ENTERGY

Entergy Operations, Inc.
P.O. Box B
Killona, LA 70066-0751
Tel 504 739 6661

Ross P. Barkhurst
Vice President, Operations
Waterford 3

W3F1-94-0150
A4.05
PR

May 19, 1995

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

Subject: Waterford 3 SES
Docket No. 50-382
License No. NPF-38
Technical Specification Change Request NPF-38-159

Gentlemen:

The purpose of this submittal is to request a change to the Technical Specifications (TS) for the hydrogen recombiners. This letter hereby retracts and supersedes the two prior submittals, letters W3F1-93-0075 and W3F1-93-0073, on the hydrogen recombiners.

Entergy Operations, Inc., Waterford 3, on October 15, 1993, requested an exemption to 10CFR50.44 and 10CFR50, Appendix A, Criterion 41 via letter W3F1-93-0073, and also provided the accompanying TS change request NPF-38-139 via letter W3F1-93-0075 to eliminate and to rescind the requirement to maintain operational the hydrogen recombiners. These submittals were submitted as a Cost Beneficial Licensing Action (CBLA). After discussions with the NRC and further consideration on the matter, we have decided that we may achieve an essentially equivalent benefit by keeping the hydrogen recombiners operational and changing the TS for the hydrogen recombiners. Specifically, this TS change request changes the Action requirement for TS 3.6.4.2. This request also changes the Surveillance Requirements and Bases to be essentially the same as described in NUREG-1432, "Standard Technical Specifications Combustion Engineering Plants." This amendment request is also submitted as a CBLA.

A001

The justification for this request is predicated on essentially the same justification as the prior submittals. The justification is herein included. The 10CFR50.92 evaluation is also herein provided. This technical specification change request has been reviewed and approved by the Plant Operations Review Committee and the Safety Review Committee.

Please contact me or Robert J. Murillo (504) 739-6715 should there be any questions regarding this matter.

Very truly yours,

R.P. Barkhurst
Vice President, Operations
Waterford 3

RPB/RJM/tmm
Attachment Affidavit
NPF-38-159

cc: L.J. Callan, NRC Region IV
D.L. Wigginton, NRC-NRR
R.B. McGehee
N.S. Reynolds
NRC Resident Inspectors Office
Administrator Radiation Protection Division
(State of Louisiana)
American Nuclear Insurers

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the matter of	)	
	)	
Entergy Operations, Incorporated	)	Docket No. 50-382
Waterford 3 Steam Electric Station	)	

AFFIDAVIT

R.P. Barkhurst, being duly sworn, hereby deposes and says that he is Vice President Operations - Waterford 3 of Entergy Operations, Incorporated; that he is duly authorized to sign and file with the Nuclear Regulatory Commission the attached Technical Specification Change Request NPF-38-159; that he is familiar with the content thereof; and that the matters set forth therein are true and correct to the best of his knowledge, information and belief.

R.P. Barkhurst
Vice President Operations - Waterford 3

STATE OF LOUISIANA)
) ss
PARISH OF ST. CHARLES)

Subscribed and sworn to before me, a Notary Public in and for the Parish and State above named this 19TH day of MAY, ~~1994.~~ 1995.

Notary Public

My Commission expires WITH LIFE.

DESCRIPTION AND SAFETY ANALYSIS
OF PROPOSED CHANGE NPF-38-159

This proposed change modifies Action statement 3.6.4.2 for the hydrogen recombiners. This proposed change also modifies the Surveillance Requirements for the hydrogen recombiners to be the same as described in NUREG-1432, "Standard Technical Specifications Combustion Engineering Plants."

Existing Specification

See Attachment C

Proposed Specification

See Attachment D

Background

Description

The hydrogen recombiners were provided in accordance with 10CFR50.44 and 10CFR50 Appendix A, Criterion 41 to be available to maintain the hydrogen concentration within containment below its flammable limit during post-LOCA conditions. Either recombiner unit is capable of controlling the hypothetical hydrogen generation during a Design Basis Accident (DBA) associated with (1) zirconium water reactions, (2) radiolytic decomposition of water, and (3) corrosion. The hydrogen control systems are consistent with the recommendations of Regulatory Guide 1.7, March 1971. The licensing basis for the hydrogen recombiners is described in FSAR section 6.2.5.

This proposed change modifies Action Statement 3.6.4.2 for the hydrogen recombiners. Currently, with one recombiner system inoperable, the inoperable system must be restored to operable status within 30 days or the plant is required to be in at least HOT STANDBY within the next 6 hours. The change would modify this requirement such that with one hydrogen recombiner system inoperable, the inoperable system would have to be restored operable prior to startup, mode 2, following the next refueling outage. With two hydrogen recombiner systems inoperable, one inoperable system would have to be restored operable within 30 days or the plant would have to be in at least HOT STANDBY within the next 6 hours. The change also modifies the Surveillance Requirements for the hydrogen recombiners to be the same as described in NUREG-1432, "Standard Technical Specifications Combustion Engineering Plants."

NUREG-1432 requires a system functional test, visual examination of each hydrogen recombiner enclosure, and a resistance to ground test at a 18 month frequency. These Surveillance Requirements are already incorporated in the current TS but the same wording used in NUREG-1432 is incorporated in the proposed change. The Surveillance Requirement for a channel calibration test is not included in NUREG-1432, and it has been deleted in the proposed change. The current TS is also revised such that the details for performing the system functional test, visual examination, and resistance to ground test for the Surveillance Requirements are incorporated in the proposed TS Bases. The wording in the proposed Bases for these Surveillance Requirements is essentially the same wording as used in the Bases in NUREG-1432.

The technical justification is predicated on the following technical bases:

1. The licensing basis for the hydrogen recombiners is documented in FSAR section 6.2.5. One hydrogen recombiner system is sufficient to maintain the hydrogen concentration level below the 4% hydrogen flammability limit. The licensing analysis of record in the FSAR is based on Regulatory Guide 1.7 and various technical conservatisms.

2. The proposed changes are consistent with and conservative when compared with the recommendations of Regulatory Guide 1.7. The regulatory guide establishes that the hydrogen control system need not necessarily be installed at each reactor. The hydrogen recombiners will remain operational, and their availability will thus provide a higher level of operational readiness.

3. Short term post LOCA hydrogen generation is less than 1%, well below the 4% hydrogen flammability limit.

4. Long term post LOCA hydrogen generation at 30 days is about 5.7% which is less than the flame propagation limit of 6%, which according to Regulatory Guide 1.7 would not result in effects adverse to containment systems. A time period of 30 days would provide ample time within which to mobilize resources to repair the inoperable unit(s) or to implement long term recovery actions, such as containment venting, for example, by using the Containment Atmosphere Release System, (CARS).

5. Waterford 3 analyses establish that a hydrogen burn at 8.1% hydrogen concentration, following a design basis LOCA without long term hydrogen control would produce a peak pressure of 31.0 psig which is below the containment design pressure of 44 psig. A hydrogen concentration of 8.1% envelops the TMI burn which occurred at about 7 to 8% hydrogen concentration, NUREG/CR-4330, Vol. 3, May 1987, and produced a peak pressure of 28 psig. The pressure resulting from the hydrogen burn, 31.0 psig, is also below the Waterford 3 limiting design basis accident (MSLB) peak pressure of 43.6 psig. The actual containment failure pressure for Waterford 3 is expected to be in the range of 2.5 to 3.0 times the containment design pressure based on containment failure pressures for containment designs similar to Waterford 3.

Safety Analysis

The proposed change described above shall be deemed to involve a significant hazards consideration if there is a positive finding in any of the following areas:

1. Will operation of the facility in accordance with this proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

   Response: No

   The response is predicated on the following technical bases: (1) the current licensing basis of record establishes that only one recombiner system is required to maintain hydrogen concentration below 4%, (2) the proposed technical specification changes are conservative when compared with the recommendations of Regulatory Guide 1.7, (3) short term post LOCA hydrogen generation is less than 1%, (4) long term post LOCA hydrogen generation is less than the flame propagation limit, which according to Regulatory Guide 1.7 would not result in adverse effects to containment systems, and (5) a design basis LOCA without long term hydrogen control would produce pressures below the containment design pressure. Each of these technical bases is herein discussed.

The Current Licensing Basis of Record Establishes That Only One Recombiner System Is Required to Maintain Hydrogen Concentration Below 4%

The licensing basis for the hydrogen recombiners is documented in FSAR section 6.2.5. One hydrogen recombiner system is sufficient to maintain the hydrogen concentration level below the 4% hydrogen flammability limit. The licensing analysis of record in the FSAR is based on Regulatory Guide 1.7 and various technical conversatisms. The licensing analysis of record incorporates a margin of 0.5 volume percent between the hydrogen concentration limit of 4% and hydrogen concentration at which the equipment would be activated in accordance with Standard Review Plan 6.2.5, BTP CSB 6-2 (11/24/75). The amount of hydrogen that is assumed to result from metal-water reaction is conservatively assumed to be five times the maximum amount calculated in accordance with 10CFR50.46. The analysis accounts for the production of hydrogen from oxidation of zinc based paint; however, Waterford 3 uses a non-zinc protective coating to prevent corrosion of zinc based paint. The analysis used an aluminum corrosion rate for a spray solution which contains sodium hydroxide, much more corrosive that Waterford 3, and thus the aluminum corrosion rate is extremely conservative.

The Proposed Change Is Conservative When Compared With Regulatory Guide 1.7, And The Availability of the Hydrogen Recombiners Provides A Higher Level of Operational Readiness.

The proposed changes are consistent with and conservative when compared with the recommendations of Regulatory Guide 1.7. The hydrogen recombiners will remain installed in the plant and operable in accordance with the proposed TS requirements. The regulatory guide establishes that the hydrogen control system need not necessarily be installed at each reactor, (page 1.7-4 fourth paragraph). Regulatory

Guide 1.7, Regulatory Position C.2, establishes that the continuous presence of redundant combustible gas control equipment at the site may not be necessary provided it is available on an appropriate time scale. Regulatory Position C.2 further states that centralized facilities, (for storing hydrogen control system(s)), may be used. The installation and operability of the hydrogen recombiners in accordance with the proposed TS requirements thus provides a higher level of operational readiness.

Short Term Post LOCA Hydrogen Generation Is Less Than 1%

Immediately following a design basis LOCA, in the first minutes, hydrogen would be generated by oxidation of zircaloy fuel cladding. The resulting hydrogen concentration in containment would be less than 1%, reference FSAR Figure 6.2-54, attached, which is well below the 4% hydrogen flammability limit. Therefore, the hydrogen recombiners are not needed in the short-term following a design basis LOCA.

Long Term Post LOCA Hydrogen Generation Is Less Than Flame Propagation Limit, Which According To Regulatory Guide 1.7 Would Not Result In Adverse Effects to Containment Systems.

In the days following a design-basis LOCA, hydrogen will slowly build up in containment from radiolysis of water and corrosion of metallic aluminum and zinc and zinc-based paints. Figure 6.2.54 of the FSAR shows hydrogen concentrations in containment post-LOCA. Waterford 3 uses a non-zinc protective coating to prevent corrosion of zinc-based paint, so the hydrogen produced from oxidation of zinc-based paint would be significantly less than shown in FSAR Figure 6.2.54. Also, the hydrogen produced from oxidation of zirconium was increased by a factor of 5 for conservatism over the hydrogen production calculated in the ECCS performance analysis. The hydrogen concentrations are shown in FSAR Figure 6.2.54. Figure 1, see attachment A, shows these hydrogen concentrations. In Figure 1, zinc-based paint corrosion was neglected, and the FSAR Figure 6.2.54 zirconium concentration was divided by 5. The other hydrogen concentrations were taken directly from FSAR Figure 6.2-54. The total hydrogen shown in Figure 1 was calculated by adding

the curves for the hydrogen sources shown in the figure. Using these total hydrogen values, the hydrogen concentration, without recombiners, will reach the 4% concentration flammability limit at 17 days and be about 5.7% at 30 days which is less than the 6% flame propagation limit. Regulatory Guide 1.7 establishes that for hydrogen concentrations between 4% and 6%, only partial burning will occur, which will not result in effects that would be adverse to containment systems. A time period of 30 days would provide ample time within which to mobilize resources to repair the hydrogen recombiner system(s) or to implement long term recovery actions, such as containment venting, for example, by using the Containment Atmosphere Release System, (CARS).

A Design Basis LOCA Without Long Term Hydrogen Control Would Produce Pressures Below The Containment Design Pressure.

If a hydrogen burn were to occur following the long term buildup of hydrogen, the containment integrity would be maintained. NUREG/CR-4330 (Vol. 3, p. 4.7) describes the hydrogen deflagration at Three Mile Island 2, with an initial hydrogen concentration of 7 to 8%, which produced no containment breach and minimal damage to equipment. Plastics and other low-melting point materials, such as telephone cases and the crane operator's seat were damaged. Both Waterford 3 and TMI-2 are large dry containments. Waterford 3 analyses using the MAAP code, see Attachment B, EPRI NP-7071-CCML, establish that for a 8.1% hydrogen concentration, the containment peak pressure resulting from a hydrogen burn would be 31.0 psig which is below the containment design pressure of 44 psig. A hydrogen concentration of 8.1% envelops the TMI burn which occurred at about 7 to 8% hydrogen concentration, NUREG/CR-4330, Vol. 3, May 1987, and produced a peak pressure of 28 psig. The pressure resulting from the hydrogen burn, 31.0 psig, is also below the Waterford 3 limiting design basis accident (MSLB) peak pressure of 43.6 psig. The actual containment failure pressure for Waterford 3 is expected to be in the range of 2.5 to 3.0 times the containment design pressure based on containment failure pressures for containment designs similar to Waterford 3. Thus a design-basis LOCA without long-term hydrogen control would not challenge containment integrity.

Therefore, the proposed change will not involve a significant increase in the probability or consequences of any accident previously evaluated.

2. Will operation of the facility in accordance with this proposed change create the possibility of a new or different type of accident from any accident previously evaluated?

   Response: No.

   The proposed change will not alter the configuration or operation of any other plant system or component. The change does not involve any change to the operational design or limits of any other plant systems or components. Thus, no new failure modes are introduced or associated with the proposed change. Therefore, the proposed change will not create the possibility of a new or different kind of accident from any accident previously evaluated.

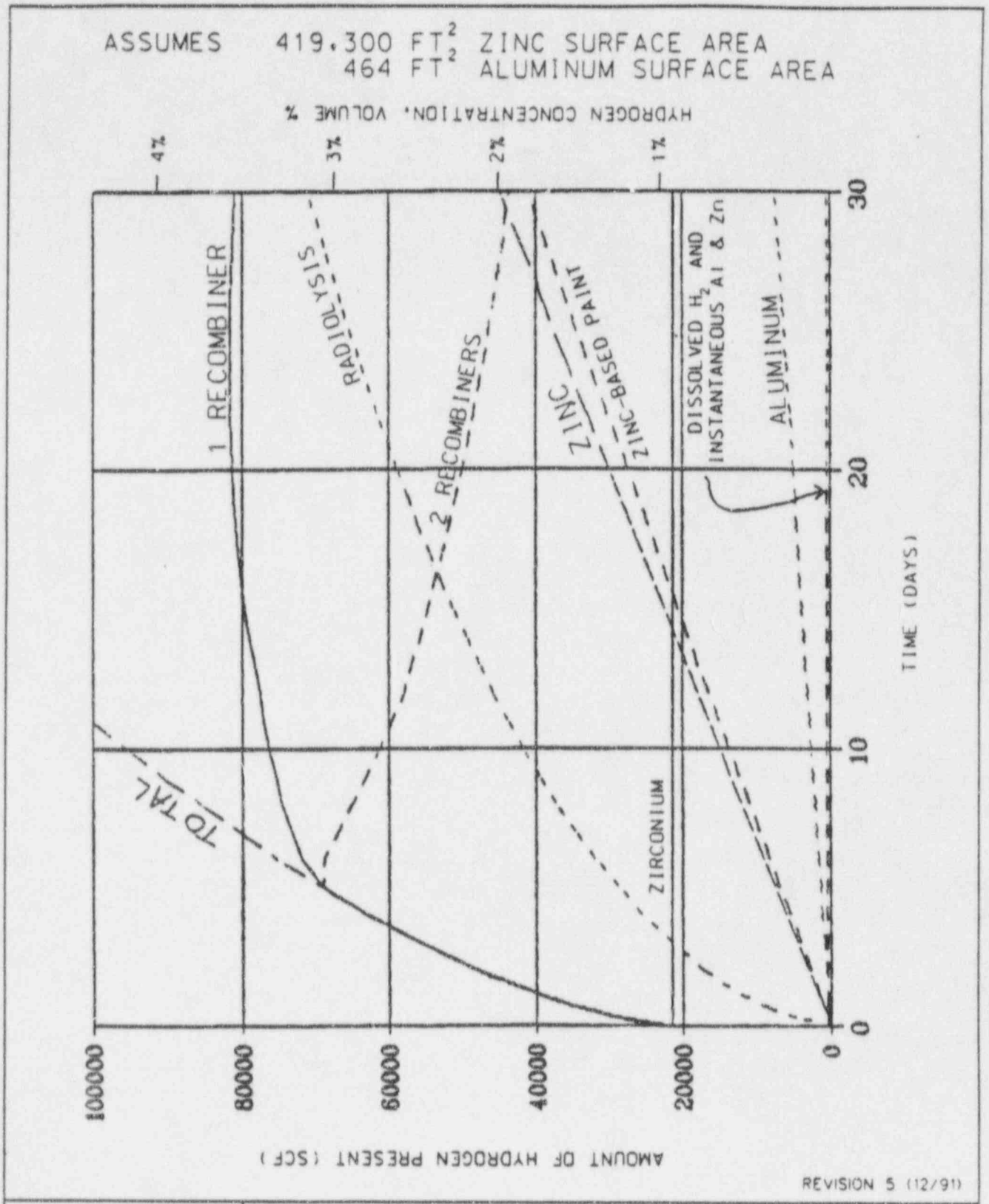
3. Will operation of the facility in accordance with this proposed change involve a significant reduction in a margin of safety?

   The proposed change will have no adverse impact on the protective boundaries, safety limits, or margin or safety. There are no limits or margins of safety being revised for any systems, components, or protective boundaries. Therefore, the proposed change will not involve a significant reduction in a margin of safety.

Safety and Significant Hazards Determination

Based on the above safety analysis, it is concluded that: (1) the proposed change does not constitute a significant hazards consideration as defined by 10CFR50.92; and (2) there is a reasonable assurance that the health and safety of the public will not be endangered by the proposed change; and (3) this action will not result in a condition which significantly alters the impact of the station on the environment as described in the NRC final environmental statement.

ATTACHMENT A

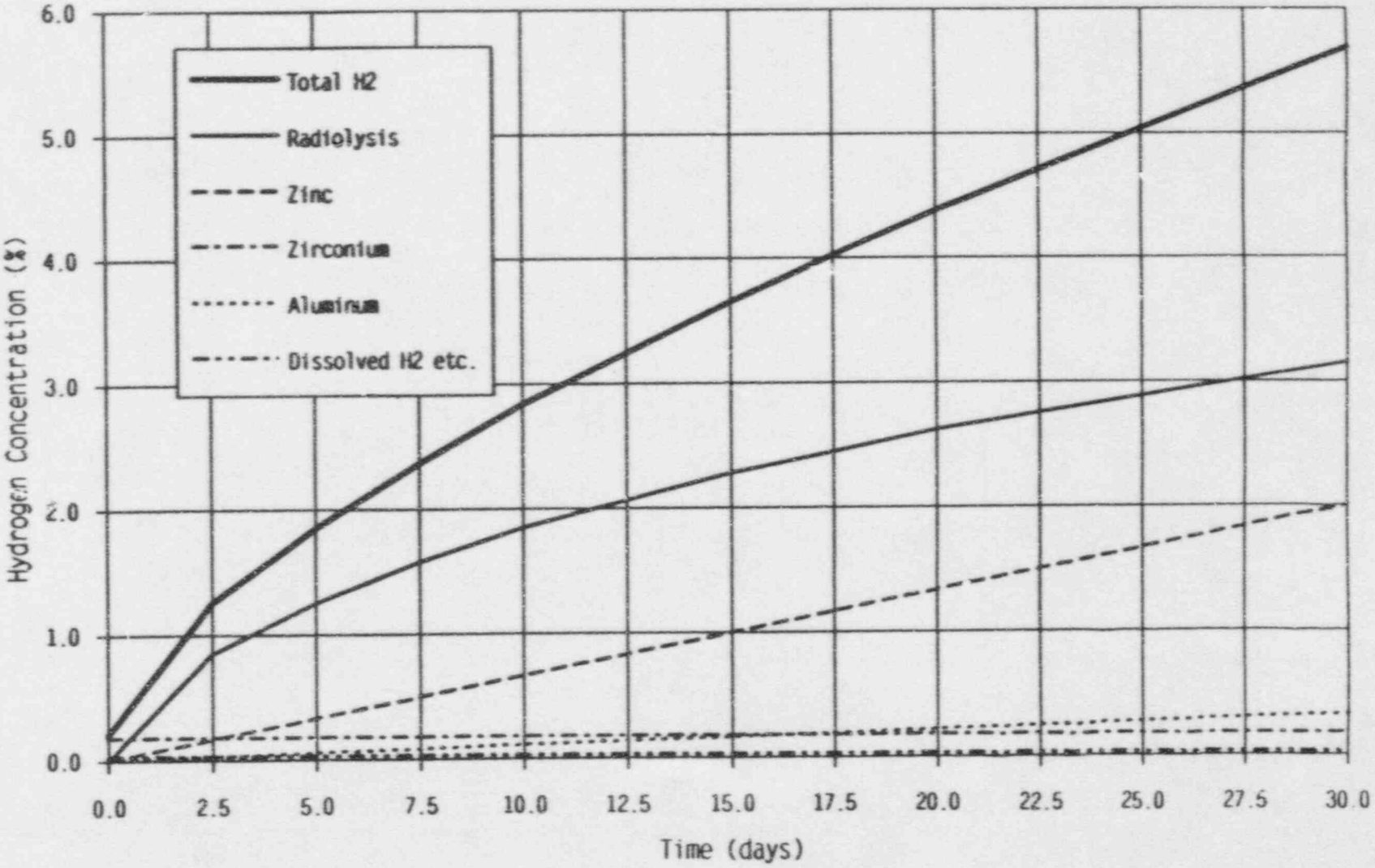


REVISION 5 (12/91)

Waterford Steam Electric Station •3	POST-LOCA HYDROGEN AS A FUNCTION OF TIME	Figure 6.2-54

Figure 1

POST-LOCA HYDROGEN CONCENTRATION



ATTACHMENT B

W3F1-94-0150

ATTACHMENT B

The Modular Accident Analysis Program (MAAP) computer code has been used to evaluate the impact of a hydrogen burn on the Waterford 3 containment pressure. The containment conditions at which the hydrogen burn was initiated were similar to the conditions expected to exist post large break LOCA, low containment pressure and 8.1% hydrogen concentration in the containment. The results show that the containment pressure spike due to complete hydrogen burn is 31.0 psig which is below the containment design pressure of 44 psig.

MAAP incorporates fully integrated models for the major severe accident phenomena and system mitigating effects that can affect containment response. MAAP code is used throughout the industry to simulate LWR behavior under severe accident conditions. MAAP analyses were used to determine the accident progression including the timing of events, the magnitude of the potential pressure loads that could cause containment failure, and the effect of plant specific design features on severe accident phenomena as part of Waterford 3 IPE effort. A plant specific model was developed for MAAP 3B Version 17.02 that incorporated the Waterford 3 design features. This model was used to simulate a hydrogen burn and its impact on Waterford 3 containment pressure. The hydrogen burn was initiated at a containment condition similar to post LOCA conditions.

The scenario considered is a large break LOCA with one train of containment cooling two containment fan coolers and one containment spray, available. To generate the desired amount of hydrogen, it is also assumed that no safety injection is available throughout the accident. This scenario was selected to achieve the desired containment conditions, pressure and hydrogen concentration. This accident condition resulted in a hydrogen mass equivalent to 8.1% hydrogen concentration for containment dry conditions long term post LOCA. This condition conservatively bounds the 30 days post design basis LOCA conditions which is expected to be at about atmospheric pressure and 5.7% hydrogen concentration. A complete hydrogen burn was simulated at the above conditions, 23.9 hours into the accident.

The following lists the containment conditions before and after the hydrogen burn:

Containment pressure before initiating hydrogen burn	8.1	psig
Hydrogen Concentration before burn	8.1%	
Containment peak pressure after the burn	39.1	psig
Containment pressure rise (ΔP) due to burn	31	psi

The above results show that the pressure spike in the containment due to a complete hydrogen burn initiated at conditions more conservative than expected at 30 days after a design basis large break LOCA, is below the containment design pressure, 44 psig. This pressure is also below the Waterford 3 limiting design basis accident (MSLB) peak pressures of 43.6 psig. The containment initial pressure in the MAAP calculational case is based on severe accident conditions at 23.9 hours after the accident. The peak containment pressure was established by subtracting 8.1 psi from the MAAP 39.1 psig value to account for long term post LOCA containment dry conditions.