



Carolina Power & Light Company

P. O. Box 1551 • Raleigh, N. C. 27602

SEP 15 1988

M. A. McDUFFIE
Senior Vice President
Nuclear Generation

SERIAL: NLS-88-212

United States Nuclear Regulatory Commission
ATTENTION: Document Control Desk
Washington, DC 20555

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-325 & 50-324/LICENSE NOS. DPR-71 & DPR-62
RESPONSE TO NRC BULLETIN 88-07
POWER OSCILLATIONS IN BOILING WATER REACTORS

Gentlemen:

The NRC issued Bulletin 88-07, "Power Oscillations in Boiling Water Reactors" on June 15, 1988. The bulletin requested that licensees perform several actions, described below, and confirm by letter that the actions have been completed. Carolina Power & Light Company hereby submits its confirmation that the requested actions have been completed for the Brunswick Steam Electric Plant (BSEP), Units 1 and 2.

The NRC requested that licensees ensure that any licensed reactor operator or Shift Technical Advisor performing shift duties has been thoroughly briefed regarding the March 9, 1988 LaSalle Unit 2 power oscillation event. Real-time training on this event was completed at BSEP on July 5, 1988.

The NRC also requested that licensees address the following items:

- a) verify the adequacy of procedural and training descriptions of those plant conditions which may result in the initiation of uncontrolled power oscillations,
- b) verify the adequacy of procedural and training descriptions of actions which can be taken to avoid plant conditions which may result in the initiation of uncontrolled power oscillations,
- c) verify the adequacy of procedural and training explanations of how to recognize the onset of uncontrolled power oscillations,

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- d) verify the adequacy of procedural and training descriptions of the actions which can be taken in response to uncontrolled power oscillations, including the need to scram the reactor if oscillations are not promptly terminated, and
- e) verify the adequacy of the instrumentation which is relied upon by the operators within their procedures.

The following are CP&L's responses to the above items.

- a) The following plant conditions may result in the initiation of uncontrolled power oscillations and have been verified as adequate in plant procedures: (1) a double recirculation pump trip occurring with a control rod line pattern greater than the 80% rod line and, (2) core flow less than 35 mlbs/hour and a control rod pattern greater than the 80% rod line.
- b) Actions to be taken to avoid plant conditions which may result in uncontrolled power oscillations are also adequate in plant procedures. If a single recirculation pump were to trip, or if there was a reduction in core flow, the operator is directed to increase core flow to greater than the 35 mlbs/hour using the unaffected recirculation pump. The operator may also reduce reactor power to a level compatible with core flow by inserting control rods; the same action is to be taken if two recirculation pumps trip.
- c) The local power range monitor (LPRM) upscale and LPRM downscale procedures now indicate that multiple LPRM upscale and/or downscale indicating lights spuriously illuminating and clearing is an indication of the reactor operating in a region of thermal hydraulic instability. If the average power range monitors (APRMs) or LPRMs indicate power oscillations greater than $\pm 15\%$ reactor thermal power, plant procedures now require initiation of a manual scram.

Indications from the downscale and upscale LPRM alarms and the LPRM meters are available on the reactor turbine generator board (RTGB) for observation of flux oscillations. These indications are easily available, requiring only selection of a control rod to allow the operator to observe individual LPRM readings. The upscale and downscale alarms are bi-stable devices that saturate in either the normal or alarm condition, thus providing a clear indication of the change in state. The use of these indicators for monitoring core instability has

been covered in operator training for the LaSalle event and is considered adequate.

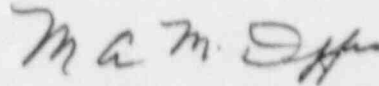
- d) The Brunswick Plant has procedures and operator training programs in place to address uncontrolled power oscillations which are considered adequate. Plant procedures have been revised to address the LaSalle event, as described above. Also, plant procedures have been revised to clearly indicate the conditions for which the operator shall initiate a manual reactor scram. The training program has also been revised to make operators more aware of the consequences of operating in the region of thermal hydraulic instability, and to emphasize the need to manually scram the reactor if the power oscillations are not promptly terminated.
- e) The instrumentation relied upon by the operators within their procedures in power oscillation events was also verified as requested in the bulletin. The neutron monitoring system at BSEP is representative of the GE BWR-4 design and is essentially unaltered from its original design. The system has been reviewed and found to contain no filters/filtering on the APRM recorders, LPRM meters, or on the LPRM upscale/downscale indicators which would conceal the presence of flux oscillations from the operator. While the mechanical nature of the APRM recorders is such that their response to instantaneous large step change inputs is incomplete, the frequency of core thermal-hydraulic instability, defined as oscillation of approximately .4 to .5 Hertz is sufficiently slow to allow the APRM recorders to track power accurately during such an event.

The ability of the APRMs and reactor protection system to respond to out-of-phase oscillations in situations where the APRM response may be reduced or degraded is also being reviewed. An analysis to evaluate this behavior is being performed by GE, the designer of the neutron monitoring system, for the BWR Owners' Group. The results of the analysis will be included in the review of this behavior as they become available.

Based on the previous discussion, the neutron monitoring system has been found to be adequate in responding to core power instabilities and oscillations and in providing accurate indications of core power conditions to operations personnel.

Please refer any questions regarding this submittal to
Mr. Stephen D. Floyd at (919) 836-6901.

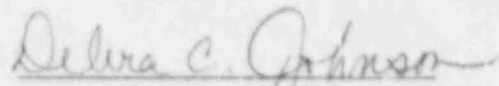
Yours very truly,



M. A. McDuffie

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M. A. McDuffie, having been first duly sworn, did depose and say that the information contained herein is true and correct to the best of his information, knowledge and belief; and the sources of his information are officers, employees, contractors, and agents of Carolina Power & Light Company.



Notary (Seal)

My commission expires: 6/26/89

cc: Dr. J. Nelson Grace
Mr. W. H. Ruland
Mr. B. C. Buckley