



PECO ENERGY

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September 11, 1995

Docket No. 50-352  
License No. NPF-39

U. S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, D.C. 20555

Subject: Limerick Generating Station, Unit 1  
Deferral of Turbine Rotor Inspections

Gentlemen:

This letter is being submitted to inform the NRC of PECO Energy Company's plans to defer turbine rotor inspections on the Limerick Generating Station (LGS) Unit 1 main turbine which were planned to be performed during the next Unit 1 refueling outage (i.e., Sixth Refueling Outage, 1R06), scheduled to begin in January, 1996. The turbine rotors on two (2) of the three (3) low pressure stages (i.e., LPB and LPC) of the LGS Unit 1 main turbine were scheduled to undergo visual examination during 1R06 in the area of the disc keyways. However, these disc keyway inspections are being deferred since all of the Unit 1 main turbine low pressure stage turbine rotors are scheduled to be replaced during the Seventh Refueling Outage (1R07), which is planned for 1998.

The LGS Unit 1 low pressure stage turbine rotors, like many other turbines, are susceptible to stress corrosion cracking in the disc keyways. Therefore, in order to preclude the potential for a turbine missile, the NRC has established criteria which should be applied for determining the frequency of turbine inspections based on the probability of generating turbine missiles.

The LGS turbine maintenance program was originally submitted for Unit 1 by letter dated May 27, 1987, and is currently described in Section 10.2.3.6, "Inservice Inspection," of the LGS Updated Final Safety Analysis Report (UFSAR). The LGS main turbine system maintenance program is based on the manufacturer's recommendations and calculations of turbine missile generation probabilities. As indicated in Section 10.2.3.6 of the UFSAR, the turbine maintenance program established for the low pressure turbine elements includes the disassembly of the turbine elements over a six (6) year interval during plant shutdowns such that each element is inspected within six (6) operating years. This maintenance program requires that visual, surface, and volumetric examinations be performed on portions of the low pressure turbine elements within the six (6) year operating period. The turbine maintenance program is based on the results of the probabilistic evaluation of the low pressure turbines performed by the General Electric (GE) Company, the turbine manufacturer. This evaluation applied the methodology delineated in a GE proprietary report entitled, "Probability of Missile Generation in General Electric Turbines," dated January 1984. The GE methodology takes into consideration the specific operating conditions, material properties, results of inspections, time since the last

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inspection, and other factors to determine the probability of generating a turbine missile. This methodology was subsequently reviewed by the NRC and found acceptable for use in establishing maintenance and inspection schedules for specific turbine systems as documented in NUREG-1048, "Safety Evaluation Report Related to the Operation of Hope Creek Generating Station," Supplement No. 6, July, 1986.

By letter dated November 3, 1987, to PECO Energy, the NRC indicated that to ensure reasonable safe turbine operation, the LGS turbine maintenance program should follow the manufacturer's recommendations, including turbine inspection intervals which are based on the NRC approved methodology. The turbine inspection interval should be calculated such that the corresponding turbine missile probability must be maintained less than  $1 \times 10^{-5}$  per year for an unfavorably oriented turbine, and  $1 \times 10^{-4}$  per year for a favorably oriented turbine. A favorable orientation exists when the turbine shaft is located radially from the axis of the reactor building. The turbine shaft for the LGS Unit 1 turbine is located in a vertical plane that is parallel to the axis of the reactor building, and therefore, is unfavorably oriented. The NRC also indicated that, given the criterion for the missile generation probability, it is necessary to calculate the turbine inspection interval taking into account turbine operating conditions, material properties of discs, and other factors. The NRC finally concluded that, based on the GE methodology used in developing the LGS turbine maintenance program, the missile generation probability of each low pressure turbine is less than  $1 \times 10^{-5}$  per year when each turbine is inspected every six (6) operating years, and therefore, is acceptable.

Deferring the visual examination of the disc keyways on the two (2) main turbine low pressure stage turbine rotors LPB and LPC, from 1R06 to 1R07, is deemed as a one-time change in the inspection interval for these specific inspections. The last inspections of this type that were performed on the Unit 1 main turbine low pressure stage rotors were conducted in February 1994 and involved examinations of the LPA rotor assembly. The most recent inspections of the LPB and LPC rotors were conducted in September 1990. In order to support deferring the examination of the disc keyways on the LPB and LPC turbine rotors, the turbine manufacturer (i.e., GE) recalculated the turbine missile probabilities using the most recent inspection data for each rotor, current prewarming conditions, and power rate operating conditions. An operating period of seven (7) years was conservatively used to determine the missile generation probability for the LPB and LPC turbine rotors. This time period was selected since the projected operating period for the Unit 1 turbine will be approximately 6.6 years based on the operating time since the last LPB and LPC inspections (i.e., September 1990), and the expected operating time until 1R07, currently scheduled for April 1998, less the time the rotors are not in use (i.e., outages). The results of the re-evaluation indicate that the probability of Unit 1 generating a turbine missile, seven (7) operating years from the last LPB and LPC inspections, is less than  $7 \times 10^{-6}$  per year, which is less than the NRC criterion of  $1 \times 10^{-5}$  per year. It is important to emphasize that the GE model for calculating turbine missile probabilities requires that certain turbine valves (e.g., stop valves, control valves, etc.) and protection features (e.g., overspeed trip system) be tested at specified frequencies to maintain the validity of the analysis. These components will continue to be tested in accordance with the turbine manufacturer's recommendations.

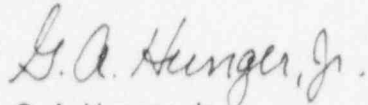
Operating the Unit 1 main turbine until 1R07 without performing disc keyway inspections on the LPB and LPC rotors during 1R06 will exceed the six (6) year operating period established for the inspection interval as currently described in UFSAR Section 10.2.3.6. In order to support deferring the inspection interval, a review of the turbine inspection program and associated commitments was performed in accordance with requirements of 10CFR50.59. Based on the results of this review, the turbine rotor missile generation probability will be maintained less than  $1 \times 10^{-5}$  per year, which is the basis for the NRC accepting the LGS turbine maintenance program

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as indicated in its November 3, 1987 letter. Therefore, deferring the LPB and LPC rotor disc keyway inspections until 1R07 will not adversely impact the operation of the Unit 1 turbine or alter the basis of any commitment made to the NRC associated with the LGS turbine maintenance program.

If you have questions or require additional information, please do not hesitate to contact us.

Very truly yours,



G. A. Hunger, Jr.  
Director - Licensing

cc: T. T. Martin, Administrator, Region I, USNRC  
N. S. Perry, USNRC Senior Resident Inspector, LGS