UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

OCT 1 0 1980

MEMORANDUM FOR: Those on Attached List

FROM: W. S. Farmer, Acting Chief
Plant Instrumentation, Control &
Power Systems Branch
Division of Reactor Safety Research, RES

SUBJECT: TRANSMITTAL OF SURVEILLANCE AND NOISE DIAGNOSTICS RESEARCH REVIEW GROUP MEETING MINUTES

Enclosed are minutes of the September 22, 1980 meeting of the Surveillance and Noise Diagnostics Research Review Group. If you have any comments or questions, contact me on (301) 427-4272.

W. S. Farmer, Chairman
Surveillance and Noise Diagnostics
Research Review Group
Division of Reactor Safety Research

Enclosure: As stated

Enclosure

Minutes of the Surveillance and Noise Diagnostics Research Review Group Meeting

Date and Place: September 22, 1980, Phillips Building, Bethesda, Maryland

Purpose: Discuss results from NRC-sponsored research in FY 80
Agenda (Attachment 1)

Attendees: (Attachment 2)

Summary:

Overview of Surveillance and Noise Diagnostics Research at ORNL (Attachment 3)

1. The status of ORNL tasks listed in the attachment were reviewed.

2. A list of 19 reports and papers published by ORNL this year were attached.

Summary of Loose Parts Studies (Attachment 4)

1. Large-scale lpm tests at EGCR and other program projectives have been completed. A final report is to be prepared by the end of December.

2. Loose parts were located with optimum precision in the EGCR large-scale tests using an automated maximum peak signal location algorithm (Rosenbrock Hillclimb Optimization Method). Time of arrival signal techniques gave poorer results.

3. Recommendations were provided for consideration for improving the lpm system requirements in R. G. 1.133:

   (a) Increased number of sensors
   (b) Proper choice of sensor location
   (c) Proper sensor mounting techniques
   (d) Calibration during plant operation

BWR Stability by Noise Analysis (Attachment 5)

1. Using data from EPRI Peach Bottom 2 noise measurements and the ORNL LAPUR code, it has been possible to show reasonable agreement between the decay ratios predicted analytically and those measured using noise analysis.

2. It has been concluded that univariant time series analysis of the noise signals can be used for on-line stability monitoring of a BWR.

Noise Signatures (Attachment 6)

1. Baseline neutron signatures have been obtained from six plants (Calvert Cliffs 1 and 2, Arkansas Nuclear 1 and 2, St. Lucie and H. B. Robinson 2).

2. Baseline process signals (pressure, temperature, etc.) will be obtained in FY 81. Studies of PSD data from the process signals will be analyzed for plant behavior correlation.

3. Baseline neutron signatures will be obtained from Trojan and Sequoyah nuclear plants in FY 81.

4. Neutron signals taken to date gave PSD's falling within a broad bandwidth for each class of plant.

Analytical Predictions of Neutron Noise (Attachment 7)

1. Installed and tested 2D space dependent kinetics code developed by J. A. Renier.

2. The ex-core detector response to a vibrating PWR control rod operating at the core center was modelled. It appears questionable whether rod vibration can be detected with ex-core neutron detectors in the model problem.

3. In FY 81 the JAR 2D space dependent kinetics code will be used to study a range of PWR and BWR in-core vibration problems for detectability using ex-core and/or in-core neutron detectors.

Continuous On-Line Reactor Surveillance System (Attachment 8)

1. The ORNL (DOE-loaned) noise diagnostic surveillance system has been installed at Sequoyah 1 and has been hooked up to the TVA patch panel and checked out.

2. The system can analyze four signals for PSD's and record 16 signals for identification.

3. Sequoyah 1 is expected to start its ascension in power test program shortly. The on-line surveillance system will be used in a learning mode to develop and record pattern recognition signals at several power steps and at full power.

Subcritical Monitoring with Cf-252 Neutron Source-Driven Noise (Attachment 9)

1. Preliminary static 2D diffusion theory calculations were performed for the Zimmer (BWR) core using venture. Calculations indicate Cf-252 detector efficiency achievable such that measurements can be made for criticality in less than 1 hour.

2. ORNL has obtained FX2TH from ANL, a 2-D time-dependent diffusion theory code. After code check it will be used in conjunction with the 2-D JAR kinetics code to calculate impulse response and spectral density.

3. CF-252 detector tests have been made at LASL on a 5% enriched uranyl fluoride solution tank experiment. Results are to be analyzed.

Noise Surveillance and Diagnostic Research at Hitachi (Attachment 10)

1. Hitachi has successfully used 1pm triangulation time of arrival and arrival order signal measurements to locate the impact of a loose part in tests in the Shimane BWR.

2. Dr. Albrecht described the Hitachi NUCAMM-80 control system to be used for human error reduction. The system consists of a plant operation monitoring system, abnormal condition guidance system and transition guidance system. These systems are described in detail in the attachment.

3. Hitachi has developed a time domain BWR stability code using point neutron kinetics.

Automated Machinery Diagnostics (Attachment 11)

1. Mr. Frarey from Shaker Research Corporation described the performance of an automated machinery diagnostic system installed at the Millstone Nuclear Power Plant under EPRI auspices.

2. Response spectrum were automatically obtained from vibration measurement signals. Typical baseline spectrum are stored in the computer against which the new signal measurements are compared over a range of frequencies. Flags are raised for significant variations.

3. Fault identification tables are used with the data frequency analysis to assist the engineer in diagnostics.

"On-Line" Diagnostic Instrumentation (Attachment 12)

1. Dr. Gopal from Westinghouse Electric Company described the various diagnostic systems Westinghouse has developed to facilitate the detection of malfunctions.

2. The systems described in the attachment include:

   (a) Acoustic leak detection,
   (b) Vibration monitoring,
   (c) Loose parts detection,
   (d) Noise analysis, and
   (e) Instrument sensor response

3. A final report has been issued on the Westinghouse research on acoustic leak detection thru valves and leakage from cracks in the primary piping. A report on response time testing is to be issued by the end of the year.

Reactor Coolant Pump Monitoring and Diagnostic System (Attachment 13)

1. Dr. Stevens, from the Babcock & Wilcox Company in Lynchburg, Virginia, described the new DOE-sponsored program to develop a pump monitoring and diagnostic system. This program is being pursued with the Toledo Edison Company. A demonstration will be conducted on the Bavis Besse Nuclear Plant.

2. A large number of sensors will be used to monitor the pump seals, and seal injection flow along with the primary system flow. A microprocessor will be used to perform spectral analysis on vibration monitoring sensor signals from sensors attached to the main pumps.

SEMIANNUAL REVIEW
SURVEILLANCE AND NOISE DIAGNOSTICS
RESEARCH REVIEW MEETING
ROOM P-110, PHILLIPS BUILDING
MONDAY, SEPTEMBER 22, 1980

AGENDA

8:45 a.m.	Overview of Surveillance and Diagnostic Methods Research at ORNL - D. N. Fry (ORNL)
9:00 a.m.	Metallic Loose Parts Detection and Characterization - R. C. Kryter (ORNL)
9:30 a.m.	Monitoring BWR Stability Using Time Series Analysis of Neutron Noise - D. N. Fry (ORNL)
10:00 a.m.	Coffee Break
10:15 a.m.	Status of Nuclear Plant Noise Signature Library - D. N. Fry (ORNL)
10:30 a.m.	Analytical Predictions of Neutron Noise Caused by Boiling and Control Rod Vibration - F. J. Sweeney (ORNL)
11:00 a.m.	Status of Sequoyah On-Line Surveillance System - N. E. Clapp (ORNL)
11:30 a.m.	Subcriticality Reactivity Monitoring by Cf-252 Source Driven Neutron Noise Method - J. T. Mihalczo (ORNL)
12:00	Lunch
1:15 p.m.	Observations on Hitachi Research on Noise Diagnostics and Loose Parts Monitoring - R. Albrecht (Univ. of Wash.)
2:00 p.m.	Review of Operation of an Automated Rotating Machinery Monitoring System - J. L. Frarey (Shaker Research)
2:45 p.m.	Coffee Break
3:00 p.m.	On-Line Monitoring System for Rotating Machinery in PWR's - R. Gopal (Westinghouse)
3:45 p.m.	Overview of B&W Program on Diagnostics of Rotating Machinery - D. Stevens (B&W)
4:15 p.m.	Discussion
4:45 p.m.	Adjourn

ATTENDEES

Surveillance and Noise Diagnostics Review Group Meeting

September 22, 1980

NRC

W. S. Farmer, WRSR, RES
L. Lois, ARB
H. VanderMolen, RS
E. J. Brown, AEOD
S. Gupta, CPB
T. Huang, DSI
J. Holonich, DSI
R. Satterfield, ICSB
R. Schemel, DHFS

DOE

D. L. Harrison, LWR
B. Reid, LWR

Others

J. T. Mihalczo, ORNL
N. E. Clapp, Jr., ORNL
F. J. Sweeney, ORNL
L. C. Oakes, ORNL
R. W. Albrecht, Univ. of Wash.
D. M. Stevens, B&W
R. Gopal, Westinghouse
J. Frarey, Shaker Research
H. G. Shugars, EPRI (Palo Alto)
R. N. Whitesel, EPRI (Washington)
K. R. Piety, TEC

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ADDRESSEES FOR MEMORANDUM DATED OCT 10 1980

Review Group Members
J. B. Henderson, IE
G. Kelly, RSB
K. Jabbour, SEPB
L. Phillips, AB
H. VanderMolen, RS
G. Weidenhamer, SD

Others

L. Lois, ARB
D. Fieno, DPB
G. Knighton, EEB
D. G. Eisenhut, DOR
R. H. Vollmer, AD/SEP
J. P. Knight, AD/ENG
D. F. Ross, DDPM
R. M. Satterfield, ICSB
S. Hanauer, AD/PS
L. S. Rubenstein, LWR
W. Johnston, DSI
R. Baer, LWR
E. J. Brown, AEOD
R. P. Gupta, SD
T. L. Huang, CSB
J. T. Holonich, CPB
J. F. Stolz, LWR
J. Stone, IE
E. Wenzinger, SD
A. Bates, ACRS
R. Savio, ACRS
R. Schemel, CPB

Non NRC
G. Shugars, EPRI
R. Whitesel, EPRI
J. L. Frarey, Shaker Research
R. Gopal, Westinghouse
D. Stevens, B&W
D. L. Harrison, DOE
Bruce Reid, DOE
R. Albrecht, Univ. of Washington
K. R. Piety, TEC

ORNL

L. Oaks
D. Fry
R. Kryter
F. Sweeney
N. Clapp
S. Ball
J. Mihalczo