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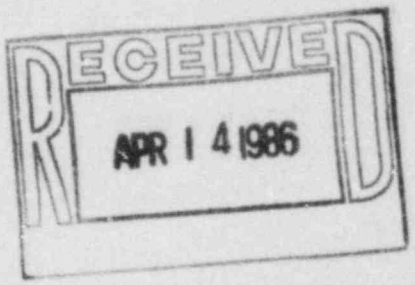
R. F. WALKER
PRESIDENT

April 2, 1986
Fort St. Vrain
Unit No. 1
P-86265



Regional Administrator Region IV
U. S. Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 1000
Arlington, TX 76011

ATTN: Mr. J. E. Gagliardo, Chief
Reactor Projects Branch

Docket No. 50-267

SUBJECT: Actions To Mitigate Moisture Ingress Into the Primary Coolant System

REFERENCE: 1) PSC Letter, Lee to Johnson dated March 12, 1985 (P-85082)
2) NRC Letter, Heitner to Walker, dated March 14, 1986 (G-86130)

Dear Mr. Gagliardo:

On March 12, 1985, Public Service Company of Colorado (PSC) addressed a letter to the Regional Administrator, Region IV describing the actions undertaken by PSC to mitigate moisture ingress into the primary coolant system. That letter (Reference 1) provided the historical background and responsibilities of the Fort St. Vrain Review Committee and its successor committee, the Fort St. Vrain Improvement Committee. The letter also described the major helium circulator issues under consideration by the Fort St. Vrain Improvement Committee and plant modifications related to moisture ingress either completed or to be completed prior to startup.

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The NRC responded in a letter dated March 16, 1986 (Reference 2) stating that PSC's plans for modifications to Fort St. Vrain in order to reduce moisture ingress into the reactor vessel had been reviewed and that the NRC had concluded (based on a safety evaluation enclosed with the letter) that these modifications should reduce the likelihood of moisture ingress into the reactor vessel. The letter also noted that PSC had committed to further studies and plant design modifications to mitigate moisture ingress into the reactor.

This letter and attachments constitute PSC's commitment to provide the NRC with an annual report of actions that have been taken by PSC or that are under consideration in order to mitigate moisture ingress into the primary coolant system.

The current report consists of the following attachments:

Attachment 1 - Information Concerning the Fort St. Vrain Improvement Committee.

Attachment 2 - Actions Taken to Mitigate Moisture Ingress Into the Primary Coolant System

Attachment 3 - Actions Under Consideration to Mitigate Moisture Ingress Into the Primary Coolant System

Public Service Company of Colorado wishes to reemphasize its total commitment to the dependable operation of Fort St. Vrain and to assure the NRC that this commitment is being translated into plant improvements to attain this goal.

Very truly yours,

R. F. Walker

R. F. Walker

RFW/GG:kb

Enclosures

ATTACHMENT 1

Information Concerning the Fort St. Vrain Improvement Committee

The Fort St. Vrain Improvement Committee consists of the following members:

Mr. R. F. Walker, President, PSC and Improvement Committee Chairman

Mr. H. L. Brey, Manager, Nuclear Licensing and Fuels Division

Mr. J. W. Gahm, Manager, Nuclear Production Division

Mr. D. W. Warembourg, Manager, Nuclear Engineering Division

Mr. L. W. Singleton, Manager, Quality Assurance Division

The purpose of the Fort St. Vrain Improvement Committee is to formulate and review proposed technical improvements to enhance the operation and reliability of Fort St. Vrain.

Actions taken by the Fort St. Vrain Improvement Committee may take the form of studies, engineering evaluations, equipment tests and plant modifications. Outside companies are utilized as necessary when specialized technical competence is required. Each issue considered by the Fort St. Vrain Improvement Committee is assigned to a specific member of the Committee for investigation and recommendation.

The Fort St. Vrain Improvement Committee held six meetings during 1985. Another meeting of the Fort St. Vrain Improvement Committee took place on February 14, 1986.

ATTACHMENT 2

Actions Taken To Mitigate Moisture Ingress Into the Primary Coolant System

1. Piping modifications were made to eliminate the loop seal between the circulator and the high pressure separator.

2. The water drain line from the high pressure separator was rerouted into the bearing water surge tank instead of the main drain line.

3. The size of the high pressure separator drain line was increased to ensure adequate drainage during transient conditions.

4. Pneumatic valve-opening boosters were added to the main drain valves to speed up their response.

5. Electronic controls for the main drain valves were installed to improve the stability of the system.

6. A control option under which the main drain is controlled from the main drain-to-buffer differential pressure was provided.

7. A computerized System 21 data acquisition system was placed in service to facilitate the analysis of plant transients.

8. Differential pressure instrument cables were replaced with shielded cables to minimize spurious circulator trips induced into the system.

9. Controls to allow the operator to bring the normal bearing water supply in gradually after operating on back-up bearing water were installed.

10. A moisture ingress/removal manual for use in operator training and guidance was prepared and issued.

11. An alarm function for the differential pressure between reactor vessel and bearing water surge tank was provided.

12. An uninterruptible power supply for critical System 21 (Primary Coolant) components was provided.

13. Indicating lights were installed in the control room to show the operator when an accumulator has fired.

14. The accumulator firing program was evaluated and found to be satisfactory.

15. The calibration frequency for System 21 instruments was evaluated and the procedures modified.

16. A Transient Improvement Committee was established to investigate all serious plant transients and to recommend plant modifications which might prevent future transients from similar conditions.

17. New positioners were installed on the high pressure separator drain valves.

18. Portions of the helium circulator auxiliaries were put into a simulator in order to improve operator training capabilities.

ATTACHMENT 3

Actions Pending to Mitigate Moisture Ingress Into the Reactor Vessel

1. Moisture removal devices (knockout pots) and moisture monitors have been installed in the purified helium header to eliminate and detect moisture. Piping changes were made during the current outage to accommodate these devices.

2. An unconventional type of valve (known as a digital valve) is being evaluated for possible use as a main drain valve. When a digital valve, which has a full open to full close stroke time of 100 milliseconds, was tested, it developed mechanical problems indicating a relatively short service life. The valve is undergoing engineering evaluations by the manufacturer.

3. Although the pressure inside the reactor vessel increases when plant startup operations begin due to nuclear heat, the circulator bearing water pressure remains constant. A study will be performed to determine whether floating the bearing water pressure with the reactor vessel pressure would help to mitigate the moisture ingress problem.

4. The buffer-midbuffer system is designed to maintain equilibrium between the circulator bearing water and the primary coolant in the reactor vessel. If a positive buffer-midbuffer condition occurs, the circulator is tripped to prevent primary coolant from flowing down the shaft. Evaluations are in progress to determine the feasibility of continuing circulator operation even though it could result in primary coolant being released.

5. There is a tendency for fine particles carried in the bearing water supply system to accumulate in the circulator bearing cartridge where they could adversely impact the bearings. Installation of full-flow or by-pass filters will be investigated with reference to system operation and pressure drops.

6. The existing laminar flow elements in the buffer helium supply lines tended to become plugged with foreign matter with resulting infrequent system maintenance and calibration. A new flow meter utilizing a resistance type of detector was installed in "D" circulator auxiliary system on a trial basis. Due to inadequate response low flows, the new flow meter was removed for further engineering analysis and the laminar flow element was returned to service.

7. The existing circulator design features an upper labyrinth static helium seal that can only be set after a circulator has stopped turning. Westinghouse was authorized to develop a hydrostatic seal concept and to perform the preliminary engineering of a hydrostatic seal that will set when pressure transients occur in the bearing water system. The Westinghouse report is being studied by Public Service Company of Colorado.

8. The circulators have dual helium/water drains. A report received from GA Technologies indicated that the lower helium/water drain of the circulators could be plugged which would reduce the amount of bearing water to be handled. This modification will be considered as the circulators are removed for refurbishment.

9. GA Technologies has submitted a proposal currently under review by the Fort St. Vrain Improvement Committee to modify the existing circulators and their auxiliaries to incorporate the following: fixed orifice main water drain control, the use of an eductor to replace the recirculators, the addition of a scavenging jet pump to the helium/water drain, elimination of the H.P. Separator, backup bearing water and accumulator systems, complete separation of the bearing water and buffer helium systems so each circulator is independent of all other circulators, installation of three bearing water pumps with uninterruptable power supplies for each circulator and the addition of a positive water ingress detector on each circulator.

10. The current plant protective system helium circulator logic inhibits the trip of the second helium circulator in a loop on a buffer mid-buffer upset. This inhibit provides the potential of continually injecting moisture into the primary system from the operating circulator. An evaluation is in progress to determine the feasibility of removing this circulator trip inhibit.

11. After evaluating various proposals involving major modifications to the circulators to reduce the possibility of moisture ingress into the reactor vessel, Proto-Power Corporation, with the support of James Howden Company, a major designer of gas-cooled reactor circulators was authorized to initiate the conceptual design and a feasibility study for new helium circulators at Fort St. Vrain. The circulators would utilize the existing single stage steam turbine and Pelton wheel drives but would replace the existing high-pressure, high-flow water lubricated thrust bearings with magnetic bearings. This evaluation is being co-sponsored by Public Service Company of Colorado and the Electric Power Research Institute.