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MEMORANDUM FOR: Robert M. Bernero, Director  
 Division of Systems Integration

FROM: Harold R. Denton, Director  
 Office of Nuclear Reactor Regulation

SUBJECT: SCHEDULE FOR RESOLVING AND COMPLETING GENERIC  
 ISSUE NO. 101 - BWR WATER LEVEL REDUNDANCY

The technical resolution for Generic Issue No. 101, "BWR Water Level Redundancy" is assigned a "HIGH" priority ranking. This memorandum approves NRR staff taking appropriate actions necessary to complete this issue. The evaluation of the subject issue is provided in Enclosure 1.

In accordance with NRR Office Letter No. 40, "Management of Proposed Generic Issues," the resolution of this issue will be monitored by the Generic Issue Management Control System (GIMCS). The information needed for this system is indicated on the enclosed GIMCS information sheet (Enclosure 2). Your schedule for resolving and completing this generic issue should be commensurate with the priority nature of the work and consistent with the NRR Operating Plan. Normally, as stated in the Office Letter, the information needed should be provided within six weeks.

The attached prioritization evaluation will be incorporated into NUREG-0933, "Prioritization of Generic Safety Issues," and is being sent to other NRC offices, the ACRS, and the PDR for comments on the technical accuracy and completeness of the prioritization evaluation. Any changes as a result of comments will be coordinated with you. However, the schedule for the resolution of this issue should not be delayed to wait for these comments.

The information requested should be sent to the Safety Program Evaluation Branch, DST. Should you have any questions pertaining to the contents of this memorandum, please contact Louis Riani (24563).

Original Signed by  
 H. R. Denton

Harold R. Denton, Director  
 Office of Nuclear Reactor Regulation

- Enclosures:
1. Prioritization Evaluation
  2. Generic Issue Management Control System

cc: See next page

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 PDR MISC  
 850528051B PDR

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 X RD-8  
 GENERIC  
 ITEM

OFFICE	SPEB: DST	SPEB: DST	AD/T: DST	D: DST	DD: NRR	D: NRR
SURNAME	LRiani:slm	WMinners	FRowsome	TSpeis	DEisenhut	HDenton
DATE	4/27/85	4/22/85	4/23/85	4/26/85	5/6/85	5/6/85

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cc w/o Enclosure 2:

V. Stello  
J. Funches  
R. Minogue, RES  
J. Taylor, IE  
C. Heltemes, Jr., AEOD  
J. Davis, NMSS  
W. Russell, DHFS  
F. Rowsome  
W. Minners  
R. Baer, IE  
ACRS  
PDR

cc w/Enclosure 2:

K. Pulsipher  
W. Houston  
B. Sheron  
R. Emrit  
L. Riani

OFFICE							
SURNAME							
DATE							

ENCLOSURE 1

PRIORITIZATION EVALUATION

## ITEM 101: BWR WATER LEVEL REDUNDANCY

### DESCRIPTION

#### Historical Background

Generic Issue 50, "Reactor Vessel Level Instrumentation in BWRs," addressed several areas of concern with BWR water level instrumentation. Resolution of Generic Issue 50 involved voluntary implementation of water level measurement improvements for all of the staff concerns except the one related to a break in an instrument line in conjunction with the worst single failure.<sup>A</sup>

This concern was first identified in an AEOD draft report.<sup>B</sup> In the interest of expeditious resolution of the remainder of Generic Issue 50, this concern was removed to form a separate generic issue,<sup>C</sup> Generic Issue 101.

#### Safety Significance

Water level is measured in BWRs by means of differential pressure sensors connected between the reactor vessel (at a point low enough in elevation to be below the expected water level) and reference columns (which are completely full of water and connected at the top to the steam dome). The differential pressure sensed by the dp cell corresponds to the difference in elevation between the "collapsed" water level in the reactor and the water level in the reference column. If the reference column is broken, the water in it will flash to steam and the water level indication in all channels connected to the broken column will give a false "high" reading.

Typically, a BWR will have two reference columns. (There is a variety of design, however.) A break in one column will cause all instrumentation associated with that column to indicate full scale high level. This can

simultaneously cause a transient and interfere with safety systems. A single failure associated with the other reference column can completely defeat mitigation systems. To quote Reference D:

"Consequences of such an event depend upon (1) the location of the postulated reference leg break, whether it is a single reference leg or a common line; (2) the physical location of an additional postulated single failure, and (3) the various combinations thereof.

"Further, effects of such an event depend upon plant specific design. In some older plants, a postulated reference leg break itself without any additional single failure will cause failure of ECC system initiation due to a reactor water level condition.

"The greatest vulnerability occurs when the same sensor is used to initiate more than one system. In one plant where core spray initiation and MSIV initiation share the same set of sensors, a single failure in either system in addition to a pipeline break in the instrument reference leg may cause a core uncover. In another plant, the consequences of the additional single failure becomes of concern only when the coolant injection system initiation transmitter fails. In such an event, operator action is required to prevent core uncover in about 45 minutes. Further, several indications are available in the control room to give the operator information relative to the accident progression and status of the plant.

#### Proposed Solution

The references cited above do not recommend specific modifications; individual plant designs are apparently too varied to permit generic solutions.<sup>E</sup> However, it appears to be possible to fix the problem by modification to the logics which use reactor level as an input.<sup>D</sup>



### Priority Determination

Enclosure 2 of Reference D contains a probabilistic assessment of the concern. This assessment estimated a core melt frequency of  $1.0\text{E}-5$  per reactor-year, a public risk of 50 man-rem per reactor-year, and a cost-benefit ratio of \$1,000 per man-rem. The affected plants were estimated to have roughly 20 effective full-power years of remaining lifetime. These figures can easily be converted into priority parameters:

man-rem per reactor	1000
core melts per reactor-year	$1.0\text{E}-5$
priority score, man-rem per million dollars	1000

### Other Considerations

It must be emphasized (as virtually every reference points out) that both the affected accident sequences and the modifications to resolve the issue will vary from plant to plant. The resolution of this issue will be more case-specific than most, and some plants may not require modification.

The calculations in Reference D assume an operator error probability of 0.1. This figure is based on judgment, balancing the relatively high likelihood of initial operator confusion, due to conflicting level indicators, against a relatively long time (45 minutes) available for problem diagnosis before core uncovering in the primary sequence. Specific plant designs and other, more rapid sequences may well indicate a higher figure for operator error probability, which would increase the priority figures above.

In some cases, occupational exposure associated with the modifications may be a significant factor. This area should be addressed in specific plant reviews.

### Conclusion

The priority parameters are on the borderline between medium and high priority. However, some specific plants will undoubtedly fall well into the high area,

others well into medium or below. At present, without further study on this issue, the specific plants for which this issue is particularly important cannot be identified. Thus, it is recommended that this issue be placed into the HIGH priority category. As work progresses, it should be possible to target the issue more specifically.

#### REFERENCES

- A. Memorandum for T. P. Speis from R. M. Bernero, "Request for Prioritization of Generic Safety Issue - Break Plus Single Failure in BWR Water Level Instrumentation," October 10, 1984.
- B. Memorandum for H. R. Denton and V. Stello from C. Michelson, "Case Study Report - Safety Concern Associated with Reactor Vessel Instrumentation in Boiling Water Reactors," September 2, 1981.
- C. Memorandum for D. G. Eisenhut from R. M. Bernero, "Resolution of Generic Issue 50, Reactor Vessel Water Level Instrumentation in BWR," September 6, 1984.
- D. Memorandum for B. Sheron from A. C. Thadani, "Reactor Vessel Level Instrumentation in BWRs (Generic Issue 50)," August 2, 1984.
- E. Memorandum for H. R. Denton from T. P. Speis, "Reactor Vessel Level Instrumentation in BWRs (Generic Issue 50)," August 2, 1984.

GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

The Generic Issues Management Control System (GIMCS) provides appropriate information necessary to manage safety related and environmental generic issues through technical resolution and completion. For the purpose of this management control system technically resolved is defined as the point where the staff's technical resolution has been issued. Generally, speaking, this occurs when the technical resolution has been incorporated into one or more of the following:

- (a) Commission policy statement/orders
- (b) NRC Regulations
- (c) Standard Review Plan
- (d) Regulatory Guide
- (e) Generic Letter

GIMCS is part of an integrated system of reports and procedures that would manage generic safety issues, TMI-related issues, and proposed new generic issues through the stages of prioritization, technical resolution, development of new criteria, review and approval, public comments, and incorporation into the Standard Review Plan (SRP), as appropriate. NUREG-0933 provides an evaluation for a recommended priority listing based on the potential safety significance and cost of implementation for each issue; NRR Office Letter Number 40 provided procedures and criteria for adding new generic issues to the system; and GIMCS provides proposed scheduling for resolving and completing issues on the prioritized listing. GIMCS will provide information to manage and control issues that are ranked High-priority generic issues, Medium-priority generic issues, issues for which possible resolution has been identified for evaluation, issues for which a technical resolution is available (as documented by memorandum, analysis, NUREG, etc.), and issues designated by the Director of NRR as issues for which resources have been made available for resolution and completion. Issues ranked as either "Low" or "Dropped" are not allocated resources. Therefore, there is no resolution to be tracked by GIMCS.

Some new generic issues prioritized and processed in accordance with NRR Office Letter No. 40 may not have resources allocated for resolution and completion. These issues will be listed in GIMCS as inactive issues. These will generally be Medium priority issues that have no safety deficiency demanding high-priority attention, but there is a potential for safety improvements or reduction in uncertainty of analysis that may be substantial and worthwhile. Efforts for resolution of these issues will be planned, over the next several years, but on a basis that will not interfere with the resolution of High-priority generic issue work or other high priority work. Thus, some (Medium) generic issues will be inactive until such time as resources become available to resolve the various issues. As resource allocations are directed at issue resolution, they will become active. The detailed schedule for resolving and completing the generic issue will be developed and monitored by the management control system.



Management and control indicators used in GIMCS are defined as follows:

1. Item No. - Generic Issue Number.
  2. Issue Type - Safety, Environmental or Regulatory Impact  
High, Note 1 or Note 2 (From NUREG-0933),  
Medium.
  3. Action Level - Degree of management attention needed to process  
generic issues in accordance with established  
schedules  
    L1 - No management action is necessary  
    L2 - Division Director action is necessary  
    L3 - Director NRR action is necessary
  4. Office/Div/Br - 1st listed has lead responsibility for re-  
solving issue, others listed have input to  
resolution.
  5. Task Manager - Name of assigned individual responsible for  
schedule updating.
  6. Tac Number - Each issue should be assigned a TAC #.
  7. Title - Generic Issue Title.
  8. Work Authorization - Who or what authorized work to be done on  
generic issue.
  9. Contract Title - Provide Contract Title (if contract issued).
  10. Contractor Name/  
    FIN No. - Identify Contractor Name and FIN Number (as  
appropriate). If contract is not yet issued,  
indicate whether the contract is included in  
the FIN plan.
  11. Work Scope - Describes briefly the work necessary to tech-  
nically resolve and complete the generic issue.
  12. Affected Documents - Identifies documents that the technical resolution  
will be incorporated into to identify new criteria.
  13. Status - Describes current status of work.
  14. Problem/Resolution - Identifies potential problem areas and describes  
what actions are necessary to resolve them.
  15. Technical Resolution - Identifies detailed schedule of milestone  
dates that are required for completing the  
issue through the issuance of the SRP revision  
or other change that documents requirements.
- Milestones - Selected significant milestones. The "original"  
schedule remains unchanged. Changes in schedule  
are listed under "Current". Actual completion  
are listed under "Actual".

# TYPICAL MILESTONES

## Other Division Involvement

Original

Current

Actual

- o Date information requested from Division
- o Date received from Division

## Contractor Information

- o Proposal Solicited
- o Proposal Evaluated and Accepted
- o Contract Schedule, if applicable
- o Testing Schedule, if applicable
- o Draft NUREG/CR report from contractor/consultant

Staff review of draft NUREG/CR report

Value Impact Statement prepared (coordinated with SPEB and RRAB as applicable)

Final report prepared by Division (include SPEB preliminary comments and SRP revision)

----- 2 wks

Final report forwarded to DST for processing

----- 2 wks

CRGR Package to NRR Director for Review

----- 1 mo

OMB Clearance obtained concurrently if applicable

Review Package to CRGR

----- 1 mo

CRGR review and EDO approval  
completed

----- 1 mo

Federal Register Notice of  
Issuance of SRP for  
Public Comment

----- 3 mo

Division review of public  
comments completed

----- 2 wks

Comments incorporated and  
transmitted to DST for  
processing

----- 2 wks

Final CRGR package to  
NRR Director for review

----- 1 mo

Review Package to CRGR

----- 1 mo

CRGR review and EDO approval  
completed

----- 1 mo

Federal Register Notice of  
Issuance of SRP

# GENERIC ISSUE MANAGEMENT CONTROL SYSTEM

<u>Issue</u> <u>Number</u>	<u>Issue</u> <u>Type</u>	<u>Action</u> <u>Level</u>	<u>Office/Div/Br</u>	<u>Task</u> <u>Manager</u>	<u>Tac No</u>
		Active-L1	NRR/.	TBP	TBP

Title -----

Work Authorization --- Memorandum to from H. R. Denton dated

Contract Title ----- To Be Provided.

Contractor Name/  
FIN No. ----- To Be Provided.

Work Scope ----- To Be Provided.

Affected Documents --- To Be Provided.

Status ----- To Be Provided.

Problem/Resolution --- To Be Provided.

Technical Resolution - To Be Provided.

<u>Milestones</u>	<u>Original</u>	<u>Current</u>	<u>Actual</u>
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New Issues - Schedule To Be Developed

As of First Quarter FY-84

OFFICE >							
SURNAME >							
DATE >							