

<b>TempNo.</b>	<b>PI</b>	<b>Topic</b>	<b>Status</b>	<b>Plant/ Co.</b>
80.1	IE01	Reactor Power Indication	4/16 Introduced and Discussed 5/15 Discussed	Columbia
81.3	IE03	Raccoon Intrusion	5/15 Introduced and Discussed	Grand Gulf
81.4	IE03	Environmental FAQ	5/15 Introduced and Discussed	Generic

## FAQ 80.1

Plant: \_\_Columbia Generating Station\_\_\_\_\_  
Date of Event: \_\_March 22, 2008\_\_\_\_\_  
Submittal Date: \_\_April 10, 2008\_\_\_\_\_  
Licensee Contact: \_\_Greg Cullen\_  
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NRC Contact: \_\_Zach Dunham, SRI\_\_\_\_  
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Performance Indicator: Unplanned Power Changes per 7,000 Critical Hours

Site-Specific FAQ (Appendix D)? No

FAQ requested to become effective when approved.

### Question Section

#### **NEI 99-02 Guidance needing interpretation (include page and line citation):**

Revision 5, Page 15, Lines 14 and 15: “Licensees should use the power indication that is used to control the plant to determine if a change of greater than 20% of full power has occurred.”

#### **Event or circumstances requiring guidance interpretation:**

On March 22, 2008 Reactor Feedwater (RFW) pump 1B (RFW-P-1B) experienced a speed transient which caused both RFW pump low suction pressure alarms to actuate. In response, control room staff initiated a reduction in reactor recirculation pump speed (both pumps) to reduce core flow (which reduces power) as directed by procedure. The core flow reduction was terminated after both RFW pump low suction pressure alarms cleared, as allowed by procedure. Upon termination of the flow reduction the operators assessed key plant parameters, including reactor power using the 1-minute average core thermal power (CTP) signal, and, after about 15 minutes, the 15-minute average CTP signal, and concluded that plant power was at 81% (as documented in the Condition Report and operating logs). The 1-minute and 15-minute average CTP signals are calculated using the reactor heat balance and are the normal signals used by operators to monitor and control plant power level. The 1-minute average CTP signal is driven by RFW flow and does not provide an accurate power calculation during RFW flow transients. It was not used by operators to assess power conditions during the initial RFW flow transient.

Subsequently, the control room staff requested that the Station Nuclear Engineer (SNE) provide an evaluation of peak power achieved during the transient to determine if reactor power exceeded 102% of the operating license limit. The SNE ultimately provided a plot of reactor power using an APRM simulated heat flux signal, which is not a signal used to control reactor power, nor is it a signal that is normally monitored by Operations personnel. The APRM simulated heat flux signal (a six second average of a single APRM signal, available for two of the APRMs) indicated that power had initially increased before the RFW control system recovered and brought speed (and power) back

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down. Since the RFW pump low suction pressure alarms did not clear at that point, operators reduced core flow. The APRM simulated heat flux signal indicates that power then went 1-3% below 80% RTP before settling out at approximately 81% RTP as conditions stabilized. Immediately following the transient the APRMs and APRM recorders were consulted for the purpose of assessing the condition of the core, but not for the purpose of assessing plant power level.

As cited above, guidance on what indications to use to determine if a change of greater than 20% of full power has occurred is “Licensees should use the power indication that is used to control the plant....” In this event the operators documented a reduction in power to approximately 81% RTP using indications available to them immediately following the transient (i.e., the 1-minute average). In addition, per Columbia operating procedures the primary power indication used to control and monitor the plant reactor power, including monitoring compliance with our license condition for reactor power, is the 15-minute average CTP signal, which is calculated using the reactor heat balance. This signal also indicated a reduction in power to approximately 81% RTP.

FAQ 227 (dated 10/31/2000) appears to be the question that led to the guidance quoted above. This FAQ asked, “For calculating the change in power, should secondary power data be used, nuclear instruments or which ever is more accurate?” The response was, “Licensees should use the power indication that is used to control the plant at the time of the transient.” In this case the operators were not controlling the plant in response to indicated power but were reducing core flow in response to the alarms. Cessation of the flow (and power) reduction was dictated by the clearing of the RFW pump low suction pressure alarms. Upon checking power level following the transient, using the 1-minute average CTP signal, it was determined that power was reduced to 81% CTP (as documented in the CR and the operating logs). The APRM simulated heat flux signal was clearly not used to control the plant, nor was it initially consulted to determine final power level or the extent of the transient. The wording of the guidance and the FAQ 227 question and response would indicate that the licensee is not required to find or use the “more accurate” indications when assessing the power change, but should use initial indications of the power level. In this case the CR, operating logs, 1-minute average CTP signal, and 15-minute average CTP signal all indicate a reduction to 81% RTP.

RIS 2007-21 generated a significant amount of discussion about monitoring of instantaneous power in Boiling Water Reactors (BWRs) and resulted in some agreement that an average CTP calculation is the best way of monitoring power. However, these calculations have inherent inaccuracies during transient conditions, particularly RFW flow transients. APRMs serve a primary purpose of performing a reactor protective trip function and also have accuracy issues as far as indication of instantaneous core thermal power. As such, they provide more insights to transient conditions, but are not as accurate for absolute power indication, and, in fact, the APRMs are calibrated against the average CTP signal.

**If licensee and NRC resident/region do not agree on the facts and circumstances explain**

NRC Region IV has indicated that they do not agree with use of the 15-minute average CTP signal for assessing the event because events of a different type (multiple transients or power oscillations) would be invisible or inaccurately assessed. They cite the example discussion on page 14, lines 23-30 of NEI 99-02, Revision 5, as a case where a 15-minute average would not lead to assessment of two separate unplanned power changes of greater than 20% due to the signal averaging over a relatively long period of time.

In addition, NRC Region IV considers that the reference in NEI 99-02, page 15, lines 14-15, to "use the power indication that is used to control the plant" should include all indications that are normally available to the operators for controlling plant power. For example, in response to a quickly developing transient, such as during plant response to a component failure, power indication averaged over 15 minutes may not be appropriate for controlling power whereas APRM's may be a better indicator for the operators to use during the transient response. In contrast, during a slowly developing transient, such as a controlled reduction in power, a power average may be appropriate.

**Potentially relevant existing FAQ numbers**

227

**Response Section**

**Proposed Resolution of FAQ**

The purpose of the indicator is to monitor the number of "unplanned power changes (excluding scrams) that could have, under other plant conditions, challenged safety functions" with the intent of providing "leading indication of risk-significant events" (per NEI 99-02). The 20% power reduction value is chosen to provide some criteria for reporting, but does not constitute a calculated threshold of risk-significance. As such, the guidance provides clarification that the reduction in power can sufficiently be determined by initial indications during and following the transient and that detailed analysis of exact core conditions is not required to meet the intent of the indicator since the difference between a reduction of 19.9% and a reduction of 20.1% (for example) is not considered to be the difference between an event that is not risk-significant and one that is. The licensee is not required to use the indications that show the highest power reduction, or even is considered the most accurate, for these reasons.

In the described event the transient essentially involved a step change in power where the operator response was not driven by monitoring of reactor power, and initial indications following completion of the transient indicated that power stabilized at 81% power. This value was documented consistently in the post-event documentation. For this event it is sufficient to determine that the gross power change was approximately 19% and it does not need to be reported.

**If appropriate, provide proposed rewording of guidance for inclusion in next revision.**

Guidance revision does not appear to be necessary at this point.

## FAQ 81.3

**Plant:** Grand Gulf Nuclear Station  
**Date of Event:** April 29, 2008  
**Submittal Date:** May 14, 2008  
**Licensee Contact:** Mike Larson **Tel/email:** 601-437-6685 / mlarson@entergy.com  
**Licensee Contact:** Steve Osborn **Tel/email:** 601-437-2344 / sosborn@entergy.com  
**NRC Contact:** Richard Smith **Tel/email:** 601-437-4620 / rich.smith@nrc.gov

**Performance Indicator:** Unplanned Power Changes per 7,000 Critical Hours

**Site Specific FAQ (Appendix D)? Yes or No:** No

**FAQ requested to become effective when approved.**

### **Question Section:**

#### **NEI 99-02 Rev 5 Guidance needing interpretation (include page and line citation):**

Page(s) 14 & 15.

42 Anticipated power changes greater than 20% in response to expected environmental problems  
43 (such as accumulation of marine debris, biological contaminants, or frazil icing) which are  
44 proceduralized but cannot be predicted greater than 72 hours in advance may not need to be  
45 counted unless they are reactive to the sudden discovery of off-normal conditions. However,  
46 unique environmental conditions which have not been previously experienced and could not  
47 have been anticipated and mitigated by procedure or plant modification, may not count, even if  
48 they are reactive. The licensee is expected to take reasonable steps to prevent intrusion of marine  
49 or other biological growth from causing power reductions. Intrusion events that can be  
1 anticipated as a part of a maintenance activity or as part of a predictable cyclic behavior would  
2 normally be counted unless the down power was planned 72 hours in advance. The  
3 circumstances of each situation are different and should be identified to the NRC in a FAQ so  
4 that a determination can be made concerning whether the power change should be counted.

#### **Event or circumstances requiring guidance interpretation:**

##### **Event**

During the spring, the Mississippi River floods as ice melts in the north and spring rains greatly increase the river flow volume. The spring 2008 Mississippi River flooding has been more extensive than flooding seen since Grand Gulf Nuclear Station (GGNS) entered construction and operation. In fact, the Mississippi River levels were higher than any seen since 1973, when the river crested at 51.2 feet, well in excess of installed animal deterrence devices.

GGNS has a service water system that employs a radial well system for its cooling water during normal operation. These radial wells are located closer to the Mississippi River than the plant and are designed to remain functional during flooding in excess of that experienced in the spring of 2008. Although situated over dry land during most of the year, equipment to support the radial wells' operation is located on a platform approximately 26 feet above ground level sitting on pilings. The structure is protected from impact by barges or large debris being swept uncontrolled down the river by additional large pilings. A boat is required for station personnel to access the Radial Well Switchgear during times of river flooding.

At 2112 on April 29, 2008, GGNS experienced a loss of Balance of Plant (BOP) Transformer 23 resulting in a loss of the 28AG Bus and Radial Well Pumps E, F, and J. The Loss of Plant Service Water (PSW) Off-Normal Event Procedure (ONEP) was entered as well as the Reduction in Recirculation Flow ONEP. Reactor power was reduced to approximately 47% using Reactor Recirculation flow and control rod insertion. The plant responded as expected. Upon investigation

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into the loss of BOP Transformer 23, a dead raccoon was found in the vicinity of the transformer which clearly appeared to have come in contact with energized equipment.

The cause of the loss of BOP Transformer 23 is believed to be a short inducted by the raccoon. The flooding of the Mississippi River is believed to have allowed the raccoon to climb into the transformer area bypassing the installed prevention measures. Animal intrusion is normally prevented from the area by removal of ladder access and installed animal deterrence (approximately 8 to 10 feet high above ground) on the power poles adjacent to the transformer structure. These measures prohibit animal intrusion under normally anticipated and expected environmental conditions when animals would be present (.i.e., dry, non-flooded conditions). It was not anticipated or expected that an animal would gain access by swimming in the flooded conditions of the Mississippi River. In order to reach the Radial Well Switchgear, the raccoon either was caught-up in the river or swam a significant distance from the flooded wood line to reach the platform.

The design features were modified following the event to prevent reoccurrence.

### Industry Design Standards

IEEE Standard 1264-1993 (R2004), "IEEE Guide for Animal Deterrents for Electric Power Supply Substations," documents methods and designs to mitigate interruptions and equipment damage resulting from animal intrusions into electric power supply substations. The standard identifies that there are many animals including birds, mammals, reptiles, and insects that are known or potential sources of animal related outages. The standard states that a mitigation program should be put in place after experiencing an unacceptable level of animal related problems and that survey results indicate that deterrence methods are typically implemented after a substation begins to experience the animal intrusions of concern.

The standard goes on to provide examples of mitigation methods and their reported effectiveness. The standard discusses that a necessary part of the mitigation of animal intrusions is monitoring the effectiveness of installed deterrents for the type of animal and problem the deterrent is intended to mitigate. The standard identifies that often a trail and error approach is necessary to find an effective solution for each problem.

### Operating Experience

Based upon previous operating experience, GGNS has implemented measures to mitigate the potential for animal intrusion into critical outdoor equipment. Previous land animal intrusions at GGNS and identified industry events have occurred when the animal approached the area of concern via a land route. This is the first identified event where the animal swam into the area of concern. There has been no occurrence of Radial Well Switchgear water borne animal intrusions in the history of GGNS.

The Mississippi Department of Wildlife, Fisheries and Parks (MDWFP) was contacted to obtain relevant information concerning raccoons. The following information was obtained from a Small Game Biologist for the department.

Under normal river conditions, a raccoon might swim to a know location or island. He would not expect one to swim on purpose in the flood conditions experienced in 2008. MDWFP observed greatly increased numbers of wildlife in areas not normally frequented due to the higher than normal flood conditions.

Raccoons' do climb trees and can travel tree to tree. He would not expect a raccoon to travel tree to tree for approximately half a mile over water, swim an extended distance, and then climb a power pole to access a structure (switchgear house). His opinion was it's more probable that the raccoon was caught-up in the river and climbed the pole seeking refuge.

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### Conclusion

The Mississippi River flooding level with an animal intrusion is a unique environmental condition that has not been previously experienced and therefore, could not have been anticipated and mitigated by procedure or plant modification.

### **Requested Interpretation**

Does the GGNS down power of April 29<sup>th</sup> 2008 count as an Unplanned Power Change per 7,000 Critical Hours?

### **If licensee and NRC resident/region do not agree on the facts and circumstances explain:**

NRC Statement to be include in the Licensee's FAQ for the greater than 20% power decrease on April 29, 2008.

#### Facts:

- In 2002 and 2005, Grand Gulf Nuclear Station had reactor scrams due to raccoons causing ground faults to station transformers in the main station switch yard.
- The corrective actions for the first scram in 2002 did not prevent the scram that occurred in 2005.
- The licensee identified the BOP 23 transformer as vulnerable to animal intrusion following the 2002 reactor scram.
- The Mississippi river level routinely rises in the spring, requiring Grand Gulf employees to use a power boat to perform operator rounds and maintenance checks on equipment at the river.
- In June of 2006, the licensee found an injured raccoon at the base of the BOP 23 transformer. The raccoon had burn marks on its nose and hind legs. The raccoon had come into contact with live current from either the primary or secondary side of one of the platform transformers but did not cause a trip of equipment.
- In response to this event in June of 2006, the licensee placed animal guards on the wooden electrical poles by the transformer platform believed to be approximately 8-10 feet from the ground. They also removed a section of ladder going to the platform approximately 4 feet 7 inch from the ground.

The region and the resident staff have concluded that the environmental conditions which have been previously experienced at the site could have been anticipated by the licensee to mitigate the unintended down power. The staff disagrees with the licensee's assertion that the combination of a routine flooding event and repetitive animal intrusion equates to a unique environmental condition. The staff has concluded that, based on the above listed facts, the licensee should have developed corrective actions to mitigate the loss of the BOP transformer by adding animal deterrents that would be effective during flooding events. This would have prevented the occurrence of the April 29, 2008 down power event.

### **Potentially relevant existing FAQ numbers:**

Multiple FAQs have been approved associated with a downpower which was the result of a known potential environmental hazard that manifested itself in a manner previously not experienced at the station (e.g., fish/debris/algae in amounts not previously experienced). Reference FAQs 306, 451, 448, 452, 437, 444, and 445.

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### **Response Section:**

**Proposed Resolution of FAQ:** No. Flooding, which allowed waterborne animals to bypass submerged animal deterrence devices, has never been previously experienced and qualifies as a unique environmental condition and could not have been anticipated and mitigated by procedure or plant modification. However, should these same conditions recur, the licensee is expected to have in place any additional modifications to the Radial Well Switchgear, the necessary practice, procedures, staff, and equipment to handle potential animal intrusions resulting from environmental flooding conditions that future unplanned power changes of greater than 20 percent may not be necessary. Development and implementation of such modifications and procedures in the future, may provide a basis for a future FAQ allowing excluding a downpower >20% for this PI.

**If appropriate proposed rewording of guidance for inclusion in next revision.**

None.

## FAQ 81.4

Plant: Generic  
Date of Event: NA  
Submittal Date: May 6, 2008  
Licensee Contact: Julie Keys  
NRC Contact: Nathan Sanfilippo

Performance Indicator: IE02

Site-Specific FAQ (Appendix D)? No

FAQ requested to become effective when approved.

### Question Section

NEI 99-02 page 14, lines 42 through 49 and page 15, lines 1 through 4 state: *“Anticipated power changes greater than 20% in response to expected environmental problems (such as accumulation of marine debris, biological contaminants, or frazil icing) which are proceduralized but cannot be predicted greater than 72 hours in advance may not need to be counted unless they are reactive to the sudden discovery of off-normal conditions. However, unique environmental conditions which have not been previously experienced and could not have been anticipated and mitigated by procedure or plant modification, may not count, even if they are reactive. The licensee is expected to take reasonable steps to prevent intrusion of marine or other biological growth from causing power reductions. Intrusion events that can be anticipated as a part of a maintenance activity or as part of a predictable cyclic behavior would normally be counted unless the down power was planned 72 hours in advance. The circumstances of each situation are different and should be identified to the NRC in a FAQ so that a determination can be made concerning whether the power change should be counted.”*

The NEI ROP Task Force and the NRC staff have in the past reviewed many repeat FAQs from various plants related to the exception in IE02, Power Changes Greater than 20%, from counting events caused by expected environmental problems. Typically FAQs are generated not because the site’s resident inspector feels the plant’s response was inadequate but because NEI 99-02 dictates it. The generation of such FAQs is an inefficient use of the industry’s and NRC’s time. Once the original FAQ (and implicitly the plant’s plans and procedures for dealing with future similar events) has been approved, the site resident inspector should be allowed to make the determination whether the plant’s response was timely and adequate. An FAQ should only be required if the resident inspector and plant do not agree the guidance has been met as is the case with the other indicators.

### Response Section

The subject text should be replaced with the following :

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Anticipated power changes greater than 20% in response to expected environmental problems (such as accumulation of marine debris, biological contaminants, animal intrusion, environmental regulations, or frazil icing) may qualify for an exclusion from the indicator. The licensee is expected to take reasonable steps to prevent intrusion of animals, marine debris, or other biological growth from causing power reductions. Intrusion events that can be anticipated as a part of a maintenance activity or as part of a predictable cyclic behavior would normally be counted, unless the down power was planned 72 hours in advance or the event meets the guidance below.

In order for an environmental event to be excluded, any of the following may be applied:

- If the conditions have been experienced before and they exhibit a pattern of predictability or periodicity (e.g., seasons, temperatures, weather events, animals, etc.), the station must have a monitoring procedure in place or make a permanent modification to prevent reoccurrence for the event to be considered for exclusion from the indicator. If monitoring identifies the condition, the licensee must have implemented a proactive procedure (or procedures) to specifically address mitigation of the condition before it results in impact to operation. This procedure cannot be a general Abnormal Operating Procedure (AOP) or Emergency Operating Procedure (EOP) addressing the symptoms or consequences of the condition (e.g., low condenser vacuum); rather, it must be a condition-specific procedure that directs actions to be taken to address the specific environmental conditions (e.g., jellyfish, gracilaria, frazil ice, etc.)
- If the event is predictable, but the magnitude of the event becomes unique, the licensee must take appropriate actions and equipment designed to mitigate the event must be fully functional at the time of the event to receive an exclusion.
- Environmental conditions that are unpredictable (i.e., lightning strikes) may not need to count if equipment designed to mitigate the event was fully functional at the time of the event.
- Downpowers caused by adherence to environmental regulations, NPDES permits, or ultimate heat sink temperature limits may be excluded from the indicator.

The circumstances of each situation are different. In all cases, the NRC Region and Resident Inspectors should evaluate the circumstances of the power change, and if in disagreement with the licensee's position, the event should be identified in an FAQ so that a decision can be made concerning whether the power change should be counted. If the event is truly unique, an FAQ should be submitted unless the NRC Region and Resident Inspectors agree with the licensee's position.