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*Regulatory Conference  
Emergency Diesel Generator #3*

*Surry Power Station  
November 30, 2001*

# AGENDA

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- *Introduction* *Richard Blount*
- *Technical Assessment* *Bryan Foster*
- *Updated Risk Assessment* *Tom Hook*
- *Additional Considerations* *Bryan Foster*  
*Tom Hook*
- *Management Perspective* *Richard Blount*

# *Introduction*

*Richard Blount*  
*Site Vice President*

# *Technical Assessment*

*Bryan Foster*

*Director - Station Safety and Licensing*



- *Purpose*

- *Perspective on two apparent violations*
- *Evaluation of EDG #3 exposure time*
- *Application of common cause factor*
- *2 Hour EDG demand run*



- *Agree with the apparent violations as stated*
- *RCE underway to verify causes and validate further corrective action*

- *Progressive phases of degradation*
- *Cumulative test hours*
- *Fault exposure assessment*

- *Variability of degradation rates*
- *As-found EDG bearing conditions differ*
- *Nominal common cause factor appropriate*



**Dominion**

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# *Updated Risk Assessment*

*Tom Hook*

*Probabilistic Safety Analysis*



- *Preliminary risk assessment resulted in overly conservative CDP values*
  - *Did not account for monthly surveillance runs of EDGs*
  - *Assumed similar accelerated wear rates for all three EDGs*
  - *Did not credit Alternate AC diesel in fire analysis*
  - *Did not consider reliability degradation was start and run-time dependent, not random*



- *Impact of monthly EDG surveillance runs*
  - *All three EDGs demonstrated capability to start and run for 2 hours each month*
  - *Parse loss of offsite power events to more accurately model risk*
    - *Loss of offsite power events lasting 2 hours or less*
    - *Loss of offsite power events lasting longer than 2 hours*



- *Impact of dissimilar wear rates*
  - *No potential for overlap of failure points based on lube oil silver trend and as found condition of No. 1 and 3 EDGs*
  - *No increased common cause impact during period that No. 3 EDG was degrading*
  - *Considered potential for increased common cause impact as a sensitivity, not best-estimate*



- *Impact of crediting Alternate AC diesel*
  - *Not credited in IPEEE fire analysis since installed after its completion*
  - *AAC diesel capable of safely shutting down both units and maintaining safe shutdown*
  - *Assumed 0.1 reduction in frequency of each applicable fire core damage cutset due to availability of AAC diesel*



- *RCP Seal Replacement Status*
  - *One RCP at Unit 1 contained both high temperature and non-high temperature endurance seals*
  - *One RCP at Unit 2 contained all non-high temperature endurance seals*
  - *RCP seal LOCA probabilities based on the Rhodes model*
    - *2 of 3 RCPs utilized high temperature endurance seals*
    - *1 of 3 RCPs utilized non-high temperature endurance seals*



- *Impact of additional deterministic evaluations*
  - *Reliability degradation was wear related, not random*
  - *Failure point can be predicted more accurately at some time following October 3, 2000*
  - *Exposure time was evaluated for two different exposure times*
    - *NRC proposed exposure time of 201 days*
    - *Dominion proposed exposure time of 104 days based on October 3, 2000 starting point*



- *Results - Core Damage Probability*

<b>Case</b>	<b>CDP (Unit's 1 and 2)</b>	<b>SDP Color</b>
<i>104 days exposure time with no increased common cause impact</i>	<i>2.2E-6</i>	<i>White</i>
<i>104 days exposure time with NRC assumed common cause impact</i>	<i>3.3E-6</i>	<i>White</i>
<i>201 days exposure time with no increased common cause impact</i>	<i>4.2E-6</i>	<i>White</i>
<i>201 days exposure time with NRC assumed common cause impact</i>	<i>6.5E-6</i>	<i>White</i>

# *Additional Considerations*

*Bryan Foster/Tom Hook*

# *Demand Run Time*

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- *Guidelines for calculating potential engine life:*
  - *1 fast start  $\cong$  10 hours run-time*
  - *1 slow start  $\cong$  1 to 2 hours run-time*
- *To consider exclusion of risk for LOOPs  $\leq 2$ hrs, EDG equivalent run time should be  $\geq 12$  hrs, i.e.,*
  - *1 fast start + 2 hrs run time, or*
  - *number of slow starts + cumulative run time  $\geq 12$  hours*
- *On 01/21/01, EDG No. 3 had  $\geq 12$  hours of total equivalent run time*



# *Demand Run Time*

Run Date	Run Time (Mns)	Run Time (Cumulative Hrs)	# of Slow Starts	# of Slow Starts (Cumulative Hrs)	# of Fast Starts	Fast Start (Cumulative Hrs)	Equivalent Run Time (Hrs)
04/15/01	143	2.38	1	1			3.4 hrs
03/18/01	160	5.05	1	2			7.1 hrs
02/18/01	157	7.67	1	3			10.7 hrs
01/21/01	161	10.35	1	4			14.4 hrs
01/02/01	64	11.42	1	5			16.4 hrs
12/24/00	187	14.53	1	6			20.5 hrs
11/26/00	142	16.90	1	7			23.9 hrs
11/01/00	38	17.53	1	8			25.5 hrs
10/31/00	163	20.24	1	9			29.2 hrs
10/31/00	42	20.95	3	12			33.0 hrs
10/03/00	180	23.94		12	1	10	45.9 hrs



**Dominion**

# *Sensitivity Analysis #1*

- Results - Core Damage Probability***

<b>Case</b> <i>(All cases assumed EDG #3 incapable of a fast start following January 21, 2001)</i>	<b>CDP</b> <b><i>(Unit's 1 And 2)</i></b>	<b>SDP Color</b>
<b><i>104 days exposure time with no increased common cause impact</i></b>	<b><i>5.5E-6</i></b>	<b><i>White</i></b>
<b><i>104 days exposure time with NRC assumed common cause impact</i></b>	<b><i>8.6E-6</i></b>	<b><i>White</i></b>
<b><i>201 days exposure time with no increased common cause impact</i></b>	<b><i>7.6E-6</i></b>	<b><i>White</i></b>
<b><i>201 days exposure time with NRC assumed common cause impact</i></b>	<b><i>1.2E-5</i></b>	<b><i>Yellow</i></b>



- *Confirmed that Alternate AC diesel and other emergency diesel generators were not unavailable concurrently over period*
- *Reduced probability of core uncover due to RCP seal LOCA prior to restoration of offsite power by 40% for cases where batteries available and RCS cooldown/depressurization would occur using WOG guideline*

- Results - Core Damage Probability**

<b>Case</b> <i>(All cases assumed EDG #3 incapable of a fast start following January 21, 2001)</i>	<b>CDP</b> <b>(Unit's 1 and 2)</b>	<b>SDP Color</b>
<i>104 days exposure time with no increased common cause impact</i>	<i>3.9E-6</i>	<i>White</i>
<i>104 days exposure time with NRC assumed common cause impact</i>	<i>6.4E-6</i>	<i>White</i>
<i>201 days exposure time with no increased common cause impact</i>	<i>5.4E-6</i>	<i>White</i>
<i>201 days exposure time with NRC assumed common cause impact</i>	<i>8.9E-6</i>	<i>White</i>



**Dominion**

## *Sensitivity Analysis #3*

- Results - Core Damage Probability*

<b>Case</b> <i>(All cases assumed EDG #3 incapable of a fast start over exposure period)</i>	<b>CDP</b> <b>(Unit's 1 and 2)</b>	<b>SDP Color</b>
<i>104 days exposure time with no increased common cause impact</i>	<i>4.0E-6</i>	<i>White</i>
<i>104 days exposure time with NRC assumed common cause impact</i>	<i>6.7E-6</i>	<i>White</i>
<i>201 days exposure time with no increased common cause impact</i>	<i>7.8E-6</i>	<i>White</i>
<i>201 days exposure time with NRC assumed common cause impact</i>	<i>1.3E-5</i>	<i>Yellow</i>



- *All sensitivity cases with additional considerations are White except for case with:*
  - *201 day exposure time, NRC common cause impact, and no credit for EDG #3 running for 2 hours during any of the exposure time*



**Dominion**

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# *Management Perspective*

*Richard Blount*

*Site Vice President*

## *EDG Wrist Pin Bearing*

