



January 17, 1997
LD-97-002

Decurrent Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Report pursuant to 10 CFR 21 Regarding the Omission of Main Steam Safety Valve Piping Pressure Loss in Safety Analyses

Dear Sir:

The purpose of this letter is to notify the Nuclear Regulatory Commission of a defect pursuant to 10 CFR 21, "Reporting of Defects and Noncompliance." The identified defect concerns the piping line loss (i.e., ΔP) between the Steam Generator (SG) and the Main Steam Safety Valve (MSSV) inlet when the MSSVs are activated. Omission of the subject line loss from analyses of occurrences during which MSSVs actuate could adversely affect the results of corresponding LOCA and non-LOCA safety analyses, MSSV performance, and piping system structural analyses.

ABB-CE has discovered that the piping pressure losses between the SG and MSSV inlets have not been fully evaluated with respect to MSSV performance or not fully addressed within plant safety analyses which involve MSSV actuation. These pressure losses reduce the effectiveness of the MSSVs, which will affect the overpressure protection capability of the MSSVs. Moreover, if the piping losses exceed the blowdown setting of the MSSVs there is a potential for MSSV chattering, and there is a concern whether the MSSVs limit main steam system pressure to less than 110% of design pressure under the design overpressure conditions. Additionally, substantial pressure pulses (i.e., spiking) might occur as a result of valve chattering. In general, such pressure pulses are not specifically considered in the piping system stress analysis typically performed by a plant's Architect Engineer (A/E). The piping stress analysis was not part of the original ABB-CE scope of supply. As such, ABB-CE can make no determination regarding acceptability of those analyses with respect to this issue.

Based on ABB-CE's investigation comprising two utilities for which relevant line loss data was available, it is known that the impact of this issue is plant specific, since it is primarily dependent on the geometry of the branch piping from the main steam header to the MSSV inlet which

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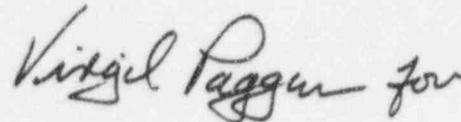
varies considerably between plants. The magnitude of the piping pressure losses that we have examined ranges from approximately 10 psi to more than 50 psi. ABB-CE considers that this issue may be applicable to nuclear power plants other than those for which ABB-CE was the nuclear steam supply system vendor.

We have recommended to the owners of plants for which ABB-CE supplied the nuclear steam supply system that reviews are necessary to determine whether or not the piping pressure loss between the SG and MSSV inlets was considered in order to determine if a particular plant is adversely affected by this issue. If such losses were not considered, a review of the impact of the omission of the unrecoverable piping pressure losses should be conducted to ensure that they are fully addressed in the applicable LOCA and non-LOCA safety analyses.

We have also recommended that utilities confirm the proper adjustment of the MSSV blowdown settings so as to preclude valve chatter and related structural concerns.

Please feel free to contact me or Virgil Paggen at 860-285-4700 if you have any questions.

Very truly yours,
COMBUSTION ENGINEERING, Inc.

A handwritten signature in cursive script that reads "Virgil Paggen for".

Ian C. Rickard, Director
Operations Licensing

Attachment

ABB Combustion Engineering Nuclear Operations 10 CFR 21 Report of a Defect or Failure to Comply

The following information is provided pursuant to 10 CFR 21.21(c)(4):

(i) *Name and address of the individuals informing the Commission:*

Ian C. Rickard, Director
Operations Licensing
Combustion Engineering, Inc.
2000 Day Hill Road
Windsor, CT 06095-0500

(ii) *Identification of the facility, the activity, or the basic component supplied for such facility or such activity within the United States which fails to comply or contains a defect:*

The activity for which this report is being filed is the omission of the effects of piping line loss (i.e., ΔP) between the Steam Generator (SG) and the Main Steam Safety Valve (MSSV) inlet in those LOCA and non-LOCA thermal hydraulic safety analyses of events in which the MSSVs are activated. Further, ABB-CE found that this omission was applicable to all safety analyses during which the MSSVs are activated for nuclear power plants for which ABB-CE was the nuclear steam supply system vendor.

(iii) *Identification of the firm constructing the facility or supplying the basic component which fails to comply or contains a defect:*

Combustion Engineering, Inc.
2000 Day Hill Road
Windsor, CT 06095-0500

(iv) *Nature of the defect or failure to comply and the safety hazard which is created or could be created by such defect or failure to comply:*

The identified defect involves the omission of the piping line loss (i.e., ΔP) between the SG and the MSSV inlet. The effect of this is to potentially cause steam generator pressure and temperature to be somewhat higher during transients which involve MSSV actuation than was reported in the safety analyses of those transients. The amount of this difference is a function of the geometry of the MSSV inlet piping and the MSSV blowdown setting. ABB-CE is concerned that this pressure loss has not been fully evaluated with respect to MSSV performance or fully addressed within plant safety analyses that involve MSSV actuation. The unrecoverable pressure loss reduces the effectiveness of the MSSVs, which will affect the overpressure protection capability of the MSSVs.

Moreover, depending on the magnitude of the line loss, there is a potential for MSSV chattering if the loss exceeds the blowdown setting of the MSSVs, and concern whether the MSSVs will limit maximum main steam system pressure to less than 110% of design pressure under design overpressure conditions. Additionally, substantial pressure pulses (i.e., spiking) might occur as a result of valve chattering.

(v) *The date on which the information of such defect or failure to comply was obtained:*

The absence of the line loss was first noted in early 1996 while ABB-CE under contract to Baltimore Gas & Electric, was revising the overpressure protection report for Calvert Cliffs Units 1 & 2. The overpressure protection report brings together the Chapter 14 safety analysis and the ASME code requirements. The ASME code requires that:

"...in determining the setting pressures and discharge capacities required to comply with these rules, full account shall be taken of the pressure drop in both inlet and discharge sides of the pressure relief devices at full discharge conditions. In addition, back pressure arising from discharge of other devices through common discharge piping shall be considered..."

Later, this observation set off a series of checks to determine whether the existing safety analyses which support the overpressure protection reports for other units accounted for the line losses; it was found that the analyses omitted these losses.

ABB-CE determined on December 6, 1996 that the omission of the piping line loss constituted a deviation to be evaluated for reportability pursuant to 10 CFR 21.

(vi) *In the case of a basic component which contains a defect or fails to comply, the number and location of all such components in use at, supplied for, or being supplied for one or more facilities or activities subject to the regulations in this part:*

The identified defect, omission of the pressure loss between the SG and the MSSV inlet from safety analyses, applies to all ABB-CE safety analyses involving MSSV actuation for nuclear power plants for which ABB-CE was the nuclear steam supply system vendor. Additionally, ABB-CE considers that this issue may be applicable to other nuclear power plants regardless of the nuclear steam supply system vendor.

ABB-CE has evaluated the non-LOCA thermal hydraulic safety analysis consequence of omitting the pressure loss for Calvert Cliffs Units 1 & 2, and San Onofre Units 2 & 3 because the relevant line loss information was available. Information for these facilities is summarized in the following table.

Plant	1st MSSV Opening Setpoint (psia)	ΔP on Actuation (SG to MSSV inlet) (psi)	Percent of Set Pressure (%)	Blowdown Setting of 1st MSSV (%)
Calvert Cliffs 1 & 2	1000	~52	~5.3%	3% to 9%
San Onofre 2 & 3	1100	~3	~0.3%	7.5% nominal

indicate that the blowdown setting for Calvert Cliffs Units 1 & 2 should be adjusted to BG&E. The San Onofre 2 & 3 results indicate that no MSSV blowdown analysis determined that omission of the pressure loss did not result in unacceptable analysis results with respect to peak SG pressure.

A small break LOCA analysis was performed for Calvert Cliffs 1 & 2. This evaluation, based on information currently available to ABB-CE, confirmed that the existing SBLOCA results for Calvert Cliffs remain valid. SBLOCA analyses have not been performed for other plants for which ABB-CE was the nuclear steam supply system vendor.

- (vii) *The corrective action which has been, is being, or will be taken; the name of the individual or organization responsible for the action; and the length of time that has been or will be taken to complete the action:*

For plants for which ABB-CE was the nuclear steam supply system vendor, ABB-CE has recommended that licensees conduct a review to ensure that the unrecoverable piping pressure losses between the SG and the MSSV inlets have been fully addressed in the applicable LOCA and non-LOCA thermal hydraulic safety analyses.

Utilities were also advised to review and adjust MSSV blowdown settings if necessary to assure stable valve operation.

- (viii) *Any advice related to the defect or failure to comply about the facility, activity, or basic component that has been, is being, or will be given to purchasers or licensees:*

ABB-CE notified each licensee for which it was the nuclear steam supply system vendor of this issue on January 16, 1997. The notification described the issue and indicated that ABB-CE does not have sufficient information to perform all relevant analyses. The notice also indicated that ABB-CE could not assess the safety significance of potential structural aspects of the issue which typically fall within the A/E's scope.

By way of supplemental information, the ABB-CE notification also forwarded the Abstract from Licensee Event Report No 96-031, dated November 4, 1996, submitted for the Millstone Unit 2 nuclear power plant on a related subject.

Moreover, depending on the magnitude of the line loss, there is a potential for MSSV chattering if the loss exceeds the blowdown setting of the MSSVs, and concern whether the MSSVs will limit maximum main steam system pressure to less than 110% of design pressure under design overpressure conditions. Additionally, substantial pressure pulses (i.e., spiking) might occur as a result of valve chattering.

(v) *The date on which the information of such defect or failure to comply was obtained:*

The absence of the line loss was first noted in early 1996 while ABB-CE, under contract to Baltimore Gas & Electric, was revising the overpressure protection report for Calvert Cliffs Units 1 & 2. The overpressure protection report brings together the Chapter 14 safety analysis and the ASME code requirements. The ASME code requires that:

"...in determining the setting pressures and discharge capacities required to comply with these rules, full account shall be taken of the pressure drop in both inlet and discharge sides of the pressure relief devices at full discharge conditions. In addition, back pressure arising from discharge of other devices through common discharge piping shall be considered..."

Later, this observation set off a series of checks to determine whether the existing safety analyses which support the overpressure protection reports for other units accounted for the line losses; it was found that the analyses omitted these losses.

ABB-CE determined on December 6, 1996 that the omission of the piping line loss constituted a deviation to be evaluated for reportability pursuant to 10 CFR 21.

(vi) *In the case of a basic component which contains a defect or fails to comply, the number and location of all such components in use at, supplied for, or being supplied for one or more facilities or activities subject to the regulations in this part:*

The identified defect, omission of the pressure loss between the SG and the MSSV inlet from safety analyses, applies to all ABB-CE safety analyses involving MSSV actuation for nuclear power plants for which ABB-CE was the nuclear steam supply system vendor. Additionally, ABB-CE considers that this issue may be applicable to other nuclear power plants regardless of the nuclear steam supply system vendor.

ABB-CE has evaluated the non-LOCA thermal hydraulic safety analysis consequence of omitting the pressure loss for Calvert Cliffs Units 1 & 2, and San Onofre Units 2 & 3 because the relevant line loss information was available. Information for these facilities is summarized in the following table.

Plant	1st MSSV Opening Setpoint (psia)	ΔP on Actuation (SG to MSSV inlet) (psi)	Percent of Set Pressure (%)	Blowdown Setting of 1st MSSV (%)
Calvert Cliffs 1 & 2	1000	~52	~5.3%	3% to 9%
San Onofre 2 & 3	1100	~3	~0.3%	7.5% nominal

These results indicate that the blowdown setting for Calvert Cliffs Units 1 & 2 should be increased to preclude the potential for MSSV chattering; a recommendation for such has been made to BG&E. The San Onofre 2 & 3 results indicate that no MSSV blowdown setting adjustment is necessary to preclude potential chattering. For both the Calvert Cliffs and the San Onofre facilities, a review of the affected thermal hydraulic safety analyses determined that omission of the pressure loss did not result in unacceptable analysis results with respect to peak SG pressure.

A small break LOCA analysis was performed for Calvert Cliffs 1 & 2. This evaluation, based on information currently available to ABB-CE, confirmed that the existing SBLOCA results for Calvert Cliffs remain valid. SBLOCA analyses have not been performed for other plants for which ABB-CE was the nuclear steam supply system vendor.

- (vii) The corrective action which has been, is being, or will be taken; the name of the individual or organization responsible for the action; and the length of time that has been or will be taken to complete the action:*

For plants for which ABB-CE was the nuclear steam supply system vendor, ABB-CE has recommended that licensees conduct a review to ensure that the unrecoverable piping pressure losses between the SG and the MSSV inlets have been fully addressed in the applicable LOCA and non-LOCA thermal hydraulic safety analyses.

Utilities were also advised to review and adjust MSSV blowdown settings if necessary to assure stable valve operation.

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