DESIRED LONG-TERM

CONTAINMENT CONFIGURATION

INDUSTRY ADVISORY GROUP

THREE MILE ISLAND #2

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Agreed to and understood by

Chuck Solbrig
Rick Muench
Jim Thiesing
Bob Campbell

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RECOMMENDATION FOR THE LONG TERM STATE OF CONTAINMENT.

The desired long term containment status is recommended to be maintained at a pressure of approximately -1.0 psig (this implies tracking local barometric pressure by starting and stopping cooling water to fan coolers), and an appropriate temperature less than 120°F to maintain the above desired pressure. The pressure requirement maintains the containment pressure less than atmospheric (inflow is better than outflow), it is close to current conditions (so that it should be an easily achievable condition), it is close to normal operating conditions of the containment (so that it is easy to modify procedures to operate at this condition), the recombiner operates at low pressure (and it may possibly be required), and the pressure difference between containment and surroundings will remain less than the containment operating limit of -2.5 psi, and avoid future potential degradation of liner plate integrity (inward bubbling). Pressure control should be accomplished with fan coolers and no non-condensibles should be added to the system.

The temperature is specified as less than 120°F to minimize equipment degredation and it is consistent with the desired pressure and the amount of non-condensible gas now in the containment.

The desired pressure may not be achievable for one of the three possible long term cooling states of the primary system. In this case, the pressure should be kept as low as possible to minimize outleakage. Analyses with a containment code is required to determine the expected containment pressure and operating heat removal equipment required for this mode of operation.

The reasons for these recommendations as well as the requirements for other systems to support this mode are discussed in this report.

INTRODUCTION

The primary objective of the investigation was to determine the desired final pressure and temperature of the containment required for the long term (that is, during the next year). Subsidiary objectives consisted of specifying the desired status of all containment systems, the current state of each system, the mode of change from the current system to the final state, and a determination of any factors which could adversely change the desired final state to an undesirable one.

The final state of the containment depends upon the final configuration of reactor cooling. The modes of cooling which allow the heat to be removed from the primary system with the steam generators will allow operation of the containment at a negative gauge pressure. However, the perculation mode of long term cooling exhausts the heat generated in the core as steam to the containment and this steam must be condensed. The heat removal capability of the containment will probably require the containment pressure to be above atmospheric to allow enough heat loss to condense the steam. A plot of the expected decay heat is shown in Figure 1. This is the maximum amount of heat which must be removed by the containment. Preliminary estimates indicate that this mode of core cooling can be accomplished with containment pressures of perhaps slightly negative to +5 psig, depending on decay heat and time of year. Computer predictions of this state is recommended to estimate the pressure expected. Leak rate information obtained previous to the accident can be used to estimate the leak rate from the containment.

CONTAINMENT STRUCTURE

The primary objective in considering the long term state is maintaining the integrity of the containment. The release rate from the containment must be as low as practically achievable.

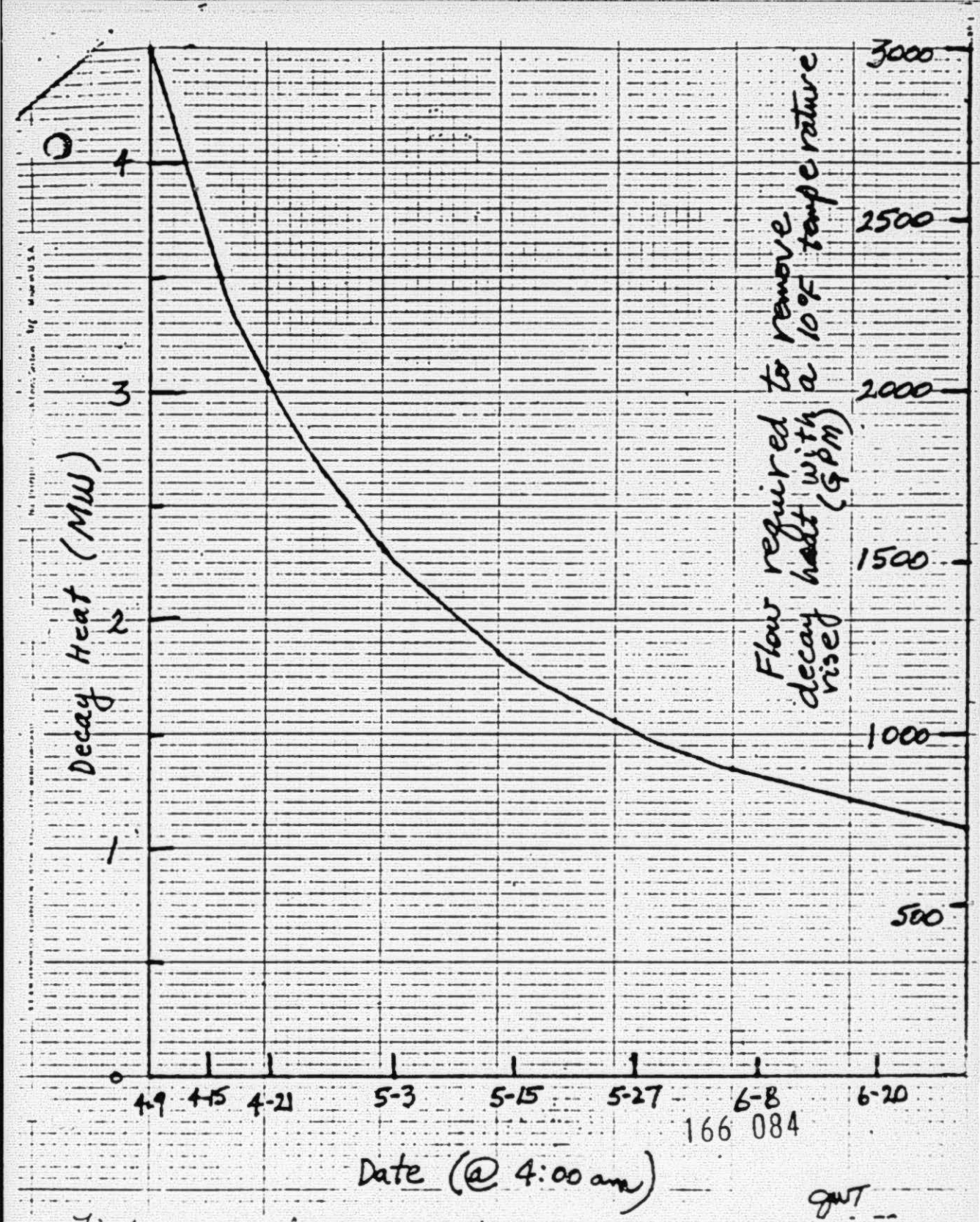

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Fig. 1 - Decay heat versus time

The design pressure is 2.5 psig negative and 60 psig positive. A low pressure can cause the metal liner to buckle inward. (In fact, some inward buckling may already have occurred). The inward buckle could introduce air between the liner and the concrete. The pressure in the containment should be kept high enough so that the liner plate/anchor integrety will not be compromised.

The pressure in the containment should be kept low enough so that only inleakage occurs.

An operating procedure should be initiated or reviewed to ensure that the containment pressure control room recorder is monitored and instructions provided for operator actions when containment pressure increases or decreases. Consideration should be given to providing adjusting set points for control room audible and visual alarms on high or low containment pressure. Consideration should be given to weather forecasts to allow lead time prior to atmospheric barometric changes in anticipation of changing fan cooler duty. Consideration should be given to the feasibility of measuring the pressure between the liner and the concrete wall in an attempt to evaluate the integrety of the metal liner.

HEAT REMOVAL SYSTEM

The fan coolers in the containment should be selectively shut off in order to reduce duty time. At least two of the coolers should be shut off as long as the pressure remains within the limits. When the service water temperature rises, it is recognized that more fan coolers will be needed. The fans also are beneficial in avoiding H_2 pockets. The fans can also be used to circulate the containment atmosphere if H_2 appears.

It is desireable to leave the spray system off because of the large decrease in pressure which these systems can create. If the sprays are being used to assist in decontamination, the pressure should be raised to near atmospheric before the sprays are turned on. The pressure can be increased by turning off the fan coolers or by running hot water through them.

COMBUSTIBLE GAS CONTROL

When the recombiner is used, the pressure of the containment is limited by the recombiner design pressure. The recombiner will not be needed if no hydrogen comes from the RCS. The recombiner adds non-condensibles from fuel and can also reduce them if it combines the hydrogen and oxygen.

Purge should not be used because of the addition of non-condensibles to the system. The percent of hydrogen should be continuously monitored.

CONTAINMENT ISOLATION VALVES

The valves necessary for the long term core cooling should be aligned correctly to allow the cooling to occur. Other valves may be aligned as needed to perform other desired functions as long as they do not affect the long term cooling function of the core. An accelerated preventive maintenance program should be instituted or containment isolation valves, particularly those that may later be used in highly radioactive service which would make maintenance impossible.

CONCLUSIONS

The most desirable containment condition approximately a pressure of -1.0 psig and a temperature less than 120°F. All systems which might affect this condition should be reviewed if they have not been reviewed here.