ENCLOSURE

EPRI Responses to
NRC Request for Additional Information

The NRC has documented their questions/comments on EPRI WinPPM Software Versions 3.1, 3.2, and 3.3, in a Request for Additional Information (RAI) dated June 3, 2008 (NRC letter from V. Perin (NRR) to J. Riley (NEI)). The EPRI responses to the RAI are provided below.

NRC Comment 1

Eight-inch and 16-inch gate valve models were developed for Versions 2, 3.1, 3.2, and 3.3 of the performance prediction methodology (PPM) software. Versions 3.1, 3.2, and 3.3 of the software were able to produce identical estimates provided the default body rail misalignment calculations were not used and identical values were entered. However, some of the results were different between Version 2 and the various Versions 3.1, 3.2, and 3.3. The calculated system conditions were identical and the opening thrust values were nearly identical for both the 8-inch and the 16-inch models, as was the closing thrust for the 16-inch model. The closing thrust for each of the Version 3 predictions were identical when using the 8-inch valve model. However, the closing thrust for each of the Version 3 predictions for the 8-inch valve model was about 10 percent lower than the closing thrust for each of the Version 2 predictions. Please provide additional justification for using any of the Version 3 software in light of the non-conservative closing thrust estimates.

EPRI Response to Comment 1

The NRC provided EPRI with electronic PPM input data files which document the basis for this comment. EPRI verified that these files, as provided, demonstrate required thrust predictions as described in the NRC comment. For the 8-inch valve, the WinPPM Version 3.1, 3.2, and 3.3 required thrust predictions were 5.7% lower than the PPM Version 2.0 prediction.

The value of one of the inputs ("Stem Added Length") in the NRC data file for PPM Version 2.0 was not consistent with the value used for this input in the WinPPM Versions 3.1, 3.2, and 3.3 NRC evaluations. Specifically, in WinPPM (Versions 3.1, 3.2, and 3.3), the input "Stem Added Length" is not entered by the user. Rather, this input is automatically set by the software to a value of twice the "Stem Diameter", in accordance with the guidance in EPRI TR-103244-R2, *Performance Prediction Methodology Implementation Guide*. In the NRC evaluations performed with WinPPM Versions 3.1, 3.2, and 3.3, the value of "Stem Added Length" was 3.0 (or twice the stem diameter of 1.5 inches).

In PPM Version 2.0, the "Stem Added Length" is a required user-input. In the NRC evaluation performed with PPM Version 2.0, the user entered value for this parameter was incorrectly entered as 0.0 (zero).

EPRI corrected this input parameter in the NRC PPM Version 2.0 input data file (i.e., changed 0.0 to 3.0) and re-ran the prediction. EPRI confirmed that with the correct input data, PPM Versions 2.0, 3.1, 3.2, and 3.3 provide consistent thrust predictions.

Note: The NRC comment also mentions use of user-entered values for the input "Body Rail Misalignment" in WinPPM Versions 3.1, 3.2, and 3.3, rather than the software calculated values for this parameter. Although calculation of this parameter was not the focus of the NRC comment, EPRI reviewed the NRC evaluations and found that the user-entered values for this parameter were incorrect. EPRI verified with hand calculations that WinPPM Versions 3.1, 3.2, and 3.3 automatically calculate this parameter in accordance with the guidance in EPRI TR-103244-R2. Note that the incorrect values for this parameter in the NRC evaluations did not ultimately affect comparison of the Version 2.0, 3.1, 3.2, and 3.3 results, as this parameter was consistently used.

NRC Comment 2

If the gate valve input is changed from an open and close stroke direction to a close only stroke direction using Versions 3.1, 3.2, or 3.3 of the PPM software, the maximum allowable closing thrust and the actuator opening capability are grayed out, implying that they are no longer [required]. However, when the prediction is performed, the previously entered values for these two parameters are displayed in the output. This could be very misleading to anyone reviewing the calculations, as well as allowing input variables that may not have been verified (as they were grayed out) to potentially be used by others. Please provide additional justification for displaying these grayed out values in the printed output.

EPRI Response to Comment 2

"Maximum Allowable Closing Thrust" and "Actuator Opening Capability" are inputs required only to evaluate opening strokes. Accordingly, these parameters should be grayed out in the user interface and NOT printed in the prediction report when a user selects to only evaluate the closing stroke direction.

EPRI tested Versions 3.1, 3.2, and 3.3 of the WinPPM software and confirmed the behavior described in the NRC Comment for all three software versions (i.e., values of "Maximum Allowable Closing Thrust" and "Actuator Opening Capability" appear in the prediction report regardless of the stroke directions evaluated). These parameters do not affect the PPM prediction results. However, EPRI agrees that displaying these values in the prediction report for a closing stroke only evaluation could be misleading to users. Accordingly, EPRI will issue an Information Notice to software users regarding this issue.

NRC Comment 3

The body rail misalignment calculation for Version 3.1 of the PPM software appears to display the correct calculated value in the input section after the prediction has been run; however, the value displayed in the report has reversed the sign of the positive offset term. Please provide additional justification for displaying the positive offset term with a reversed sign.

EPRI Response to Comment 3

EPRI tested WinPPM Version 3.1 and confirmed the behavior described in the NRC comment. WinPPM Version 3.1 displays the correct value for the body rail misalignment (positive offset) in the user interface, uses the correct value of this parameter to determine the required thrust, but prints this input with a "reversed sign" in the prediction report. Accordingly, this problem is restricted to a printout error.

This printout problem was corrected in WinPPM Version 3.2. (EPRI confirmed both Versions 3.2 and 3.3 correctly displayed the value for the body rail misalignment (positive offset) in both the user interface and prediction report.) EPRI noted in the Version 3.2 software user manual that typographical and other minor errors discovered in the Version 3.1 software had been corrected in Version 3.2. At the time, EPRI did not believe it was necessary to issue an Information Notice regarding these items. In light of the NRC's concern for this specific item, EPRI will issue an Information Notice to software issues for WinPPM Version 3.1 regarding the sign of the body rail misalignment (positive offset) in the prediction report.

NRC Comment 4

Implementation of the inverted guide model in Versions 2.0, 3.1, and 3.2 requires the user to replace selected conventional valve parameters with inverted guide parameter values. The parameters that need to be revised and the procedure to revise them are discussed in Electric Power Research Institute (EPRI) Technical Report 1011290, "Method for Evaluating Gate Valves with Inverted Guides," dated February 2005. These parameters are summarized in Table 2-2 of EPRI Report 1011290 and include the body rail angular misalignment (degree), the disk slot angular misalignment (degree), and the disk slot misalignment (inches). While all the parameters that were required to be revised were found in the Version 2.0 software, these three parameters could not be found in Versions 3.1 or 3.2. Please discuss how these parameters are to be applied when implementing the inverted guide model in Versions 3.1 and 3.2 of the PPM software.

EPRI Response to Comment 4

The parameters "Body Rail Angular Misalignment", Disk Slot Angular Misalignment", and "Disk Slot Misalignment" are not user-entered values in WinPPM Versions 3.1, 3.2, and 3.3. Rather, the software automatically sets the values for these parameters.

For a valve with conventional guides, these parameters should be set to 0.0 (zero), in accordance with the guidance in EPRI TR-103244-R2, *Performance Prediction Methodology Implementation Guide*. For a valve with inverted guides, these parameters should be set in accordance with the guidance in EPRI 1011290, *Method for Evaluating Gate Valves with Inverted Guides*. Specifically, these parameters should be set as detailed in the table below for inverted guides.

Parameter	Opening Stroke	Closing Stroke
Disk slot misalignment	0.0	½ (Min. Disk Tab Width + Max. Body Groove Width) i.e., (F1 + F2) / 2
Body rail angular misalignment	0.0	0.0
Disk slot angular misalignment	0.0	0.0

WinPPM Versions 3.1 and 3.2 automatically set all three of these parameters to 0.0 (zero). Accordingly, WinPPM Versions 3.1 and 3.2 will calculate an appropriate required thrust for (a) valves with conventional guides and (b) opening strokes for valves with inverted guides. However, WinPPM Versions 3.1 and 3.2 will not determine a required thrust for closing strokes of valves with inverted guides in accordance with the guidance in EPRI 1011290.
EPRI 1011290 states that the inverted guide methodology detailed in the report is applicable to Versions 1.0 through 3.2 of the EPRI MOV PPM software. This report will be revised to state the following:

The method described in this report is applicable to Versions 1.0 and 2.0 of the EPRI MOV PPM software. PPM Versions 3.1 and 3.2 does not provide a means for users to adjust the input parameters for analyzing gate valves with inverted guides, and the method in this report cannot be implemented in Versions 3.1 and 3.2. For PPM Version 3.3, the capability to evaluate gate valves with inverted guides is incorporated in the software. Accordingly, users of Version 3.3 do not need to manually adjust input parameters as described in this report.

EPRI will notify recipients of EPRI 1011290 of this revision to the method applicability statement. EPRI will also issue a PPM Software Error Notice, clarifying that the inverted guide methodology documented in EPRI 1011290 can not be implemented in PPM software Versions 3.1 and 3.2.

NRC Comment 5

Version 3.3 of the PPM software was used to compare closing thrust values for an 8-inch gate valve with and without inverted guides. In this case, the closing thrusts values for the inverted guide gate valve were 2-3 percent lower than the closing thrust values for the conventional gate valve. The same comparisons were also made for the same 8-inch gate valve using Version 2 of the PPM software. The Version 2 comparisons also showed a 2-3 percent decrease in closing thrust for the inverted gate valve. Please provide additional information discussing the supporting data used to validate/confirm the reduced closing thrust demands associated with an inverted guide gate valve versus a conventional gate valve.

EPRI Response to Comment 5

The NRC provided EPRI with electronic PPM input data files which document the basis for this comment. EPRI verified that these files, as provided, demonstrate required thrust predictions as described in the NRC comment.

The input data used in the NRC calculations have several input errors and the key dimensions related to the guide rail/slot interface are inconsistent between the inverted guide model and the conventional guide model. EPRI corrected the input data as detailed in the table below and re-evaluated the thrust predictions for both models using PPM Version 2.0 and 3.3. With these corrections, all results from the Version 3.3 predictions were consistent with the Version 2.0 predictions. In addition, the results for the inverted guide arrangement were consistent with the conventional guide arrangement.

Parameter	**Input Values used in NRC Calculations**		**Corrected Input Values**	
	Conventional Guides	**Inverted Guides**	**Conventional Guides**	**Inverted Guides**
D4 – Disk Body Width	10.0	10.0	12.0	10.0
W1 – Disk Width to Slot	8.0	12.0	10.0	12.0
G1 – Slot Width	1.0	---	1.0	---
F1 – Tab Width	---	0.6	---	0.6
G2 – Rail Width	0.6	---	0.6	---
G3 – Rail Depth	1.0	---	1.0	---
F2 – Groove Width	---	1.0	---	1.0
G4 – Groove Depth	---	1.0	---	1.0
W2 – Body Width to Rail	9.0	13.0	11.0	13.0

NRC Comment 6

The inverted guide gate valve model was developed in 1995; however, the EPRI Report 1011290, published in 2005, states under the "EPRI Perspective" section of the "Product Description" that the method must be considered a "best available" methodology until the model is validated against test results. Please discuss any plans to obtain the necessary test results to benchmark the methodology. If valve testing is not anticipated, please discuss the reasons for not benchmarking the methodology against test results and whether additional margin should be applied to the computed estimates in order to have confidence that the results bound actual valve behavior.

EPRI Response to Comment 6

Although the inverted guide configuration does exist in the nuclear industry valve population, it is a less common configuration (compared to standard guides), and no further testing has been performed by EPRI to validate the model detailed in EPRI 1011290. This inverted guide gate valve model is still considered "best available information".

In WinPPM Version 3.3, EPRI incorporated the inverted gate valve model into the PPM software. Addendum 7 to EPRI TR-102327-R2, *PPM Version 3.3 Software Changes*, provides the following user guidance regarding inverted guides (see page 2-1):

> Note that predictions for gate valves with inverted guide arrangements have not been validated by comparison to test data. Accordingly, users have the responsibility to validate the use of this method by comparison to appropriate test data.

EPRI does not believe it appropriate to specify requirements for users to apply a specific amount of additional margin to the valve model prediction results. Fundamentally, the mechanisms and friction coefficients that affect stem thrust are similar between valves with standard guides and inverted guides.

NRC Comment 7

For Versions 3.1, 3.2, or 3.3 of the PPM software, if the entry for the butterfly valve inlet diameter is empty, the calculate box is checked, and the user is viewing any screen other than Valve Data (1), an error will be generated when attempting to perform a prediction. The error will continually be generated until the Valve Data (1) screen is visible, at which time the prediction will be performed correctly. Although the resulting value for the inlet diameter is correct, please provide additional justification for requiring the user to be viewing the Valve Data (1) input screen in order to perform a prediction.

EPRI Response to Comment 7

EPRI tested WinPPM Versions 3.1, 3.2, and 3.3 and confirmed the behavior described in the NRC Comment. As detailed in the NRC Comment, this software problem is a software usability issue only and does not affect the prediction results. Accordingly, no Error Notice or Information Notice is required.

NRC Comment 8

The Version 2 input conversion feature of either Version 3.1 or 3.2 of the PPM software resulted in an error being generated in the WinPPM module that would terminate the PPM software. Version 3.3 of the PPM software successfully converted a Version 2 input file. Please provide additional justification and insight on how to use these features, and discuss how users of the PPM software will be informed of this additional insight.

EPRI Response to Comment 8

The file conversion feature in WinPPM Versions 3.1 and 3.2 requires that the original DOS-based PPM files are retrieved from a file directory structure consistent with the PPM Version 1.0 or 2.0 file directory. That is to say, the source data for the file conversion must be stored in the following directory structure:

C:/PPM/MOV/"valvename.MOV"
C:/PPM/Valve/"valvename.VLV"

If the source data is stored in accordance with this directory structure, the file conversion feature in WinPPM Versions 3.1 and 3.2 functions appropriately. If not stored in this way, the file conversion feature will indicate an error has occurred. The alternative to using the file conversion feature is to manually enter the input data.

In WinPPM Version 3.3, the file conversion feature was modified to allow users to specify the file locations for both the .MOV and .VLV source data files. Accordingly, Version 3.3 does not require a specific directory structure for the source data and the conversion feature will function appropriately regardless of the source data file locations. Guidance in the software user manual regarding this feature was updated accordingly for the Version 3.3 software.

The file conversion feature in the WinPPM software was included in the software as a "convenience" feature. Admittedly, it was not as convenient as desired in Versions 3.1 and 3.2. The file conversion process does not implement the PPM Methodology, nor any portion thereof. Users who implement this feature are still required to review and verify that the WinPPM input data is appropriate. Additionally, the further insight provided above does not affect previous PPM calculations performed with Versions 3.1 and 3.2. This insight is only applicable to current users of these software versions. Version 3.3 of the software, which improved the functionality of the file conversion feature, was issued in 2005, and it is likely that most WinPPM users are currently using

this version of the software. For these reasons, EPRI believes that an Information Notice regarding this issue is unnecessary.

NRC Comment 9

None of the versions of the PPM software will operate on a machine with the Vista operating system. While the various versions of the software are not advertised to be Vista compatible, consideration should be given to ensuring that future versions of the software will be Vista compatible as the new operating system will become more prominent in the future. Please provide additional insight to future Vista compatibility of the current and future versions of the PPM software.

EPRI Response to Comment 9

At the current time, EPRI does not have plans to issue a VISTA-compliant version of the PPM software. However, if the nuclear industry expresses a need for such an application in the future, EPRI will consider issuing a new version of the software.