INL USQ PROCESS
POTENTIAL INADEQUACY IN THE SAFETY ANALYSIS (PISA) FORM
(DO NOT USE FOR PROPOSED CHANGES)

Facility or Activity: RTC, TRA-670 Advanced Test Reactor

USQ Process No.: RTC-USQ-2006-445

Subject: Discrepancy with the ATR Primary System Overpressure Protection Report

Describe the New Information/Discovery:

From PG-T-88-005 "ATR Primary Coolant System Overpressure Protection Report", the second most demanding transient for PCS relief valve capacity is the complete loss of heat sink (LOHS) without a reactor scram. Upon a loss of heat sink the PCS water will heat up, expand, and cause a pressure increase. The maximum PCS relief valve flow rate for this transient is stated as 622 gpm. The additional flow of 68 gpm from the gland seal water (GSW) pump was not considered in the analysis. The SAR requires the PCS relief valves to have a total relief capacity of ≥688 gpm; this will assure that the PCS maximum pressure does not exceed 120% of the design pressure. Combining the GSW flow with the LOHS transient flow would result in a total flow of 690 gpm; this would exceed the capacity of the SAR minimum required relief valve flow. The currently installed PCS relief valves have a combined certified relief capacity of 700 gpm this would provide adequate protection for this transient.

Identify the applicable safety basis document(s) (e. g., DSA, SAR, BIO, TSRs, etc.):
SAR-153, chapter 15.5 - Accident Analysis Increase In Primary Coolant Inventory,
PG-T-88-005 - ATR Primary Coolant System Overpressure Protection Report

I. PISA ASSESSMENT

a. Is there a potential inadequacy in the analytical methodology and/or tools used in the safety basis?
☒ Yes ☐ No

b. Is there a potential discrepancy between the safety basis assumptions, provisions, or conditions, in the accident analysis and the facility operation or parameters?
☒ Yes ☐ No

c. Is the actual physical condition of the facility different than as described in the safety basis (discrepant as-found condition)?
☐ Yes ☒ No

d. Has an actual or postulated operational event or incident revealed a potential inadequacy in the safety basis?
☐ Yes ☒ No

e. Is this an activity or condition not analyzed in the existing safety basis?
☐ Yes ☒ No

Provide an explanation of the assessment result:

There is reason to believe that the safety analysis for the SAR might be in error. Therefore this constitutes a PISA

Veryl Kirkpatrick		**6/21/06**
USQ Evaluator Print/Type Name	USQ Evaluator Signature	Date
MARTIN McDONOUGH	M. B. McDonough	6/21/06
Nuclear Facility Manager Print/Type Name	Nuclear Facility Manager Signature	Date

INL USQ PROCESS
POTENTIAL INADEQUACY IN THE SAFETY ANALYSIS (PISA) FORM
(DO NOT USE FOR PROPOSED CHANGES)

Facility or Activity: RTC, TRA-670 Advanced Test Reactor

USQ Process No.: RTC-USQ-2006-445

Subject: Discrepancy with the ATR Primary System Overpressure Protection Report

If the answer to ALL of the assessment questions above is No, file the completed form. Do not complete Section II, III, or IV.
If the answer to any one of the assessment questions is Yes, there is a potentially inadequate safety analysis (PISA):

- Nuclear Facility Manager document actions (Section II), including interim operating restrictions, taken to place or maintain the facility in a safe condition.
- Nuclear Facility Manager execute reporting process per MCP-190 or AWP-3.1, for PISA.
- USQ evaluator proceed to Section III.

II. DOCUMENT ACTIONS TAKEN TO PLACE OR MAINTAIN FACILITY IN A SAFE CONDITION AND PROVIDE THE BASIS FOR THE SELECTION OF ANY INTERIM CONTROLS

EDF-5522 "Update Complete Loss of Flow and Complete Loss of Heat Sink Analyses for the Advanced Test Reactor" performed the loss of heat sink analysis for the SAR chapter 15.2 "Decrease In Heat Removal By the Secondary", this analysis assumed a loss of heat sink and the failure of the reactor to scram from high pressure, the same as in PG-T-88-005. PG-T-88-005 was last revised in 1990, and used hand calculations to determine the PCS expansion, some of the assumptions used in the analysis were very conservative, for example inlet temperature of 150 °F, outlet temperature of 200 °F, and a PCS flow of 34,000 gpm, EDF-5522 was performed in 2005 and used RELAP5 to perform the analysis, RELAP5 calculated a worst case PCS expansion of 600 gpm. The RELAP5 does not model the GSW inflow, combining the two flows result in a total relief valve flow of 668 gpm. This value is below the SAR minimum required flow of ≥688 gpm. Therefore continued operation with no restriction is justified.

G.L. Sharp		6/21/2006
Safety Analyst Print/Type Name	Safety Analyst Signature	Date
M.B. McDONOUGH	M.B. McDonough	6/21/2006
Nuclear Facility Manager Print/Type Name	Nuclear Facility Manager Signature	Date

Is independent technical review required? Yes ☐ No ☒

Nuclear Facility Manager Signature or Initials

Independent Reviewer Print/Type Name	Independent Reviewer Signature	Date

III. DETERMINATION

Identify applicable section(s) of the safety basis document(s) (e.g., DSA, SAR, BIO, TSRs, etc.).

INL USQ PROCESS
POTENTIAL INADEQUACY IN THE SAFETY ANALYSIS (PISA) FORM
(DO NOT USE FOR PROPOSED CHANGES)

Facility or Activity: RTC, TRA-670 Advanced Test Reactor

USQ Process No.: RTC-USQ-2006-445

Subject: Discrepancy with the ATR Primary System Overpressure Protection Report

IIIa: POTENTIAL FOR AN INCREASE IN PROBABILITY OR CONSEQUENCE OF AN ACCIDENT OR MALFUNCTION EVALUATED IN THE SAFETY BASIS

1. Could the PISA increase probability of occurrence of an accident previously evaluated in the safety basis?
   Yes ☐ No ☐
   Explain:

2. Could the PISA increase the consequences of an accident previously evaluated in the safety basis?
   Yes ☐ No ☐
   Explain:

3. Could the PISA increase the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the safety basis? Yes ☐ No ☐
   Explain:

4. Could the PISA increase the consequences of a malfunction of equipment important to safety previously evaluated in the safety basis? Yes ☐ No ☐
   Explain:

IIIb: POTENTIAL FOR CREATION OF AN UNANALYZED ACCIDENT OR MALFUNCTION OF A DIFFERENT TYPE

5. Could the PISA create the possibility of an accident of a different type than previously evaluated in the safety basis? Yes ☐ No ☐
   Explain:

INL USQ PROCESS
POTENTIAL INADEQUACY IN THE SAFETY ANALYSIS (PISA) FORM
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Facility or Activity: RTC, TRA-670 Advanced Test Reactor

USQ Process No.: RTC-USQ-2006-445

Subject: Discrepancy with the ATR Primary System Overpressure Protection Report

6. Could the PISA create the possibility of a malfunction of equipment important to safety of a different type than previously evaluated in the safety basis? Yes ☐ No ☐
   Explain:

IIIc: POTENTIAL FOR REDUCTION IN A MARGIN OF SAFETY

7. Could the PISA reduce a margin of safety as defined in the safety basis? Yes ☐ No ☐
   Explain:

IIId: USQ DETERMINATION CONCLUSION

8. Based on the responses to questions 1 – 7 above, does the PISA constitute an Unreviewed Safety Question?
   Yes ☐ No ☐
   Explain:

NOTE: If USQ determination result is positive, additional notification for ORPS is required per MCP-190 or AWP-3.1.

IV. APPROVAL/CONCURRENCE SIGNATURES

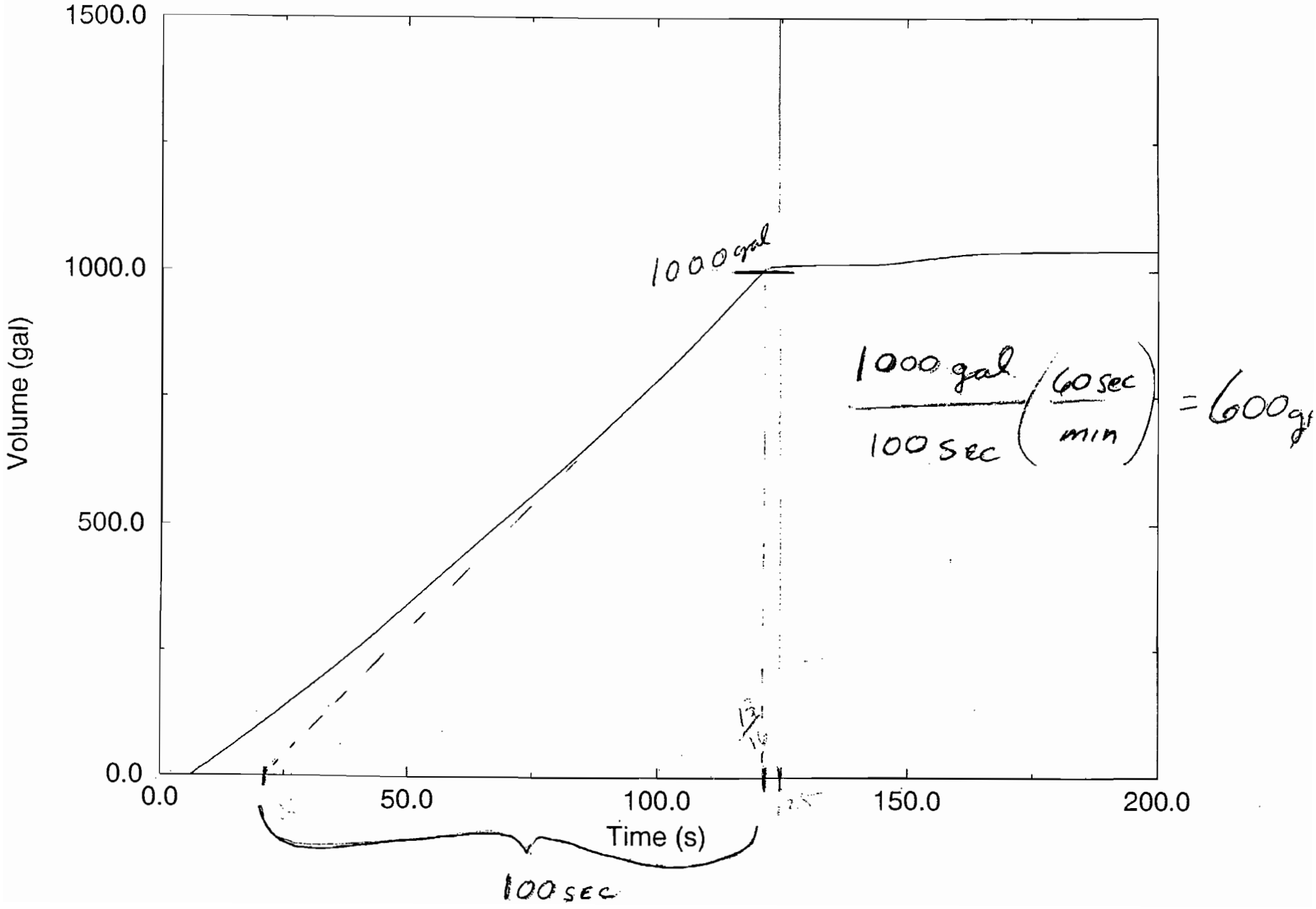
APPROVAL:

USQ Evaluator Print/Type Name	USQ Evaluator Signature	Date
Nuclear Facility Manager Print/Type Name	Nuclear Facility Manager Signature	Date

CONCURRENCE:

Independent Review Committee Chair Print/Type Name	Independent Review Committee Chair Signature	Date

FROM EDF-5522



$$\frac{1000\ \text{gal}}{100\ \text{sec}}\left(\frac{60\ \text{sec}}{\text{min}}\right) = 600\ \text{gpm}$$

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(DO NOT USE FOR PROPOSED CHANGES)

Facility or Activity: RTC

USQ Process No.: RTC-USQ-2006-445

Subject: Discrepancy with the ATR Primary System Overpressure Protection Report

Describe the New Information/Discovery:
From PG-T-88-005 "ATR Primary Coolant System Overpressure Protection Report", the second most demanding transient for PCS relief valve capacity is the complete loss of heat sink (LOHS) without a reactor scram. Upon a loss of heat sink the PCS water will heat up, expand, and cause a pressure increase. The maximum PCS relief valve flow rate for this transient is stated as 622 gpm. The additional flow of 68 gpm from the gland seal water (GSW) pump was not considered in the analysis. The SAR requires the PCS relief valves to have a total relief capacity of ≥688 gpm; this will assure that the PCS maximum pressure does not exceed 120% of the design pressure. Combining the GSW flow with the LOHS transient flow would result in a total flow of 690 gpm; this would exceed the capacity of the SAR minimum required relief valve flow. The currently installed PCS relief valves have a combined certified relief capacity of 700 gpm this would provide adequate protection for this transient.

Identify the applicable safety basis document(s) (e. g., DSA, SAR, BIO, TSRs, etc.):
SAR-153, chapter 15.5 - Accident Analysis Increase In Primary Coolant Inventory,
PG-T-88-005 - ATR Primary Coolant System Overpressure Protection Report

I. PISA ASSESSMENT

a. Is there a potential inadequacy in the analytical methodology and/or tools used in the safety basis?
☒ Yes ☐ No

b. Is there a potential discrepancy between the safety basis assumptions, provisions, or conditions, in the accident analysis and the facility operation or parameters?
☒ Yes ☐ No

c. Is the actual physical condition of the facility different than as described in the safety basis (discrepant as-found condition)?
☐ Yes ☒ No

d. Has an actual or postulated operational event or incident revealed a potential inadequacy in the safety basis?
☐ Yes ☒ No

e. Is this an activity or condition not analyzed in the existing safety basis?
☐ Yes ☒ No

Provide an explanation of the assessment result:
There is reason to believe that the safety analysis for the SAR might be in error. Therefore this constitutes a PISA

USQ Evaluator Print/Type Name	USQ Evaluator Signature	Date

INL USQ PROCESS
POTENTIAL INADEQUACY IN THE SAFETY ANALYSIS (PISA) FORM
(DO NOT USE FOR PROPOSED CHANGES)

Facility or Activity: RTC

USQ Process No.: RTC-USQ-2006-445

Subject: Discrepancy with the ATR Primary System Overpressure Protection Report

Nuclear Facility Manager Print/Type Name	Nuclear Facility Manager Signature	Date

If the answer to ALL of the assessment questions above is No, file the completed form. Do not complete Section II, III, or IV.
If the answer to any one of the assessment questions is Yes, there is a potentially inadequate safety analysis (PISA):

- Nuclear Facility Manager document actions (Section II), including interim operating restrictions, taken to place or maintain the facility in a safe condition.
- Nuclear Facility Manager execute reporting process per MCP-190 or AWP-3.1, for PISA.
- USQ evaluator proceed to Section III.

II. DOCUMENT ACTIONS TAKEN TO PLACE OR MAINTAIN FACILITY IN A SAFE CONDITION AND PROVIDE THE BASIS FOR THE SELECTION OF ANY INTERIM CONTROLS

EDF-5522 "Update Complete Loss of Flow and Complete Loss of Heat Sink Analyses for the Advanced Test Reactor" performed the loss of heat sink analysis for the SAR chapter 15.2 "Decrease In Heat Removal By the Secondary", this analysis assumed a loss of heat sink and the failure of the reactor to scram from high pressure, the same as in PG-T-88-005. PG-T-88-005 was last revised in 1990, and used hand calculations to determine the PCS expansion, some of the assumptions used in the analysis were very conservative, for example inlet temperature of 150 °F, outlet temperature of 200 °F, and a PCS flow of 34,000 gpm, EDF-5522 was performed in 2005 and used RELAP5 to perform the analysis, RELAP5 calculated a worst case PCS expansion of 600 gpm. The RELAP5 does not model the GSW inflow, combining the two flows result in a total relief valve flow of 668 gpm. This value is below the SAR minimum required flow of ≥688 gpm. Therefore continued operation with no restriction is justified.

Safety Analyst Print/Type Name	Safety Analyst Signature	Date
Nuclear Facility Manager Print/Type Name	Nuclear Facility Manager Signature	Date

Is independent technical review required? Yes ☐ No ☐

Nuclear Facility Manager Signature or Initials

Independent Reviewer Print/Type Name	Independent Reviewer Signature	Date

III. DETERMINATION

Identify applicable section(s) of the safety basis document(s) (e.g., DSA, SAR, BIO, TSRs, etc.).

SAR-153, Chapter 15.5 - Accident Analysis Increase In Primary Coolant Inventory,
SAR-153, Chapter 15.2 - Decrease in Heat Removal by the Secondary.

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POTENTIAL INADEQUACY IN THE SAFETY ANALYSIS (PISA) FORM
(DO NOT USE FOR PROPOSED CHANGES)

Facility or Activity: RTC

USQ Process No.: RTC-USQ-2006-445

Subject: Discrepancy with the ATR Primary System Overpressure Protection Report

IIIa: POTENTIAL FOR AN INCREASE IN PROBABILITY OR CONSEQUENCE OF AN ACCIDENT OR MALFUNCTION EVALUATED IN THE SAFETY BASIS

1. Could the PISA increase probability of occurrence of an accident previously evaluated in the safety basis?
   Yes ☐ No ☒
   Explain:
   The PISA only questioned the maximum relief capacity of the PCS relief valves, SF-A-71 and SF-A-72. The probability of failure of the valves was not an issue. Therefore, the PISA does not increase the probability of occurrence of an accident previously evaluated in the safety basis.

2. Could the PISA increase the consequences of an accident previously evaluated in the safety basis?
   Yes ☒ No ☐
   Explain:
   This PISA raised an issue on the maximum relief capacity of the PCS relief valves, SF-A-71 and SF-A-72. SAR-153 documented a maximum required flow of 622 gpm due to thermal expansion but did not account for additional flow from the gland seal system. Between coolant expansion and additions by the gland seal pumps the flow could be as high as 690 gpm. The SAR requires the PCS relief valves to have a total relief capacity of ≥688 gpm; this will assure that the PCS maximum pressure does not exceed 120% of the design pressure. In actuality the relief valves have been certified to relieve at 700 gpm and would relieve either flow value. The difference of 2 gpm (688 gpm versus 690 gpm) is expected to have only a minor impact on the system pressure upstream of the relief valves. However, a slightly higher pressure could be viewed as increasing the consequences of an accident previously evaluated in the safety basis. With this pressure increase the maximum pressure may exceed 120% of the design pressure. Therefore, this PISA does increase the consequences of an accident previously evaluated in the safety basis.

3. Could the PISA increase the probability of occurrence of a malfunction of equipment important to safety previously evaluated in the safety basis? Yes ☐ No ☒
   Explain:

   The PISA only questioned the capacity of the relief valves, SF-A-71 and SF-A-72. The probability of occurrence of a malfunction of equipment important to safety previously evaluated in the safety basis was not an issue. Therefore, the PISA does not increase the probability of occurrence of malfunction of equipment important to safety previously evaluated in the safety basis.

4. Could the PISA increase the consequences of a malfunction of equipment important to safety previously evaluated in the safety basis? Yes ☒ No ☐
   Explain:
   The PISA only questioned the capacity of the relief valves, SF-A-71 and SF-A-72. The difference between the reported relief value flow rates was 2 gpm, 688 gpm versus 690 gpm. This difference of 2 gpm is expected to have only a minor impact on the plant pressure response, but might result in the PCS system reaching a slightly higher pressure value than presented in SAR-153. This increase may mean that the PCS maximum pressure may not remain within 120% of the design pressure. Therefore, this PISA does increase consequences of an accident previously evaluated in the safety basis.

IIIb: POTENTIAL FOR CREATION OF AN UNANALYZED ACCIDENT OR MALFUNCTION OF A DIFFERENT TYPE

INL USQ PROCESS
POTENTIAL INADEQUACY IN THE SAFETY ANALYSIS (PISA) FORM
(DO NOT USE FOR PROPOSED CHANGES)

Facility or Activity: RTC

USQ Process No.: RTC-USQ-2006-445

Subject: Discrepancy with the ATR Primary System Overpressure Protection Report

5. Could the PISA create the possibility of an accident of a different type than previously evaluated in the safety basis? Yes ☐ No ☒

Explain:

The PISA only questioned the capacity of the relief valves, SF-A-71 and SF-A-72. The PISA did not question the failure of the relief valves to open or of the valves to fail in a way different than discussed in SAR-153. Therefore, the PISA did not create the possibility of an accident of a different type than previously evaluated in the safety basis.

6. Could the PISA create the possibility of a malfunction of equipment important to safety of a different type than previously evaluated in the safety basis? Yes ☐ No ☒

Explain:

The PISA only questioned the capacity of the relief valves, SF-A-71 and SF-A-72. The PISA did not question the failure of the relief valves to open or of the valves to fail in a way different than discussed in SAR-153. Therefore, the PISA did not create the possibility of a malfunction of equipment important to safety of a different type than previously evaluated in the safety basis

IIIc: POTENTIAL FOR REDUCTION IN A MARGIN OF SAFETY

7. Could the PISA reduce a margin of safety as defined in the safety basis? Yes ☒ No ☐

Explain:

The PISA identified that the possible flow rate through the relief valves might be 2 gpm more than assumed in SAR-153 (690 gpm versus 688 gpm). This increase could cause the system pressure to be slightly higher than presented in SAR-153. This change could reduce the required 120% margin required between the PCS maximum pressure and the piping design pressure. This slight difference in pressure could reduce a margin of safety as defined in the safety basis.

IIId: USQ DETERMINATION CONCLUSION

8. Based on the responses to questions 1 – 7 above, does the PISA constitute an Unreviewed Safety Question? Yes ☒ No ☐

Explain:
Part I shows that there is a potential for an increase in probability or consequence of an accident evaluated in the safety basis. Part II shows that there is no potential for the creation of an unanalyzed accident or malfunction of a different type, and Part III shows that there is a reduction in the margin of safety established in the safety basis. Therefore, this PISA finding does constitute a USQ.

NOTE: If USQ determination result is positive, additional notification for ORPS is required per MCP-190 or AWP-3.1.

IV. APPROVAL/CONCURRENCE SIGNATURES

APPROVAL:

S.R. Wagoner	Steve Wagoner	7/10/06
USQ Evaluator Print/Type Name	USQ Evaluator Signature	Date

INL USQ PROCESS
POTENTIAL INADEQUACY IN THE SAFETY ANALYSIS (PISA) FORM
(DO NOT USE FOR PROPOSED CHANGES)

Facility or Activity: RTC

USQ Process No.: RTC-USQ-2006-445

Subject: Discrepancy with the ATR Primary System Overpressure Protection Report

MARTIN McDONOUGH	Martin McDonough	7/10/06
Nuclear Facility Manager Print/Type Name	Nuclear Facility Manager Signature	Date

CONCURRENCE:

R.T. METCALF (Alternate)	R.T. Metcalf (Alternate)	7/10/06
Independent Review Committee Chair Print/Type Name	Independent Review Committee Chair Signature	Date