VOGLEWEDE
READING FILE

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

JUN 7 1979

MEMORANDUM FOR: Warren Minners, TMI-2 Lessons Learned Task Force

FROM: John Voglewede, TMI-2 Lessons Learned Task Force

SUBJECT: CONTRIBUTION TO LESSONS LEARNED SUBJECTS

Enclosed is my contribution to the Lessons Learned subject file for Three Mile Island, Unit 2. The list is based on my first reading of all materials distributed to the Lessons Learned Task Force and should not be considered complete. Rather than confine myself only to those areas currently assigned to me, I have taken the liberty of commenting on other areas as well. This will result in some duplication within your master file, but may also include areas not covered by the present Task Force Subject Catagory List.

Where possible, I have also commented on the priority, assignment and disposition of these items. I believe that these comments should be confirmed by the Task Force.

John C. Voglewede

John Voglewede
Reactor Fuel Section
Core Performance Branch
Division of Systems Safety

Enclosure:
As stated

cc w/enclosure:
C. Long, L²

cc w/o enclosure:
R. Mattson, L²
R. Tedesco, L²

Dupe of
7907180047

TMI LESSONS LEARNED

SUBJECT LISTING

Subject No.: 3.1.3

Title: Reactor Coolant Pump Limits

Corss reference subject number:

Description of suggestion, preliminary recommendation, request, etc.:

Establish emergency reactor coolant pump limits for slug flow, steam flow, particulate damage, vibration, overspeed etc. for use by operators under accident conditions.

Source: Voglewede 5/25/79

References and sources of information:

NUREG-0557, 7.2

Actions:

Description of action (evaluation, analysis, study, etc.):

Assigned to:

Schedule:

Current Status:

Disposition:

Description of finding, conclusion, recommendation, etc.

TMI LESSONS LEARNED

SUBJECT LISTING

Subject No.: 2.1

Title: Core Cooling Options

Corss reference subject number:

Description of suggestion, preliminary recommendation, request, etc.:

Review plant safety analyses to determine if core cooling options are considered separately as a function of accident initiator, as a function of radioactivity containment capability, and as a function of reliability.

Source: Hoglewede 5/25/79

References and sources of information:

NUREG-0557, 1.1

Actions:

Description of action (evaluation, analysis, study, etc.):

Assigned to:

Schedule:

Current Status:

Disposition:

Description of finding, conclusion, recommendation, etc.

TMI LESSONS LEARNED

SUBJECT LISTING

Subject No.: 3.1.6

Title: Zircaloy Cladding Alternatives

Corss reference subject number:

Description of suggestion, preliminary recommendation, request, etc.:

Evaluate zircaloy cladding alternatives in light of high oxidation during the TMI-2 accident

Source: JOGLEWICZ 5/25/79

References and sources of information:

Actions:

Description of action (evaluation, analysis, study, etc.):

Assigned to:

Schedule:

Current Status:

Disposition:

Description of finding, conclusion, recommendation, etc.

TMI LESSONS LEARNED

SUBJECT LISTING

Subject No.: 3.1.6.

Title: Zircaloy Spacer Grid Alternatives

Corss reference subject number:

Description of suggestion, preliminary recommendation, request, etc.:

Evaluate Zircaloy Spacer Grid Alternatives in light of extensive core component oxidation during the TMI-2 accident.

Source: VOGLEWEDE 5/26/79

References and sources of information:

Actions:

Description of action (evaluation, analysis, study, etc.):

Assigned to:

Schedule:

Current Status:

Disposition:

Description of finding, conclusion, recommendation, etc.

TMI LESSONS LEARNED

SUBJECT LISTING

Subject No.: I.2.2

Title: Operator recognition of CORE DAMAGE

Cross reference subject number:

Description of suggestion, preliminary recommendation, request, etc.:
I&E sequence of events suggests "all personnel felt the core was covered." yet the containment dome radiation monitor was reading 6000R/hr at the time and the airborne levels in the control room required partial evacuation. Determine operator conception of core damage symptoms and evaluate the possibility of corrective training

Source: VOGLEWEDE 5/26/79

References and sources of information:
I&E sequence of events (DAVIS letter to NRC @ 6hrs)

Actions:

Description of action (evaluation, analysis, study, etc.):

Assigned to:

Schedule:

Current Status:

Disposition:
Description of finding, conclusion, recommendation, etc.

TMI LESSONS LEARNED

SUBJECT LISTING

Subject No.: 3.3

Title: TMI-2 MAKE-UP PUMP TRIPS

Corss reference subject number:

Description of suggestion, preliminary recommendation, request, etc.:
Make-up pumps trip repeatedly after SCRAM in TMI-2 event sequence. No reason given. Investigate cause. Determine if problem is applicable to other operating reactors.

Source: VOGLEWEDE 5/26/79

References and sources of information:
I & E sequence of events (DAVIS letter to NRC)

Actions:

Description of action (evaluation, analysis, study, etc.):

Assigned to:

Schedule:

Current Status:

Disposition:

Description of finding, conclusion, recommendation, etc.

TMI LESSONS LEARNED

SUBJECT LISTING

Subject No.: 3.5

Title: Conditions for Reactor Scram

Corss reference subject number:

Description of suggestion, preliminary recommendation, request, etc.:

Require reactor scram for generator/turbine trip as well as high Reactor Coolant System Pressure.

Source: Voglewede 5/29/79

References and sources of information:

Actions:

Description of action (evaluation, analysis, study, etc.):

Assigned to:

Schedule:

Current Status:

Disposition:

Description of finding, conclusion, recommendation, etc.

TMI LESSONS LEARNED

SUBJECT LISTING

Subject No.: 3.1.1

Title: Reactor Vessel Level Instrumentation

Corss reference subject number:

Description of suggestion, preliminary recommendation, request, etc.:

Require upgraded instrumentation to give a positive indication of reactor vessel coolant level.

Source: DOGGETT/DE 5/29/79

References and sources of information:

NOTE HELTEMES TO MATTSON 5/17/79

Actions:

Description of action (evaluation, analysis, study, etc.):

Assigned to:

Schedule:

Current Status:

Disposition:

Description of finding, conclusion, recommendation, etc.

LESSONS LEARNED

SUBJECT LISTING

Subject No.: 2.1

Title: Class 9 Safety Analysis Requirements

Corss reference subject number:

Description of suggestion, preliminary recommendation, request, etc.:

Consideration of extending the range of Design Basis Accidents to include events where substantial core damage occurs (Class 9). For example, the effect of non-condensible gases in the RCS.

Source: Voglewede 5/30/79

References and sources of information:

NUREG-0557, 1.2

Actions:

Description of action (evaluation, analysis, study, etc.):

Assigned to:

Schedule:

Current Status:

Disposition:

Description of finding, conclusion, recommendation, etc.

TMI LESSONS LEARNED

SUBJECT LISTING

Subject No.: 3.1.1

Title: SATURATION METER

Corss reference subject number:

Description of suggestion, preliminary recommendation, request, etc.:

REQUIRE AN INSTRUMENT WHICH INDICATES DEGREES SUBCOOLING ON A PWR BASED ON HOT LEG TEMPERATURE AND PRESSURE

Source: VOGTLE 5/30/79

References and sources of information:

Mattson's COMMENT AT L² meeting

Actions:

Description of action (evaluation, analysis, study, etc.):

Assigned to:

Schedule:

Current Status:

Disposition:

Description of finding, conclusion, recommendation, etc.

TMI LESSONS LEARNED

SUBJECT LISTING

Subject No.: I.2.2

Title: Operator Conception of System Priorities

Corss reference subject number:

Description of suggestion, preliminary recommendation, request, etc.:
Determine reactor operator conception of relative system priorities. For example, would a reactor operator be so busy trying to avoid reactor vessel overpressurization that he would allow the core to become uncovered. Determine NRC conception of priorities and compare the two.

Source: VOGLEWEDE 5/30/79

References and sources of information:

Actions:

Description of action (evaluation, analysis, study, etc.):

Assigned to:

Schedule:

Current Status:

Disposition:

Description of finding, conclusion, recommendation, etc.

TMI LESSONS LEARNED

SUBJECT LISTING

Subject No.: 3.2.2.2

Title: RCS ACTIVITY MONITORING EQUIPMENT

Corss reference subject number:

Description of suggestion, preliminary recommendation, request, etc.:

Require on-line radioactivity monitoring equipment with gross activity and γ-SCAN CAPABILITY for REACTOR COOLING systems on all operating REACTORS.

Source: VOGLEWEDE 5/30/79

References and sources of information:
NUREG-0401

Actions:

Description of action (evaluation, analysis, study, etc.):

Assigned to:

Schedule:

Current Status:

Disposition:

Description of finding, conclusion, recommendation, etc.

TMI LESSONS LEARNED

SUBJECT LISTING

Subject No.: 1.6.2

Title: Control Room Flight Tape Recorder

Corss reference subject number:

Description of suggestion, preliminary recommendation, request, etc.:
Require on-line recording of key control room parameters so that at any given time, the last hour or two of data are recorded. For normal operation, the data could be overwritten when it is more than several hours old.

Source: VOGLEWEDE 5/30/79

References and sources of information:

Actions:

Description of action (evaluation, analysis, study, etc.):

Assigned to:

Schedule:

Current Status:

Disposition:

Description of finding, conclusion, recommendation, etc.

TMI LESSONS LEARNED

SUBJECT LISTING

Subject No.: 2.2.2

Title: ANALYTICAL FIRE DRILLS

Corss reference subject number:

Description of suggestion, preliminary recommendation, request, etc.:
As a part of NRC staff emergency preparedness and code qualification, require fire drill response to test problems, where analysis must be completed in a specified period of time with possibly incomplete data.

Source: VOGLEWEDE 5/30/79

References and sources of information:

Actions:

Description of action (evaluation, analysis, study, etc.):

Assigned to:

Schedule:

Current Status:

Disposition:

Description of finding, conclusion, recommendation, etc.

TMI LESSONS LEARNED

SUBJECT LISTING

Subject No.: 3.1.6

Title: In Core THERMOcouple instrumentation

Corss reference subject number:

Description of suggestion, preliminary recommendation, request, etc.:
Require minimum in-core thermocouple instrumentation for all operating reactors. Request licensees to provide information on current capability, proposed changes and consequences of the additional information made available.

Source: Voglewede 5/30/79

References and sources of information:
ACRS Interim Report #2

Actions:

Description of action (evaluation, analysis, study, etc.):

Assigned to:

Schedule:

Current Status:

Disposition:

Description of finding, conclusion, recommendation, etc.

TMI LESSONS LEARNED

SUBJECT LISTING

Subject No.: 3.1.6

Title: Melting Point Changes in Core Components

Corss reference subject number:

Description of suggestion, preliminary recommendation, request, etc.:

Evaluate changes in the melting point of TMI-2 core components due to local mixing and eut

Source: JOGLEWEDE 5/31/79

References and sources of information:

President's Commission question to Mattson

Actions:

Description of action (evaluation, analysis, study, etc.):

Assigned to:

Schedule:

Current Status:

Disposition:

Description of finding, conclusion, recommendation, etc.

TMI LESSONS LEARNED

SUBJECT LISTING

Subject No.: 3.1.6

Title: Recriticality Requirements of TMI-2 in absence of Borated Coolant.

Corss reference subject number:

Description of suggestion, preliminary recommendation, request, etc.:

Determine Recriticality requirements of TMI-2 core without borated coolant.

Source: VOGLEWEDE 5/31/79

References and sources of information:

President's Commission question to Mattson

Actions:

Description of action (evaluation, analysis, study, etc.):

Assigned to:

Schedule:

Current Status:

Disposition:

Description of finding, conclusion, recommendation, etc.

TMI LESSONS LEARNED

SUBJECT LISTING

Subject No.:

Title: Regulatory Guide 1.97 Review

Corss reference subject number:

Description of suggestion, preliminary recommendation, request, etc.:

Distribute copies of Reg Guide 1.97 to L^2 and NRC staff for implementation on operating reactors.

Source: VOGTLE 5/31/79

References and sources of information:

ACRS INTERIM REPORT #2

Actions:

Description of action (evaluation, analysis, study, etc.):

Assigned to:

Schedule:

Current Status:

Disposition:

Description of finding, conclusion, recommendation, etc.

TMI LESSONS LEARNED

SUBJECT LISTING

Subject No.: 3.1.6

Title: Expanded range for IN-CORE Thermocouples

Corss reference subject number:

Description of suggestion, preliminary recommendation, request, etc.:

Require licensees to utilize full range of in-core instrumentation.

Source: VOGTLE WEDGE 5/31/79

References and sources of information:

ACRS INTERIM REPORT #2

Actions:

Description of action (evaluation, analysis, study, etc.):

Assigned to:

Schedule:

Current Status:

Disposition:

Description of finding, conclusion, recommendation, etc.

TMI LESSONS LEARNED

SUBJECT LISTING

Subject No.: 3.5.8

Title: Decay Heat Meter

Corss reference subject number:

Description of suggestion, preliminary recommendation, request, etc.:

Establish feasibility of reactor system heat balance meter for control room using decay heat, RC pump heat, core flow and core ΔT as input

Source: Vogtmede 5/31/79

References and sources of information:

Actions:

Description of action (evaluation, analysis, study, etc.):

Assigned to:

Schedule:

Current Status:

Disposition:

Description of finding, conclusion, recommendation, etc.

TMI LESSONS LEARNED

SUBJECT LISTING

Subject No.: 3.1.4

Title: RCS VENT

Corss reference subject number:

Description of suggestion, preliminary recommendation, request, etc.:

Require RCS venting capability for non-condensibles

Source: VOGLEWEDE 6/1/79

References and sources of information:

ACRS RECOMMENDATIONS 4/7/79

Actions:

Description of action (evaluation, analysis, study, etc.):

Assigned to:

Schedule:

Current Status:

Disposition:

Description of finding, conclusion, recommendation, etc.

TMI LESSONS LE[illegible]

SUBJECT LISTING

Subject No.: 8.1

Title: LESSONS TO BE LEARNED

Corss reference subject number:

Description of suggestion, preliminary recommendation, request, etc.:

MANY LESSONS REMAINED TO BE LEARNED PENDING CLEAN-UP AT TMI-2. Particular areas are CORE, VESSEL and CONTAINMENT conditions. NRC should have (but may not have) AN ACTIVE ROLE in this process.

Source: VOGLEWEDE 6/1/79

References and sources of information:

Actions:

Description of action (evaluation, analysis, study, etc.):

Assigned to:

Schedule:

Current Status:

Disposition:

Description of finding, conclusion, recommendation, etc.

TMI LESSONS LEARNED

SUBJECT LISTING

Subject No.: 3.4

Title: Condensate Pump Trip

Corss reference subject number:

Description of suggestion, preliminary recommendation, request, etc.:

Establish reason for condensate pump (Co-P-1A) trip at TMI-2. Determine possible generic application — breakers protection relay.

Source: Voglewede 6/4/79

References and sources of information:

Mtg Ed seq. of events Moseley to Core 5/22/79

Actions:

Description of action (evaluation, analysis, study, etc.):

Assigned to:

Schedule:

Current Status:

Disposition:

Description of finding, conclusion, recommendation, etc.

TMI LESSONS LEARNED

SUBJECT LISTING

Subject No.: 3.1.6

Title: H_2/O_2 GENERATION UNDER ACCIDENT CONDITIONS

Corss reference subject number:

Description of suggestion, preliminary recommendation, request, etc.:
Evaluate application of Baker-Just or Cathcart-Powel oxidation relation for material near melting point (dynamic geometry).

Source: JOGLEKAR 6/4/79

References and sources of information:
ACRS SUBCOMMITTEE ON TMI-2 5/31-6/1/79

Actions:

Description of action (evaluation, analysis, study, etc.):

Assigned to:

Schedule:

Current Status:

Disposition:

Description of finding, conclusion, recommendation, etc.

TMI LESSONS LEARNED

SUBJECT LISTING

Subject No.: 3.1.2

Title: Pressurizer Relief Value Position Indicator

Corss reference subject number:

Description of suggestion, preliminary recommendation, request, etc.:

Require positive indication of pressurizer relief value position on operating PWRs

Source: VOGLEWEDE 6/4/79

References and sources of information:

L.S. Tong memo 5/17/79

Actions:

Description of action (evaluation, analysis, study, etc.):

Assigned to:

Schedule:

Current Status:

Disposition:

Description of finding, conclusion, recommendation, etc.

TMI LESSONS LEARNED

SUBJECT LISTING

Subject No.: 3.1

Title: VENT VALVES FOR OTSG

Corss reference subject number:

Description of suggestion, preliminary recommendation, request, etc.:

Require motor operated vent valves to top of OTSG.

Source: VOGLEWEDE 6/4/79

References and sources of information:

L.S. Tong Memo 5/17/79.

Actions:

Description of action (evaluation, analysis, study, etc.):

Assigned to:

Schedule:

Current Status:

Disposition:

Description of finding, conclusion, recommendation, etc.

TMI LESSONS LEARNED

SUBJECT LISTING

Subject No.: 3.2.2.2 2

Title: Automatic Containment Isolation

Corss reference subject number:

Description of suggestion, preliminary recommendation, request, etc.:

Require automatic containment isolation on other than just high containment pressure signal (for example, on ECCS actuation or high containment radioactivity level)

Source: Voglewede 6/4/79

References and sources of information:

L.S. Tong memo 5/17/79

Actions:

Description of action (evaluation, analysis, study, etc.):

Assigned to:

Schedule:

Current Status:

Disposition:

Description of finding, conclusion, recommendation, etc.

TMI LESSONS LEARNED

SUBJECT LISTING

Subject No.: 2.2.1

Title: TRANSIENT ANALYSIS ASSUMPTIONS

Corss reference subject number:

Description of suggestion, preliminary recommendation, request, etc.:

Consider station blackout and water-hammer effects in plant transient analyses.

Source: Vogtle ISE 6/5/79

References and sources of information:

ACRS letter to NRC 5/16/79

Actions:

Description of action (evaluation, analysis, study, etc.):

Assigned to:

Schedule:

Current Status:

Disposition:

Description of finding, conclusion, recommendation, etc.

TMI LESSONS LEARNED

SUBJECT LISTING

Subject No.: 3.1.2

Title: PORV reliability

Corss reference subject number:

Description of suggestion, preliminary recommendation, request, etc.:

Establish plant-record reliability of PORV closure. Compare to small breaks LOCA probability. Require reliability upgrade if value is limiting: Require safety-grade PORV if necessary. Extend review to other reactor pressure vessel boundry components.

Source: Voglewede 6/5/79

References and sources of information:

Letter ACRS to NRC 5/16/79
Met. Ed Seq. of Events — Mosely to Case 5/22/79

Actions:

Description of action (evaluation, analysis, study, etc.):

Assigned to:

Schedule:

Current Status:

Disposition:

Description of finding, conclusion, recommendation, etc.

TMI LESSONS LEARNED

SUBJECT LISTING

Subject No.: 3.1.4

Title: Pressurizer Water level Instrumentation

Corss reference subject number:

Description of suggestion, preliminary recommendation, request, etc.:

Extend present pressurizer water level instrumentation to include all of the pressurizer volume such that a positive direct indication of a water solid condition in the pressurizer can be established.

Source: Voglewede 6/5/79

References and sources of information:

NUREG-0557, 1.1

Actions:

Description of action (evaluation, analysis, study, etc.):

Assigned to:

Schedule:

Current Status:

Disposition:

Description of finding, conclusion, recommendation, etc.

TMI LESSONS LEARNED

SUBJECT LISTING

Subject No.: 2.2.3

Title: EXXON FSAR

Corss reference subject number:

Description of suggestion, preliminary recommendation, request, etc.:

Require submittal of generic safety analysis from EXXON reload

Source: NOGEWEDE 6/5/79

References and sources of information:

Letter Kane to Helfenes 5/31/79 on EXXON TMI-2 related re-evaluations

Actions:

Description of action (evaluation, analysis, study, etc.):

Assigned to:

Schedule:

Current Status:

Disposition:

Description of finding, conclusion, recommendation, etc.

TMI LESSONS LEARNED

SUBJECT LISTING

Subject No.: 2.2

Title: Volatile Decay Heat

Corss reference subject number:

Description of suggestion, preliminary recommendation, request, etc.:
Analysis of fission products contributing to core decay heat indicates up to 30% of this heat source may be volatiles and may not be in the core at all. Assess the impact of this heat source not being in the core (heated bubble size, upper head reaction)

Source: VOGLEWEDE 6/5/79

References and sources of information:

Actions:

Description of action (evaluation, analysis, study, etc.):

Assigned to:

Schedule:

Current Status:

Disposition:

Description of finding, conclusion, recommendation, etc.

TMI LESSONS LEARNED

SUBJECT LISTING

Subject No.: 2.1

Title: Coplanar Blockage Assumption in Safety Analysis

Corss reference subject number:

Description of suggestion, preliminary recommendation, request, etc.:

Partial core uncovery, such as that experienced at TMI-2, leads to cladding strain and rod rupture only in the uncovered portion of the core. Increased likelihood of all blockage be limited to certain core elevations should be assumed in plant safety analysis....

Source: Vogtmedia 6/6/79

References and sources of information:

Actions:

Description of action (evaluation, analysis, study, etc.):

Assigned to:

Schedule:

Current Status:

Disposition:

Description of finding, conclusion, recommendation, etc.

TMI LESSONS LEARNED

SUBJECT LISTING

Subject No.: 10.2

Title: Quantitative Assessment of Core Performance Safety Goals

Corss reference subject number:

Description of suggestion, preliminary recommendation, request, etc.:

Establish quantitative assessment goals for Core Performance Safety. Coordinate action with NRC/RES

Source: Vogtle 6/6/79

References and sources of information:

Letter Carbon to Hendrie 5/16/79

Actions:

Description of action (evaluation, analysis, study, etc.):

Assigned to:

Schedule:

Current Status:

Disposition:

Description of finding, conclusion, recommendation, etc.