building coolers, there would not be a means to result in a large release of radioactivity within a short time period. The existence of a core melt situation would not directly result in the loss of the containment and could not result in the classification of a General Emergency. Should subsequent evaluation of containment parameters indicate a degradation of function, a core melt condition would, when associated with the loss of the reactor coolant pressure boundary and containment result in classification as a General Emergency.

5.a. Small and large LOCAs with failure of ECCS to perform leading to severe core degradation or melt in from minutes to hours

A LOCA event is the failure of one fission product barrier. The subsequent failure to cool the core with ECCS will result in the second barrier failure by degradation of the cladding. When two barriers have been breached, a Site Area Emergency exists per the classification criteria of the Plan. If continuing assessment activities determine that containment failure will result or has been lost functionally due to errors, i.e., by transport of massive amounts of fission gas to the waste disposal system as occurred at TMI, the containment would be non-functional also and a General Emergency would exist.

5.b. Transient initiated by loss of feedwater and condensate systems followed by failure of emergency feedwater system for extended period

The failure of emergency feedwater will result in the loss of the reactor coolant system pressure barrier due to either operators opening the PORVs on the pressurizer or the automatic opening of the pressurizer safety valves. The event would be classified as an Alert due to the loss of one barrier, the reactor coolant system pressure barrier. Should the operators follow proper mitigating procedures and open the pressurizer PORVs and initiate high head injection to maintain water inventory in the reactor coolant system as a means to remove decay heat, the other fission product barriers would not be subject to stresses sufficient to cause a breach. The continuous monitoring of plant conditions by means of Table 2.2-3 of the Plan and the Critical Safety Function Status Trees would enable proper event classification regardless of the effectiveness of mitigating efforts.

5.c. Transient requiring operation of shutdown systems with failure to scram which results in core damage or additional failure of core cooling and makeup systems

ATWS events result in significant loss of reactor coolant system mass to the containment through the pressurizer safety valves and the pressurizer relief tank which would result in indication of a reactor coolant system breach. If fuel damage resulted such that the criteria of five times the Technical Specifications limit for primary coolant gross specific activity is exceeded, the emergency classification criteria would classify the event as a Site Area

Emergency. Operator action per the emergency procedures should mitigate any subsequent damage to the fission product barriers following an ATWS. The continuing evaluation of plant conditions by the Technical Support Center staff would enable anticipatory identification of containment breach or additional core degradation. The criteria of the Plan provide a means to classify an ATWS event properly in regard to the potential for offsite exposure to radioactive materials.

5.d. Failure of offsite and onsite power along with total loss of emergency feedwater makeup capability for several hours

Should all onsite and offsite power be lost with a loss of emergency feedwater, the sequence for fission product barrier loss would be the failure of the reactor coolant system, followed by failure of the cladding, followed by failure of containment. The reactor coolant system barrier would be breached by safety valve operation following steam generator dryout. Upon loss of sufficient reactor coolant to uncover the core, the cladding would fail due to overheating. The containment may be subject to temperatures and pressures in excess of design without functional heat removal systems. The times to the successive failures would be approximately 30 minutes to reactor coolant relief through safety valves, approximately 4 to 8 hours for core overheating and well in excess of one day for containment failure due to the large thermal inertia of the containment. The classification system would enable emergency classification escalation as the event progressed such that offsite protective actions would be accomplished prior to offsite release of large amounts of radioactive materials. This form of an event would have a progression of physical conditions which would enable anticipatory classification of the emergency prior to actual breach of a barrier. Mitigating activities by operators such as supplying water by means of a fire hose to the steam generators with their associated dump valves open to atmosphere, could prevent core damage and containment breach or extend the time interval to failure of the barriers. The classification criteria would enable proper classification of the event regardless of the effectiveness of mitigating activities.

5.e. Small LOCA and initially successful ECCS. Subsequent failure of containment heat removal systems could lead to core melt and likely failure of containment

A LOCA event is the failure of the reactor coolant system boundary. Successful ECCS operation for small LOCA events should prevent fuel damage in excess of the classification criteria for clad breach. A subsequent failure of containment for any reason should not compromise the function of the ECCS system. The loss of two fission product barriers would be a Site Area Emergency per the WCGS Emergency Classification System. The SNUPPS design does not require the function of the containment heat removal system to enable proper operation of the ECCS following a small break LOCA event. There does not appear to be a mechanism for cladding breach for this event at WCGS. Should subsequent failures occur which result in failure to cool the core, the WCGS-ECS would classify the combined conditions as a General Emergency.

6. Not applicable

7. Any major internal or external event which could cause massive common damage to plant systems

The emergency classification criteria of the WCGS-ECS are independent of cause and are specifically dependent upon the functional existence of the fission product barriers and the ability to maintain those barriers which are not breached.