Docket No. 50-255

September 9, 19

Mr. Gerald B. Slade
Plant General Manager
Palisades Plant
Consumers Power Company
27780 Blue Star Memorial Highway
Covert, Michigan 49043

Dear Mr. Slade:

SUBJECT: PALISADES PLANT - AMENDMENT RE: DELETION OF HYDRAZINE REQUIREMENTS (TAC NO. M83825)

The Commission has issued the enclosed Amendment No. 158 to Facility Operating License No. DPR-20 for the Palisades Plant. The amendment consists of changes to the Technical Specifications (TS) in response to your application dated June 12, 1992, as supplemented October 7, 1992, and July 8, 1993.

This amendment changes the Palisades Technical Specification 3.19 and 4.2 to delete the requirements relating to the Iodine Removal System Hydrazine Storage Tank, T-102, and to rearrange the remaining requirements in an updated format.

A copy of our Safety Evaluation is also enclosed. The notice of issuance will be included in the Commission's biweekly Federal Register notice.

Sincerely,

ORIGINAL SIGNED BY

Anthony H. Hsia, Project Manager
Project Directorate III-1
Division of Reactor Projects - III/IV/V
Office of Nuclear Reactor Regulation

Enclosures:
1. Amendment No. 158 DPR-20
2. Safety Evaluation

cc w/enclosures:
See next page

OFFICE	LA:PD31	PM:PD31	OGC	(A)D:PD31
NAME	CJamerson	AHsia		WDean
DATE	8/18/93	8/18/93	8/24/93	9/7/93
DATE	YES/NO	YES/NO	YES/NO	YES/NO

EMCB	SPLB	PRPB
JStrosnider	CMcCracken	JCunningham
8/19/93	9/3/93	9/3/93
YES/NO	YES/NO	YES/NO

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FILENAME: G:\WPDOCS\PALISADE\PAL83825.AMD

14-070

DF01

Mr. Gerald B. Slade
Consumers Power Company

Palisades Plant

cc:

M. I. Miller, Esquire
Sidley & Austin
54th Floor
One First National Plaza
Chicago, Illinois 60603

Mr. Thomas A. McNish, Secretary
Consumers Power Company
212 West Michigan Avenue
Jackson, Michigan 49201

Judd L. Bacon, Esquire
Consumers Power Company
212 West Michigan Avenue
Jackson, Michigan 49201

Regional Administrator, Region III
U.S. Nuclear Regulatory Commission
799 Roosevelt Road
Glen Ellyn, Illinois 60137

Jerry Sarno
Township Supervisor
Covert Township
36197 M-140 Highway
Covert, Michigan 49043

Office of the Governor
Room 1 - Capitol Building
Lansing, Michigan 48913

Mr. David W. Rogers
Safety and Licensing Director
Palisades Plant
27780 Blue Star Memorial Highway
Covert, Michigan 49043

U.S. Nuclear Regulatory Commission
Resident Inspector Office
Palisades Plant
27782 Blue Star Memorial Highway
Covert, Michigan 49043

Nuclear Facilities and Environmental
Monitoring Section Office
Division of Radiological Health
Department of Public Health
3423 N. Logan Street
P. O. Box 30195
Lansing, Michigan 48909

Gerald Charnoff, Esquire
Shaw, Pittman, Potts and Trowbridge
2300 N Street, N. W.
Washington DC 20037

Alora Davis
Commitment Tracking System
Coordinator
Palisades Plant
Consumers Power Company
27780 Blue Star Memorial Hwy.
Covert, Michigan 49043-9530

DATED: September 9, 1993

AMENDMENT NO. 158 TO FACILITY OPERATING LICENSE NO. DPR-20-PALISADES

Docket File
NRC & Local PDRs
PDIII-1 Reading
J. Roe
J. Zwolinski
W. Dean
C. Jamerson
A. H. Hsia
OGC-WF
D. Hagan, 3302 MNBB
G. Hill (2), P1-22
C. Grimes, 11/F/23
A. N. Massey (PRPB)
J. Medoff (EMCB)
T. Chandrasekaran (SPLB)
ACRS (10)
OPA
OC/LFDCB
W. Shafer, R-III

cc: Plant Service list

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

CONSUMERS POWER COMPANY

DOCKET NO. 50-255

PALISADES PLANT

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 158
License No. DPR-20

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Consumers Power Company (the licensee) dated June 12, 1992, as supplemented October 7, 1992, and July 8, 1993, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public; and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public;

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to the license amendment and Paragraph 2.C.(2) of Facility Operating License No. DPR-20 is hereby amended to read as follows:

Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 158 , and the Environmental Protection Plan contained in Appendix B are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

William M. Dean, Acting Director
Project Directorate III-1
Division of Reactor Projects - III/IV/V
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Technical
Specifications

Date of Issuance: September 9, 1993

ATTACHMENT TO LICENSE AMENDMENT NO. 158

FACILITY OPERATING LICENSE NO. DPR-20

DOCKET NO. 50-255

Revise Appendix A Technical Specifications by removing the pages identified below and inserting the attached pages. The revised pages are identified by amendment number and contain vertical lines indicating the areas of change.

REMOVE	INSERT
3-84	3-84
4-15b	4-15b

3.19 IODINE REMOVAL SYSTEM

Specification:

3.19 The Iodine Removal System shall be OPERABLE with:

a. The Sodium Hydroxide Tank (T-103) containing a minimum 4,200 ± 300 gallons of 30.0 ± 0.5 percent by weight sodium hydroxide solution.

b. T-103 capable of supplying sodium hydroxide solution to the containment spray pump suction headers.

Applicability

Specification 3.19 is applicable during POWER OPERATION.

Action

With the Iodine Removal System inoperable:

a. Restore the system to operable status within 72 hours, or

b. Be in HOT SHUTDOWN within the next 48 hours.

Bases

The Iodine Removal System acts in conjunction with the containment spray system to reduce the post-accident level of fission products in the containment atmosphere. Sodium Hydroxide is added to the recirculated water after a LOCA to establish a neutral pH.

References

FSAR, Section 6.4.
FSAR, Section 14.22.

Table 4.2.2 (Contd)

Minimum Frequencies for Equipment Tests

12. Iodine Removal System

The Iodine Removal System shall be demonstrated operable:

a. At least once per 31 days by verifying that each valve (manual, power operated or automatic) in the flow path that is not locked, sealed or otherwise secured in position, is in its correct position.

b. At least once per 6 months by:

   1. Verifying the volume of sodium hydroxide in tank T-103.

   2. Verifying the concentration of sodium hydroxide in T-103.

13. Containment Purge and Ventilation Isolation Valves

The Containment Purge and Ventilation Isolation Valves shall be determined closed:

a. At least once per 24 hours by checking the valve position indicator in the control room

b. At least once every 6 months by performing a leak rate test between the valves.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 158 TO FACILITY OPERATING LICENSE NO. DPR-20

CONSUMERS POWER COMPANY

PALISADES PLANT

DOCKET NO. 50-255

1.0 INTRODUCTION

By letter dated June 12, 1992, as supplemented October 7, 1992, and July 8, 1993, the Consumers Power Company (CPCo or the licensee) requested an amendment to the Technical Specifications (TS) appended to Facility Operating License No. DPR-20 for the Palisades Plant. The proposed amendment would change the Palisades TS 3.19 and 4.2 to delete the requirements relating to the iodine removal system hydrazine storage tank, T-102, and to rearrange the remaining requirements in an updated format. The October 7, 1992, and July 8, 1993, submittals provided clarifying information only and did not change the initial no significant hazards consideration determination.

2.0 BACKGROUND

The acceptance criteria for crediting a containment spray system (CSS) with iodine "scrubbing" capability during a design basis accident are covered by the scope of Standard Review Plan (SRP), 6.5.2, "Containment Spray as a Fission Product Cleanup System." There are two major considerations regarding the iodine scrubbing capability of the CSS during a design basis event. The first deals with calculating the elemental, particulate, and organic iodine removal rates initiated by operation of the CSS during the event. The second involves calculating the maximum decontamination factor (DF) after the event has proceeded for a period of time. The effectiveness of the spray in removing elemental iodine is presumed to end at that time when the maximum elemental iodine DF is reached. No upper limit is placed upon the maximum DF for particulate and organic forms of iodine, as these forms have different, slower removal mechanisms from that of elemental iodine.

The existing TS for the Palisades Nuclear Plant require use of the CSS in conjunction with the iodine removal system for removal of iodine from a post-accident containment atmosphere. The iodine removal system adds hydrazine to the containment spray solution. On June 12, 1992, the licensee requested an amendment to the TS which would remove the requirements for hydrazine in the Palisades CSS. The licensee has pointed out in its submittal that Revision 2 of SRP 6.5.2 issued in December 1988, no longer requires a chemical additive injection to the containment spray solution as long as the containment sump solution pH is maintained basic in order to prevent the long-term revolatilization of iodine from the sump into the containment atmosphere.

Hydrazine is added to the containment spray solution because it was originally believed that such addition would enhance the spray system's removal rates of elemental iodine and particulate iodine from the containment atmosphere. The licensee stated that at Palisades, the post-accident pH control is provided by sodium hydroxide solution addition to the recirculated solution in the containment sump. The requirements for sodium hydroxide addition are unaffected by the proposed changes. The licensee also points out in the submittal that the current revision of the Combustion Engineering Standard Technical Specifications (NUREG-0212) does not require the use of hydrazine for iodine removal. The licensee has, therefore, proposed elimination of hydrazine addition to the containment spray solution from the TS 3.19, Iodine Removal System limiting condition of operation (LCO) and TS Table 4.2.2, Iodine Removal System surveillance requirements. Additionally, the licensee has proposed minor editorial changes and deletion of references involving hydrazine in the "Bases" and "References" sections of TS 3.19.

In its submittals, the licensee considered the effect of elimination of hydrazine from the iodine removal system on such issues as:

1. elemental iodine and particulate iodine removal rates from the containment atmosphere used in control room and offsite dose analyses,

2. pH control of the containment sump solution during recirculation phase of CSS operation,

3. hydrogen generation,

4. stress corrosion cracking,

5. spray system's operational capability, and

6. sodium hydroxide addition system's operational capability.

The licensee concluded that the elimination of the hydrazine addition system from the iodine removal system will not affect the capacity, functioning or settings of any other equipment and that it will have insignificant impact on the above issues.

3.0 DEFINITIONS

Partition Coefficient: the ratio of a component's maximum solubility in two different phases, at equilibrium. In the case of a design basis accident, the partition coefficient for iodine would correspond to the ratio of the concentration of iodine in the aqueous phase (the sump volume) to that in the gas phase (the containment atmosphere).

Iodine Removal constant (designated as either k or lambda): the kinetic rate constant (/hour) at which iodine is removed from the containment atmosphere, during a design basis event. Iodine removal from the containment atmosphere follows a typical first order kinetic equation where:

$$d[C]/[C] = -k*d(t) \quad \text{or} \quad \ln[C] = -k*t + \ln[C_0]$$

In this case, [C] is the iodine concentration of the iodine species being removed from the containment atmosphere, k is the iodine removal constant of the particular species in question (/hr), t is the time in hours, and C_0 is the initial concentration of the iodine species in question at time equaling 0 hours. It should be noted that the iodine removal constants should be determined individually for elemental iodine, particulate iodine, and organic iodine species by standard concentration versus time studies, or estimated according to the guidance of SRP 6.5.2, Rev. 2, 1988.

Decontamination Factor (DF): the ratio of the maximum iodine concentration in the containment atmosphere during the design basis accident to the iodine concentration in the containment atmosphere at some time later, after decontamination has occurred (at equilibrium). According to SRP 6.5.2, the maximum credit for the allowable DF is 200. When the DF is reached, the spray solution is presumed to be incapable of further iodine removal from the containment atmosphere. Therefore, the time to maximum DF is important since it determines the amount of time the spray solution is credited for removing elemental iodine. The licensee may calculate the DF for elemental iodine according to the following equation:

$$DF = 1 + (V_s/V_c)*H,$$

where V_s is the minimum sump volume, V_c is the containment building net free volume less V_s, and H is the partition coefficient of the spray solution. There is no need to limit the DF for particulate or organic iodine types, since they follow different (slower) removal mechanisms.

The licensee has indicated that the engineering factors affecting iodine removal from a post-accident containment atmosphere are:

1. the iodine removal rates for spray removal and wall deposition of elemental iodine, and for spray removal of particulate iodine,

2. the iodine partition coefficient, and

3. the iodine decontamination factor.

These engineering factors are used to calculate the concentration of iodine which is assumed present in the containment atmosphere following an accident, and, therefore, in any leakage from the containment. The licensee's initial submittal concentrated primarily on the iodine removal rate and not on the partition coefficient and DF used in the licensee's calculations. Since the licensee discussed only the iodine removal rate, the effects of the removal of hydrazine requirements on the licensee's calculation of the other associated engineering factors was uncertain. In a June 16, 1993, conference call with the licensee, the NRC requested additional information on iodine-related engineering factors. By letter dated July 8, 1993, CPCo provided that information.

The Palisades iodine removal system is currently designed to interact with the plant's containment spray to provide a means of lowering containment pressure and radioactive iodine levels in the event of a design basis accident. The CSS is automatically initiated by a containment spray actuation signal (CSAS), which occurs on high containment pressure, and initially delivers (sprays) borated water from the plant's safety injection refueling water tank (SIRWT). Upon receipt of a CSAS, the containment spray pumps are started, the spray header isolation valves are opened and spray water from the SIRWT is delivered to the containment spray headers. Positive displacement pumps will also automatically start to add hydrazine from the hydrazine storage tank to the containment spray lines. When the water level in the SIRWT reaches a specified setpoint, a recirculation actuating signal will align the suction of the CSS to the containment sump by opening the containment sump isolation valves.

The iodine removal system is currently designed to mix 270 gallons of a 15.0% by weight hydrazine solution to the CSS upon receipt of the same containment high pressure signal. Suction of the CSS switches to the containment sump recirculation mode upon depletion of the SIRWT contents. The recirculation mode of the CSS provides for containment cooling by recirculating and cooling the sump water through the shutdown cooling heat exchangers. Studies have shown that, at pH's below 7.0, the sump water is subject to a revolatilization reaction of iodide ion (I^-) to iodine molecule (I_2). This can cause some of the I_2 to redistribute in the containment atmosphere, since I_2 is typically less soluble in water than I^-. The sump water pH is maintained at pH >= ~7.0 during the recirculation phase by mixing the sump volume with a 30.0% by weight solution of sodium hydroxide.

4.0 EVALUATION

The licensee's assessment of the Palisades iodine removal system capability is given in its July 8, 1993, supplement to the TS amendment request. The revised analyses have been performed in accordance with Revision 2 of SRP 6.5.2 dated 1988. SRP 6.5.2, Rev. 2, includes a number of changes to the acceptance criteria in regard to calculating iodine removal rates and DFs used in iodine scrubbing analyses. The old version, SRP 6.5.2, Rev. 1, dated 1981, states the iodine removal rates and iodine DFs can be increased by using chemical additives, which promote iodine removal in the containment spray solution. Aqueous solutions of hydrazine promote iodine removal by reducing I_2 to I^-. According to SRP 6.5.2, Rev. 2, chemical additives do not effectively change the iodine removal rates and DFs which determine the effectiveness of the iodine removal system during a design basis accident. This change is a result of research by the NRC which has shown that the process of iodine removal is more dependent on diffusive (mechanical) factors, and less dependent on factors based on chemical interactions.

The latter revision acknowledged that a chemical additive is not required during spray injection if the pH of the sump water is maintained basic during post-accident conditions. As a result, the revised SRP eliminates the effects that the presence of hydrazine had on the calculation of the engineering factors and provides no reduction in the calculated concentration of iodine in the post-accident containment atmosphere due to the addition of hydrazine. Also, the new methodology provided by the revised SRP results in higher iodine removal rates without any reference to, or credit taken for, hydrazine. The licensee has stated that at Palisades, the post-accident pH control is provided by the addition of sodium hydroxide solution to the recirculated solution in the containment sump; the operating procedure directs the addition of sodium hydroxide to the emergency core cooling system pump suction to maintain the sump and spray solution pH between 7 and 8. The requirements for sodium hydroxide addition are unaffected by the proposed changes.

The licensee's original analysis based on the acceptance criteria of SRP 6.5.2, Rev. 1, 1981, claimed initial elemental iodine removal rate constants (/hr), during the initial actuation of the iodine removal system, of 0.42 for a borated spray solution, and 10 for a borated spray solution with 50 ppm hydrazine. The licensee's original analysis also claimed a particulate iodine removal rate constant of 1.0 (/hr), independent of whether or not the borated spray solution contained hydrazine. The original analysis conservatively set the organic iodine removal rate constant to be 0, as suggested by SRP 6.5.2, Rev. 1, 1981. An equilibrium iodine partition coefficient of 1000 was also used in the original analysis; this corresponds to an elemental iodine DF value of 25.57.

The licensee's revised analysis employs the latest version of SRP 6.5.2, Rev. 2. The licensee has recalculated the elemental iodine removal rate constant to be 20 (/hr), independent of whether or not the borated spray solution contained hydrazine. The particulate iodine removal rate constant was similarly recalculated to be 4.43 (/hr), declining to 0.443 (/hr) after 98% of the iodine particulates have been removed (i.e., the aerosol mass has been depleted of iodine particulates by a factor of 50). The licensee has continued to assume that organic iodine removal rate constant is 0, as recommended by the guidance of SRP 6.5.2, Rev. 2.

The licensee calculated a former iodine partition coefficient at 1000, and a revised partition coefficient of 1250. The former DF was 25.57; the licensee recalculated the maximum DF to be 32.51. This is based on a total iodine partition coefficient of 1250 (obtained from NUREG/CR-4697, Figure 6, pg. 13). The maximum DF of 32.51 assures that the licensee's method of calculating the iodine removal kinetics until iodine equilibrium is reached is reasonable. The licensee's calculations were based on the evidence of several iodine removal studies, performed for the NRC by the Oak Ridge National Laboratories, in Oak Ridge, TN (see NUREG/CR-4697, "Chemistry and Transport of Iodine in Containment," and NUREG/CR-5732, "Iodine Chemical Forms in LWR Severe Accidents"). These calculations revealed that the revised iodine partition coefficient and the DFs are unaffected by the proposed removal of the hydrazine TS requirements.

In regard to hydrazine usage during normal operations, the staff has confirmed that hydrazine addition is accomplished in a batch manner from the chemical addition tank, by way of the volume and chemical control system. Removal of the hydrazine storage tank, therefore, would not affect (increase) oxygen levels in the reactor coolant, and thus, would not result in an increase in the probability of intergranular stress corrosion cracking (IGSCC) of the reactor coolant system over time. Furthermore, removal of the hydrazine storage tank should not increase the concentration of hydrogen gas in the containment atmosphere. This is due to the fact that the predominant form of iodine in the sump water exists as I^-. Although I^- acts as scavenger for hydrogen and hydrogen peroxide radicals, which could promote some additional radiolysis of water, no effective change in the concentration of I^- in the sump water would be caused by the removal of the hydrazine storage tank; thus, the equilibrium concentrations of hydrogen in the containment would already be established by the time the recirculation phase of the CSS is initiated.

The licensee's current analysis of the CSS's iodine scrubbing capability provides a conservative basis for removing the hydrazine requirements from the plant's TS for iodine removal. The licensee's analysis shows that elemental iodine removal rates are approximately twice as fast, and particulate iodine removal rates approximately four times as fast, as those previously calculated using hydrazine addition to the CSS. The changes in the iodine removal rates are based on a change of the SRP, Section 6.5.2, "Containment Spray as a Fission Product Cleanup System," which states that, at pH's at or above 7.0, the process of iodine removal is largely independent of any chemical additives in the CSS. The new iodine DF of 32.51 is also conservative relative to the previous value.

The staff's understanding is that the licensee's current operating basis is such that addition of sodium hydroxide to the sump volume is done manually by control room operation. The licensee's Emergency Operating Procedures identified in Attachment 1 to an April 21, 1992, letter from CPCo describe the method for adding sodium hydroxide to the sump volume during a design basis accident which ensures that the pH of the sump volume will be maintained at a neutral or basic pH (pH of 7.0 or higher).

The staff finds that the removal of the hydrazine addition system will not compromise the CSS's operational performance since the CCS was originally designed without the hydrazine addition system and further because the original plant startup testing was successfully completed without the hydrazine tank in place. The staff also finds that the sodium hydroxide addition system will not be affected by the proposed deletion of the hydrazine addition system since the sodium hydroxide tank and other equipment in the sodium hydroxide addition system are independent of the hydrazine tank and the associated automatic valves.

The staff concludes that the proposed changes to the Palisade TS concerning elimination of hydrazine additive to the containment spray lines are acceptable. This conclusion is based on Rev. 2 of SRP 6.5.2 and its acknowledgment that a chemical additive, such as hydrazine, is not required for effective iodine removal following a design basis accident as long as the pH of the containment sump solution remains basic. The licensee has provided technical information in accordance with Rev. 2 of SRP 6.5.2, and has satisfactorily illustrated that by removing the hydrazine requirement from the TS, there would be no adverse impact on the radiological consequences of an accident.

The staff further concludes that the proposed minor editorial changes and changes in the "Bases" and "References" sections of TS 3.19 as listed in the licensee's submittals are acceptable.

Therefore, based on the above evaluation, the staff finds the licensee's request to remove the hydrazine additive requirement from the TS acceptable.

5.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Michigan State Official was notified of the proposed issuance of the amendment. The Michigan State Official had no comments.

6.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluent that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration and there has been no public comment on such finding (57 FR 42775). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

7.0 CONCLUSION

The staff has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributors: J. Medoff, EMCB
T. Chandrasekaran, SPLB
T. Massey, PRPB

Date: September 9, 1993