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SCHWENCER,A. Licensing Branch 2

SUBJECT: Forwards revised response for SER Open Item 54, "Loose Parts Monitoring Sys," Submittal will be included in FSAR Amend 17.

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NIAGARA MOHAWK

NIAGARA MOHAWK POWER CORPORATION/300 ERIE BOULEVARD WEST, SYRACUSE, N.Y. 13202/TELEPHONE (315) 474-1511

December 13, 1984
(NMP2L 0294)

Mr. A. Schwencer, Chief
Licensing Branch No. 2
Division of Licensing
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Schwencer:

Re: Nine Mile Point Unit 2
Docket No. 50-410

Enclosed for your use and information is the revised response for Safety Evaluation Report open item 54, "Loose Parts Monitoring System."

This submittal will be included in Final Safety Analysis Report Amendment 17.

Very truly yours,

C. V. Mangan
Vice President
Nuclear Engineering & Licensing

DS:ja
Enclosure
xc: R. A. Gramm, NRC Resident Manager
Project File (2)

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
	)	
Niagara Mohawk Power Corporation	)	Docket No. 50-410
	)	
(Nine Mile Point Unit 2)	)	

AFFIDAVIT

C. V. Mangan, being duly sworn, states that he is Vice President of Niagara Mohawk Power Corporation; that he is authorized on the part of said Corporation to sign and file with the Nuclear Regulatory Commission the documents attached hereto; and that all such documents are true and correct to the best of his knowledge, information and belief.

C V Mangan

Subscribed and sworn to before me, a Notary Public in and for the State of New York and County of Onondaga, this 13th day of December, 1984.

Christine Austin
Notary Public in and for
Onondaga County, New York

My Commission expires:

CHRISTINE AUSTIN
Notary Public in the State of New York
Qualified in Onondaga Co. No. 4787687
Commission Expires March 30, 1985

TABLE 1.8-1 (Cont)

Regulatory Guide 1.133, Revision 1 (May 1981)

Loose-Part Detection Program for the Primary System of Light-Water Reactors

FSAR Section 4.4.6.2

Position

The Unit 2 project complies with the Regulatory Position (Paragraph C) of this guide through the alternate approach described below.

1. Paragraph C.1.g. The audio/visual alarm capability is not qualified to remain functional following seismic events. As an alternative, plant operating procedures will require the operator to verify the operability of the LPMS following any detected seismic event. If inoperable, the operator will initiate any appropriate maintenance activities to restore the system to operability. The LPMS need not be qualified according to the requirements of Regulatory Guide 1.89.

4.4.6.1 Loose Parts Monitoring System (LPMS)

4.4.6.1.1 Design Basis

a. The LPMS is designed to detect loose parts in the reactor coolant systems.

b. The LPMS is designed to reduce the effects of variations in background noise on system capabilities for the detection of loose parts.

c. The LPMS is designed in conformance with Revision 1 (May 1981) of Regulatory Guide 1.133 through the alternate approach described in Section 1.8.

4.4.6.1.2 System Description

The function of this system is to detect and alarm for loose parts in the reactor coolant system. Loose parts are those metallic objects that can be physically moved by the reactor flow. A secondary function of the system for the Nine Mile Point Unit 2 is to assist the plant personnel in locating the detected loose parts as accurately and quickly as possible.

The sensing devices mounted within containment are designed to withstand the OBE and are redundant (ten sensors located on opposite sides of the reactor at five elevations) as described in Table 4.4-8. Separation is maintained between redundant monitoring channel circuits up to and including the main relay room monitors (which contain the alarm circuits). While these precautions have been taken, the system is not considered safety-related.

The system has been designed to discriminate between regular noise and signals caused by a loose part.

A primary consideration in the design of the LPMS is the power spectrum density (PSD) plot shown in Figure 4.4-10, which illustrates the normal background energy content over a specific band of frequencies of an operating power reactor, as detected by a piezoelectric transducer. The overall energy content and shape of the plot varies with plant conditions and between different sensor locations. Salient features demonstrated by the PSD are:

a. Low-frequency energy is related to the NSSS structure and machinery vibration.

b. High-frequency energy is related to flow associated noises.

c. Relatively rapid attenuation of the higher-frequency noises occurs because of the filtering effect of the acoustic path through the NSSS components. The LPMS incorporates tuned bandpass filters to concentrate on the portion of the noise spectrum that has a low background level, generally in the 1 KHz to 10 KHz frequency range. Because metal-to-metal impacts result in a relatively flat frequency response in the 1-10 KHz range and because certain portions of the background noise in that portion of the frequency spectrum are of relatively low level, the signal-to-noise ratio is improved, thereby enhancing detection capability while reducing the occurrence of false alarms.

The LPMS sensors are mounted on the exterior of the reactor vessel primary coolant system located at strategic natural collection points. These sensors monitor lower vessel tubes, recirculation pump, recirculation inlet lines, feedwater lines and instrument nozzles in the upper vessel region. The sensors are strapped or clamped to the measuring region in accordance with Table 4.4-8.

Special low noise coaxial cables conduct the accelerometer signals to remote-mounted preamplifiers. The preamplifiers condition the signals for transmission over the relatively long distances to the detector modules located in the main relay room on the (LPM) loose part monitoring panel.

The main relay room is a low radiation area during normal and transient conditions. During accidents, this area is served by the control room special filter train. Most surveillance and maintenance can be performed in this area which minimizes radiation exposure. Maintenance inside the drywell will be controlled in accordance with plant radiation protection procedures to minimize exposure.

At the loose part monitoring panel, the signals from the loose parts channels are compared with preset levels to generate alarms. An alarm is generated when a signal exceeds the preset level for a specified period of time. The alarm signal activates an indicating light, causes the multichannel cassette recorder to start recording four specific channels in accordance with Table 4.4-9 and activates the printer which produces a hard copy of the event. The following considerations will be addressed to establish the alert level:

1. The alert level will consider signals such as normal hydraulic, mechanical and electric noise due to normal and transient conditions.

2. The alert level will consider varying alarm setpoints from sensor to sensor to aid in compensating for specific transducer location noise.

3. Alert levels will be evaluated as part of the startup test program to ensure as low as practical of a false alarm rate over normal and transient operating conditions.

Each channel is connected to a selector switch for indication on a digital panel meter and on auxiliary readout equipment, such as a spectrum analyzer or audio output. The spectrum analyzer is for on-line signature analysis. The system includes also a loose parts locator. The loose part locator uses a microprocessor to calculate the location of a loose part by determining the impact energy at the sensors and the arrival time. The amplitude is used to characterize the energy of the impact, while the arrival time is converted to distance for part location. The result is printed out for a hard copy record and is of great assistance in determining the location of the loose part.

The locator will also indicate the occurrence of a spurious alarm by printout out a spurious alarm message. All electronic equipment within the system has provision for self testing and calibration.

The systems online sensitivity for detecting a loose part is a loose parts impact energy of 0.5 ft. - lbs. within three feet of a sensor.

The system is designed to operate continuously without operator supervision, except for routine system testing.

4.4.6.1.3 Safety Evaluation

The LPMS is intended to be used for information purposes only and is not a safety-related system. The system conforms with Regulatory Guide 1.133 through the alternate approach described in Section 1.8. The design of the equipment was specifically selected for the application at a nuclear power plant during normal operation (pressure, temperature, humidity, radiation). For example, the LPMS monitoring cabinet is designed for mild environments of the main relay room where it is located. Similarly, the cables, accelerometers and preamplifiers were designed for their environmental conditions in the primary and secondary containments. The equipment has been "qualified" on the basis of past experience in operating nuclear plants. The plant personnel use the LPMS to assist in the detection of anomalous loose parts. They also use it to assist in determining the location of any anomalous loose parts. The operators do not rely solely on this system or information provided by this system for the performance of any safety-related action. Any evaluations or actions taken to confirm the presence of a loose part will be handled on a case-by-case basis. Guidance for evaluation is provided in Figures 4.4-7, 4.4-8 and 4.4-9.

4.4.6.1.4 LPMS Training and Calibration

4.4.6.1.4.1 LPMS Training

The scope of training for the onsite LPMS will cover the theory and operation of the LPMS system including hands-on training. Emphasis will be placed on detection and characterization of loose parts and implementation of diagnostic concepts.

4.4.6.1.4.2 LPMS Calibration

The LPMS calibration is in accordance with Regulatory Guide 1.133. The calibration is performed at refueling outages and at least one cold shutdown occurring between refueling outages when the time from last calibration exceeds 18 months, provided entry into the primary containment for maintenance purposes is required. Calibrated impact hammers are used. Data are taken at various impact levels at various locations relative to each sensor. The development and schedule of surveillance procedures is in Section 13.5. The data obtained provide information to determine the following system characteristics to be used as baseline for plant operations:

a. Channel sensitivity or minimum loose part impact to cause alarm (Alert Level)

b. Time and frequency responses to impact.

c. Impact energy versus channel output amplitude.

In addition, the following surveillance requirements will be performed for each channel of the LPMS to demonstrate operability:

a. Channel check at least once per 24 hours

b. Once every 7 days listen to the Audio output

c. Channel functional test at least once per 31 days

d. Once every 92 days verify the background noise