A2

Report No. 5074

Project 87Z-548

QUALIFICATION TEST REPORT

FOR

THE ENVIRONMENTAL QUALIFICATION

OF THE TARGET ROCK CORPORATION

THREE WAY VALVE, SOLENOID OPERATED

P/N 1/2 SMS-S-02-1

IN ACCORDANCE WITH IEEE 382-1985

Target Rock Corporation, 1966E Broadhollow

Target Rock

PART NAME - 3 WAY SOLENOID VALVE

TEST DESIGN BASIS EVENT

89

C 4736 PART S.S. 10		DATE	CHBR TEMP	TRANSIENT	CHBR PRESS	TIME	FULL STROKE	VALVE CYCLE		VOLTS DC	PRESS PSIG
1ST TRANSIENT											
HOURS	DAYS										
2	—	1/18	150	—	0	2 HRS	—	—		—	—
		1/18	355	1ST	68.2	20 SEC	—	—		92	250
		1/18	355	1ST	68.2	3 HR	YES	5X		154	260
3	—	1/19	355	1ST	68.2	3 HR	YES	5X			
2ND TRANSIENT											
3	—	1/19	355	2ND	68.2	20 S	—	—		92	250
		1/19	355	2ND	68.2	3 HR	YES	5X			
6	—	1/19	335	—	49.5	6 HR	YES	30 MIN APART		140	135
—	1	1/20	265	—	40.0	24 HR	YES	30 MIN APART		140	135
—	2	1/21	215	—	27.5	2 DAYS	YES	CYCLING STOPPED AFTER 48 HRS OUTBOARD SOLENOID CONTINUOUSLY ENERGIZED. INBOARD SOLENOID CYCLED ONCE A WEEK. INBOARD SOLENOID CONTINUOUSLY ENERGIZED @ 140 VDC AND AT 135 PSIG			
						HOURS					
—	4	1/26	215		11.0	96	YES			140	135
WEEK		2/2	215		11.0	227.5	YES	1X		105	125
1		2/9	215		11.0	395.5	YES	1X		105	125
2		2/16	215		11.0	563.5	YES	1X		105	125
3		2/23	215		11.0	731.5	YES	1X		105	125
4		3/2	215		11.0	897.5	YES	1X		105	125
5		3/20	215		11.0	1079	YES	1X		105	125
6		3/27	215		11.0	1247	YES	1X		105	125
7		4/3	215		11.0	1415	YES	1X		105	125
8		4/10	215		11.0	1583	YES	1X		105	125
9		4/17	215		11.0	1751	YES	1X		105	125
10		4/24	215		11.0	1916	YES	1X		105	125
11		5/1	215		11.0	2084	YES	1X		105	125
12		5/8	215		11.0	2252	YES	1X		105	125
13		5/15	215		11.0	2420	YES	1X		105	125
14		5/17	215		11.0	2468	YES	1X		105	125

3116A

A3

EQDI 3170

123874

TERI 033

TECHNICAL EVALUATION OF REPLACEMENT ITEM

CONFORMAL COATING

P/N 830-0005

PREPARED BY: N. Campanelli — 2/29/96
N. Campanelli
Project Engineer
Date

APPROVED BY: S. Karidas — 2/29/96
S. Karidas
Manager, Applications Engineering
Date

APPROVED BY: [signature] — 3/01/96
R. Glazier
Manager, Quality Engineering
Date

Target Rock

Target Rock Corporation, 1966E Broadhollow Road, East Farmingdale, New York 11735

TARGET ROCK CORPORATION
SUBSIDIARY, CURTISS-WRIGHT CORPORATION
1966E BROADHOLLOW ROAD
FARMINGDALE, NY 11735

1.0 **ORIGINAL ITEM**

Conformal Coating having TRC Part Number 830-0005.

1.1 **Functional Classification**

Safety Related Valve Application

1.2 **Functional Mode**

Passive

1.3 **Item Safety Function**

Silicone conformal coating provides environmental protection for electrical components.

2.0 **NEED FOR TECHNICAL EVALUATION**

The original conformal coating has a solvent system which has become unacceptable due to human health danger presented by this material.

3.0 **FAILURE MODES AND EFFECTS**

Credible Failure Mode	Effects
Loss of protective ability	Decreased electrical resistance to ground.

4.0 **DESIGN BASED CRITICAL CHARACTERISTICS**

Environmental Acceptability

Material

Configuration

4.1 **Replacement Item**

Chemtronics "KORNFORM SR 2000", Type CTSR-12, Silicone Conformal coating is the replacement for "KONFORM", Type C416 silicone conformal coating.

Both items use the same silicone resin system. However the solvent system for "KONFORM SR 2000" has been modified for environmental considerations.

5.0 **LIKE-FOR-LIKE EVALUATION**

The change in solvent systems does not affect the protection provided by silicone resin system and makes this item a like for like replacement item. Based on the proceeding comparison this like for like replacement conformal coating is entirely suitable and preferred replacement for safety related applications.

Use of this replacement item does not affect environmental qualification nor does any TRC equipment qualification or design report require reconciliation as a result.

6.0 **TECHNICAL AND QUALITY REQUIREMENTS**

6.1 **Technical Requirements**

Configuration

Materials

6.2 **Quality Requirements**

- TRC acceptance of these items is based on verification of certain critical characteristics upon receipt in accordance with Critical Characteristics/Attribute Verification (CCAV) Sheet.

6.3 **Supplier Documentation**

TRC Part Number
Supplier Part Number
Certificate of Conformance

6.4 **Acceptance Requirements**

Review Certificate of Conformance
Dedicate incoming items per CCAV Sheet requirements.

Patel/EGS Conformal Coating (PECC)

In response to the issues highlighted in NRC IE Information Notice 84-47 and NUREG/CR-3418, Patel Engineers developed and qualified a conformal coating to reduce leakage current.

The transparent resin has been shown to greatly reduce leakage current when applied to instrumentation terminal blocks and other instrumentation terminations.

Successfully qualified by test in accordance with:

IEEE 323-1983
IEEE 344-1975
10 CFR 50.49

- **Qualified life of 40 years @ 90°C**
- **Radiation tested to 2×10^7 rads gamma**
- **Accident tested to 355°F, 30 psig and 100% R.H.**
- **Leakage current reduced by more than 99% during accident test**
- **Seismic tested in excess of 6.0 g's ZPA**
- **Supplied under a quality assurance program in accordance with ANSI N45.2 and 10 CFR 50, Appendix B**

Product Description

Patel Engineers Conformal Coating (PECC) is a transparent resin solution that offers excellent dielectric properties, moisture resistance and thermal shock properties. PECC's primary usage is as a coating applied to terminal blocks and other electrical terminations. PECC eliminates excessive leakage current during postulated accident conditions and minimizes loss of insulation resistance.

Application

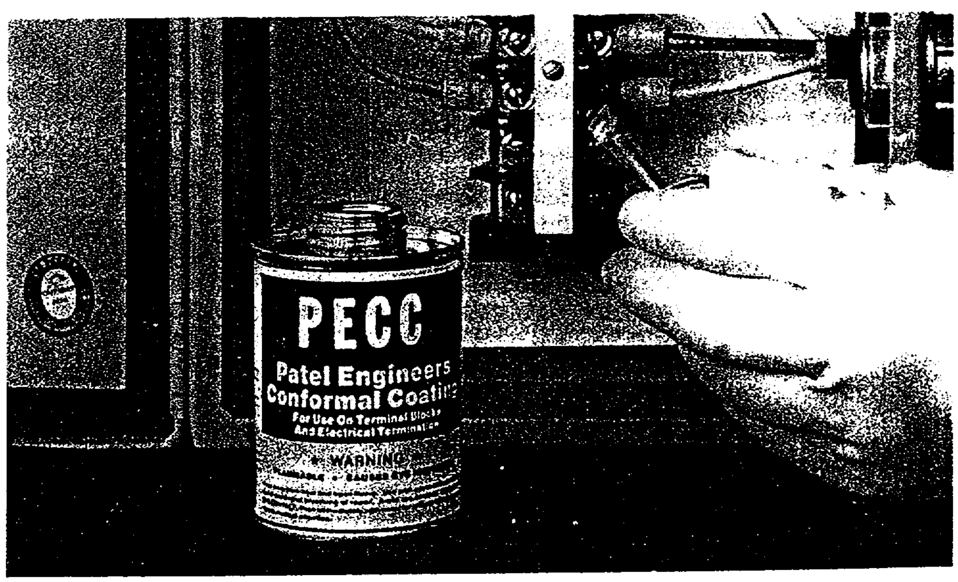
Surface preparation is made by simp removing dust and contamination by brushing. PECC is applied with a noi conductive, soft-bristled brush, by spraying or dipping. Complete applic tion procedures are supplied with ea order.

Design Features

- One part compound—no mixing or measuring
- Easy application
- May be applied to energized circuits
- Suitable for most qualified non-polystyrene terminal block materials
- Curable at room temperature
- Tack-free in one hour
- Easily removed for later access to circuits

How To Order

PECC is available in 4 oz. and 1 gal. containers and ordered as PECC.



EGS
ENGINEERING AND ADVANCED TECHNOLOGY

KNOXVILLE OFFICE • KNOXVILLE, TENNESSEE • (615) 690-6200 • FAX: (615) 690-0429
CORPORATE HEADQUARTERS • HUNTSVILLE, ALABAMA • (205) 722-8500 • FAX: (205) 722-8533

EGS
MATERIAL SAFETY DATA SHEET

MATERIAL NAME: PATEL ENGINEERS CONFORMAL COATING (PECC)

SECTION 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

EGS
125 West Park Loop, Suite 200
Huntsville, AL 35806

24-Hour Emergency Telephone: (619) 546-6965

MSDS No.: PECC-1

Print Date: 9/7/95

Last Revised: 9/7/95

Generic Description:	Silicone in solvent
Physical Form:	Liquid
Color:	Greenish yellow
Odor:	Strong Odor
NFPA Profile:	Health NA Flammability 3 Reactivity 0

Note: NFPA = National Fire Protection Association

SECTION 2. HAZARDOUS COMPONENTS

CAS Number:	Wt %	Component	Exposure Limits
000108883	24	Toluene	OSHA PEL: TWA 200 ppm, Ceiling 300 ppm, max. 500 ppm. ACGIH TLV-skin: TWA 50 ppm
01185553	3	Mathyltrimethoxysilane	Dow Corning guide: TWA 50 ppm. Also see methyl alcohol comments.
068952932	73	Dimethylmethylphenylmethoxy siloxana	None established

Comments: Methyl alcohol forms on contact with water or humid air. Provide adequate ventilation to control exposures within guidelines of OSHA PEL: TWA 200 ppm and ACGIH TLV-skin: TWA 200 ppm, STEL 250 ppm

SECTION 3. EFFECTS OF OVEREXPOSURE

Acute Effects

Eye: Direct contact may irritate seriously with moderate to severe redness, swelling and some corneal injury lasting several days to a week.

Skin: A single short exposure (less than 24 hours) may irritate. Repeated prolonged contact (24 to 48 hours) may irritate moderately.

Inhalation: Short vapor exposure may cause drowsiness, irritate nose and throat and cause injury to the following organ(s): Liver. Kidneys. Nervous system.

Oral: Inhaling liquid while vomiting can injure lungs seriously. Small amounts transferred to the mouth by fingers during use, etc., should not injure. Swallowing large amounts may injure slightly.

Repeated Exposure Effects

Skin: None Known.

EGS
MATERIAL SAFETY DATA SHEET

MATERIAL NAME: PATEL ENGINEERS CONFORMAL COATING (PECC)

Repeated Exposure Effects (Continued)

Inhalation: Short vapor exposure may cause drowsiness, irritate nose and throat and cause injury to the following organ(s): Liver. Kidneys. Nervous system.

Oral: Small amounts transferred to the mouth by fingers during use, etc., should not injure. Swallowing large amounts may injure slightly.

Special Hazards

This material contains the following components with the special hazards listed below.

Carcinogens

None Known

Teratogens

None Known

Mutagens

None Known

Reproductive Toxins

000108883	24	Toluene	Possible Reproduction Hazard

Sensitizers

None Known

Comments: Toxicology studies with laboratory animals and occupational evaluations with humans have found limited evidence of birth defects, low birth weights and delayed growth in offspring resulting from repeated exposures to toluene during pregnancy. When heated to temperature above 150°C in the presence of air, product can form formaldehyde vapors. Formaldehyde is a potential cancer hazard, a known skin and respiratory sensitizer; and an irritant to the eyes, nose, throat, skin, and digestive system. Safe handling conditions may be maintained by keeping vapor concentrations within the OSHA Permissible Exposure Limit for formaldehyde.

The above listed potential effects of overexposure are based on actual data, results of studies performed upon similar compositions component data and/or expert review of the product.

SECTION 4. FIRST AID MEASURES

Eye: Immediately flush with water for 15 minutes. Get medical attention.

Skin: Remove from skin and wash thoroughly with soap and water or waterless cleanser. Get medical attention if irritation or other ill effects develop or persist.

Inhalation: Remove to fresh air. Get medical attention if ill effects persist.

Oral: Get medical attention. Do not induce vomiting.

Comments: Treat according to person's condition and specifics of exposure.

EGS
MATERIAL SAFETY DATA SHEET

MATERIAL NAME: PATEL ENGINEERS CONFORMAL COATING (PECC)

SECTION 5. FIRE FIGHTING MEASURES

Flash Point (Method):	55.40 Degree F / 13.00 Degree C
Autoignition Temperature:	Not Determined
Flammability Limits in Air:	Not Determined
Extinguishing Media:	Carbon dioxide (CO_2). Dry chemical. Foam.
Unsuitable Extinguishing Media:	Water.
Fire Fighting Procedures:	Self-contained breathing apparatus and protective clothing should be worn in fighting fires involving chemicals. Heat exposure pressurizes closed containers. Cool with water spray. Evacuate area in case of overheating or fire.
Unusual Fire Hazards:	Vapors are heavier than air and can travel along ground to remote ignition sources. Static electricity may accumulate and ignite vapors. Prevent a possible fire hazard by suitable means, such as, bonding and grounding, inert gas purge, vapor dilution, and the like.
Hazardous Decomposition Products:	Metal oxides. Carbon oxides and traces of incompletely burned carbon compounds. Silicon dioxide. Formaldehyde.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Containment/Clean-Up:	Disposal of collected product, residues, and clean-up materials may be governmentally regulated. Observe all applicable local, state, and federal waste management regulations. Remove possible ignition sources and, if needed, use nonsparking tools and equipment. To prevent possible spontaneous combustion, store rags, mops, absorbent, etc., used during clean-up only in appropriate containers or covered with water. Determine whether to evacuate or isolate the area depending on such specified factors as site location, population density, traffic flow, size of the release or spill, weather conditions, the material's hazards and risks to people, and whether a fire is underway or possible. Mop up, or wipe up, or soak up with absorbent and contain for salvage or disposal. For large spills, provide diking or other appropriate containment to keep material from spreading. Clean any remaining slippery surfaces by appropriate techniques, such as: several moppings or swabbings with appropriate solvents; washing with mild, caustic detergents or solutions; or high pressure steam for large areas. For nonsilicones, use typical industrial cleaning materials. Observe any safety precautions applicable to the cleaning material being used. Observe all personal protection equipment recommendations described in Sections 5 and 8. Local, state, and federal reporting requirements may apply to spills or releases of this material into the environment. See applicable regulatory compliance information in Section 15.

NOTE: See Section 8 for Personal Protective Equipment for Spills

EGS
MATERIAL SAFETY DATA SHEET

MATERIAL NAME: PATEL ENGINEERS CONFORMAL COATING (PECC)

SECTION 7. HANDLING AND STORAGE

Handling No special precautions.

Storage: Keep container closed and away from heat, sparks, and open flame. Keep container closed and store away from water or moisture.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls

Local Exhaust: Recommended

General Ventilation: Recommended

Personal Protective Equipment for Routine Handling

Eyes: Use chemical worker's goggles.

Skin: Wash at mealtime and end of shift. Contaminated clothing and shoes should be removed as soon as practical and thoroughly cleaned before reuse. Chemical protective gloves are recommended.

Suitable Gloves: Eval/Unknown (Silver Shield(R), Barricade(R), Respondor(R), Chemrel(R)) PE/Eval/PE (Safety4-4H(R)).

Inhalation: Use respiratory protection unless adequate local exhaust ventilation is provided or air sampling data show exposures are within recommended exposure guidelines. Industrial Hygiene Personnel can assist in judging the adequacy of existing engineering controls.

Suitable Respirator: Self-contained breathing apparatus (SCBA) or other supplied-air respirator.

Personal Protective Equipment for Spills

Eyes: Use full face respirator.

Skin: Wash at mealtime and end of shift. Contaminated clothing and shoes should be removed and thoroughly cleaned before reuse. Chemical protective gloves are recommended.

Inhalation/Suitable Respirator: Use self-contained breathing apparatus (SCBA) or other supplied-air respirator.

Precautionary Measures: Avoid eye contact. Avoid skin contact. Avoid breathing vapor. Kep container closed. Do not take internally.

Comments: Products evolves methyl alcohol when exposed to water or humid air. Provide ventilation during use to control exposure within Section 2 guidelines or use air-supplied or self-contained breathing apparatus.

Note: These precautions are for room temperature handling. Use at elevated temperature, or aerosol/spray applications, may require added precautions.

BROWNELL ELECTRO, INC.
TREVOSE - PA

Patel Job No.: 8504

Customer P.O. No.: - NA -

Program Mgr./Project Eng: R. Minadeo

ITEMS INSPECTED

Item No.	Qty.	Part No.	Serial Number	Description	Patel I.D. No.	Acceptance Criteria Document	Accep Yes
1	40 LB	DC 1-2577	- NA -	DOW CORNING 1-2577 CONFORMAL COATING	—	—	✓
				LOT NR. A0 24 027	—	—	✓
				BATCH 520			

PACKAGING: ☐ Crate ☒ Metal Container 5-GAL CAN ☐ Cardboard ☐ Double Packed ☒ Single Packed — X

DOCUMENTATION: ☐ Material Certification ☐ Certificate of Conformance ☐ Certificate of Calibration ☐ Other (Specify) — X

REMARKS

* 1. A Notice of Anomaly is required per QEP 15.1: ☐ Yes ☒ No

2. Documentation to be provided separately.

3. OFF THE SHELF ITEM

Description of Discrepancies (continue on reverse):

Signature: [signature] 11-1-8
Inspector Dat

PEI Form No. 1011 - Revised 1/84

.130

CUSTOMER P.O. NUMBER | TELETYPE & MISC. | CHARGE | TELEPHONE & MISC. | CHARGE | TERR-1 | TERR-2 | PCT | TYP | STATE TX. AMT. | COUNTY TX. AMT.

SHIP TO

PATEL ENG
3400 BLUESPRING RD
HUNTSVILLE AL
35810

RETURN POSTAGE GUARANTEED

ASK BOB. MENADEO
~~U.P.S. NEXT DAY AIR~~
FED. EXPRESS RED LABAL
Call on Arrival airport
HUNTVILLE AL 205-859-5000
EXT 145

SOLD TO

CARTONS	1 PAIL
WEIGHT	40#
CHARGES	
EDIT	
OTHER (50)	

TRANSPORTATION CODE

U.P.S.	1	PREPAY & CHARGE
P.P.	2	PREPAID
P.P. SO.	3	COLLECT
P.P. INS.	4	PICK UP
TRUCK	5	C.O.D.
AIR	6	DIRECT
F/C	7	NO CHARGE
BUS	8	
NO CHARGE	9	

TERR-1	TERR-2	PCT	IND	STATE	COUNTY	CITY	TX TYP

CHARGE | TERMS
CASH | FOB

ITEM	QUANTITY ORDERED	PUT UP	CATALOGUE NO.	PRODUCT NO.	QUANTITY SHIPPED	BALANCE DUE	UNIT	CODE	UNIT PRICE	DISCT.	EXTENSION	COST
1	1		DC 12577 40LR 183		1	0		A				
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												

ORDER TAKEN BY | ORDER PULLED BY | ORDER CHECKED BY | ORDER PACKED BY

TOTAL

YOUR ORDER NO./ SPECIAL INSTRUCTIONS

STATE TAX ____ %
COUNTY TAX ____ %
CITY TAX ____ %
NO. OF INVOICES ____

SUB TOTAL	
TOTAL SALES TAXES	
PPD TRANS	
TOTAL	

RECEIVED BY ____

NO RETURNS WITHOUT AUTHORIZATION. ALL CLAIMS MUST BE ACCOMPANIED BY THIS BILL
WE GUARANTEE THAT ALL MERCHANDISE COVERED BY THIS INVOICE WAS PRODUCED IN COMPLIANCE WITH FAIR LABOR STANDARDS ACT OF 1938, AS AMENDED

PACKING LIST

CHEMTRONICS®
Technical Data Sheet

TDS # CTSR-12

Konform® SR

PRODUCT DESCRIPTION

Konform® SR provides maximum flexibility for extreme temperatures. This transparent coating provides ideal protection for both rigid and flexible printed circuit boards. Cured coatings are hydrolyticly stable and retain their physical electrical properties after high temperature and humidity exposure. Konform® SR will not stress delicate circuit components.

- Extends component life by protecting against adverse environments
- Good insulation properties, excellent flexibility
- Resists moisture, salt, fungus, corrosive vapors, and severe environments
- Engineered to withstand heat generated by electronic circuitry as well as climatic temperatures
- Contains a UV indicator for thorough Quality Control inspection
- UL Recognized

TYPICAL APPLICATIONS

Konform® SR is ideal for applications in:

- Aerospace
- Data Communications
- Instrumentation
- Automotive Manufacturing
- Marine Manufacturing
- Process Control

TYPICAL PRODUCT DATA AND PHYSICAL PROPERTIES

Usable Temp. Range of Cured Coatings		(-85°F to 390°F) (-65°C to 200°C)
Tack Free Time		30 Min. to 1 Hour
Curing Conditions (@ 80% R.H.)		24 Hours @ 77°F (25°C) 8 Hours @ 170° (77°C)
Specific Gravity (Water=1) @ 68°F		0.74 (Liquid only)
Viscosity (cps @ 77°F)		40 ± 5 cps
Flash Point (TCC)		-20°F
Volume Resistivity (ohm/cm)		1.5×10^{16}
Dielectric Strength (volts/mil)		1100
Coefficient of Thermal Expansion (in/in/°C)		2.1×10^{-4}
Coverage ($1\ mil/ft^2$)	CTSR-1 CTSR-12	250.9 21.0

COMPATIBILITY

Konform® SR is generally compatible with most materials found on printed circuit boards. As with any chemical product, product/component compatibility must be determined on a non-critical area prior to use.

Performance

Moisture Resistance	Excellent
Removability	Excellent
Ease of Repair	Excellent
Flexibility	Excellent
Adhesion	Excellent
Abrasion Resistance	Fair
Solvent Resistance	Good

USAGE INSTRUCTIONS

For industrial use only.
Read MSDS carefully prior to use.
Before applying Konform® SR conformal coatings, clean circuit boards to remove contamination and allow to dry. Cleaning may be performed with Chemtronics® Electro-Wash® NX or High Purity Acetone.

SPRAY APPLICATION: Apply top to bottom, allowing coating to flow evenly around components. Rotate PCB 90° and repeat application. Rotate and apply coating two additional times, then allow board to cure. If additional thickness is desired, apply additional coatings. When using liquid spray with automatic dispensing equipment, adjustments may be required in application rate and viscosity.

DIP APPLICATION: Using automatic equipment or hand immersion technique, slowly immerse PCB into the coating and remove slowly. Use an average rate of approximately 1 foot per minute. After allowing the board to cure, process may be repeated to achieve desired thickness.

BRUSH APPLICATIONS: Evenly apply coating to areas desired at thickness required. Allow time for curing before reapplying to achieve a thick coating. Use Chemask® to protect components during conformal coating process. After application, cured Konform® SR may be removed by soaking in Chemtronics® Electro-Wash® Two Step, or an aromatic solvent (such as xylene), or a short chain ketone (such as acetone).

AVAILABILITY

CTSR-12 11 oz. Aerosol
CTSR1 1 Gal. Liquid CTSR5 5 Gal. Liquid

ENVIRONMENTAL IMPACT DATA

(For Aerosol Product)

ENVIRONMENTAL IMPACT DATA			
CFC	0.0%	VOC	88.0%
HCFC	0.0%	HFC	0.0%
Cl. Solv.	0.0%	ODP	0.00

CFC, HCFC, CL. SOLV., VOC, and HFC numbers shown are the content by weight. Ozone depletion potential (ODP) is determined in accordance with the Montreal Protocol and U.S. Clean Air Act of 1990. The ODP of this product is 0.0. It is the sum of the ODP of the substances that may contribute to the depletion of stratospheric ozone, based upon the weight of each substance in the product's formulation.

TECHNICAL & APPLICATION ASSISTANCE

Chemtronics® provides a technical hotline to answer your technical and application related questions. The toll free number is: **1-800-TECH-401.**

NOTE: This information is believed to be accurate. It is intended for professional end users having the skills to evaluate and use the data properly. CHEMTRONICS® does not guarantee the accuracy of the data and assumes no liability in connection with damages incurred while using it.

MANUFACTURED BY:

ITW CHEMTRONICS
8125 COBB CENTER DRIVE
KENNESAW, GA 30152
1-770-424-4888 REV. D (03/01)

DISTRIBUTED BY:

TECHNICAL HOT LINE 1-800-TECH-401

SECTION 1: CHEMICAL PRODUCT AND COMPANY INFORMATION

Company Address:
8125 Cobb Center Drive
Kennesaw, GA 30152
Product Information: 800-TECH-401
Customer Service: 800-645-5244
Emergency: (Chemtrec) 800-424-9300
Revision Date: October 6, 1997

Product Identification

KONFORM® SR
(Formerly Konform SR 2000)

Product Code: CTSR-12

SECTION 2: COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS#	Wt. % Range
Isohexane, a mixture of:		
3-methylpentane	96-14-0	5.0 -10.0
2,3-dimethylbutane	79-29-8	5.0- 10.0
2,2-dimethylbutane	75-83-2	5.0 -10.0
2-methylpentane	107-83-5	15.0-20.0
n-Hexane	110-54-3	0.1 -1.0
Acetone	67-64-1	13.0-18.0
Silicone polymer	68952-93-2	10.0-15.0
Propane	74-98-6	10.0-15.0
Isobutane	75-28-5	10.0-15.0
Propylene glycol methyl ether acetate	108-65-6	2.0 -5.0
Toluene	108-88-3	1.0-4.0

SECTION 3: HAZARD IDENTIFICATION

Emergency Overview: Translucent, slightly green liquid with hydrocarbon odor. This product is extremely flammable. Liquid will irritate eyes and skin under repeated or prolonged exposure. Breathing high concentrations of product vapor may produce drowsiness and a headache.

Potential Health Effects:

Eyes: Liquid, aerosols and vapors of this product are irritating and can cause pain, tearing, reddening and swelling accompanied by a stinging sensation.

Skin: Contact causes skin irritation.

Ingestion: Harmful if swallowed. Irritating to mouth, throat and stomach. May cause optic nerve damage.

Inhalation: Harmful if inhaled. High concentrations of vapors in immediate area can displace oxygen and can cause dizziness, unconsciousness, and even death with longer exposure. Keep people away from such vapors without self-contained breathing apparatus.

Pre-Existing Medical Conditions Aggravated by Exposure: Heart, lung, skin, eye.

SECTION 4: FIRST AID MEASURES

Eyes: Immediately flush with plenty of water. After initial flushing, remove any contact lenses and continue flushing for at least 15 minutes. Have eyes examined and tested by medical personnel if irritation develops or persists.

Skin: Wash skin with soap and water. Remove contaminated clothing. Get medical attention if irritation develops or persist. Wash clothing separately before reuse.

Ingestion: Do not induce vomiting. Get immediate medical attention.

Inhalation: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

SECTION 5: FIRE FIGHTING MEASURES

Flash Point:-20 F (liquid only TCC) -156 F (propellant only) LEL/UEL: Not established (% by volume in air)

Extinguishing Media: Use alcohol foam, carbon dioxide, or water spray when fighting fires involving this material.

Fire Fighting Instructions: As in any fire, wear self-contained breathing apparatus (pressure-demand, MSHA/NIOSH approved or equivalent) and full protective gear.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Large Spills: Shut off leak if possible and safe to do so. Wear self-contained breathing apparatus and appropriate personal protective equipment. Absorb spill with inert material (e.g. dry sand or earth), then place in a chemical waste container for proper disposal. Do not flush to sewer. Avoid runoff into storm sewers and ditches which lead to waterways. Small Spills: Absorb spill with inert material (e.g. dry sand or earth), then place in a chemical waste container for proper disposal.

SECTION 7: HANDLING AND STORAGE

Avoid prolonged or repeated contact with eyes, skin, and clothing. Wash hands before eating. Use with adequate ventilation. Avoid breathing product vapor or mist. Do not reuse this container. Store in a cool dry place away from heat, sparks and flame. Keep container closed when not in use. Do not store in direct sunlight.

KEEP OUT OF REACH OF CHILDREN.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Guidelines:

CHEMICAL NAME	ACGIH TWA	OSHA PEL	OSHA STEL
Toluene	50 ppm	200 ppm	C300 ppm
Acetone	750 ppm	1000 ppm	None Established
Propylene glycol methyl ether acetate	None Established	None Established	None Established

Work/Hygienic Practices: Good general ventilation should be sufficient to control airborne levels. Local exhaust ventilation may be necessary to control any air contaminants to within their TLVs during the use of this product. Wear safety glasses with side shields (or goggles) and rubber or other chemically resistant gloves when handling this material.

NFPA and HMIS Codes:	NFPA	HMIS
Health	2	2
Flammability	3	3
Reactivity	1	1
Personal Protection	-	B

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Translucent, slightly green liquid

Odor: hydrocarbon

Solubility in Water: slightly soluble

Specific Gravity: 0.74 (liquid only) (Water =1)

pH: NA	Evaporation Rate: >1
Vapor Pressure: not determined	(Butyl acetate=1)
(Air = 1)	Viscosity: NA
Vapor Density: >1	Percent Volatile: 88.6%
(Air = 1) 0	Boiling Point: 130F (liquid by indirect data only)
Can Pressure: 70 psig 77 F	-43.7F (propellant only)

SECTION 10: STABILITY AND REACTIVITY

Stability - This product is stable. Conditions to Avoid: Do not spray near open flames, red hot surfaces or other sources of ignition.
Incompatibility: Do not mix with powdered alkali and alkaline earth metals or strong oxidizing agents.
Products of Decomposition: Thermal decomposition may release carbon monoxide, carbon dioxide and incompletely burned hydrocarbons.
Hazardous Polymerization: Will not occur Conditions to Avoid: NA

SECTION 11: TOXICOLOGICAL INFORMATION

Inhalation:
Acetone rat LC50 50100 mg/m3/8H
Toluene Rats LC50 49 gm/m3/4H
Propylene glycol methyl ether acetate LD50 8532 mg/kg

Ingestion:
Acetone rat LD50 5800 mg/kg
Toluene LD50 rat 636mg/kg

Skin:
Acetone Rabbit 500 mg/24H Mild irritation
Toluene Rats LD50 14100 uL/kg
Propylene glycol methyl ether acetate rabbit LD50 >5000 mg/kg

Eye:
Acetone rabbit 20 mg/24H MOD
Toluene rabbit 20 mg/24H MOD

Cancer Information: No ingredients listed as human carcinogens by NTP or IARC

SECTION 12: ECOLOGICAL INFORMATION

Environmental Impact Information
Avoid runoff into storm sewers and ditches which lead to waterways. Water runoff can cause environmental damage.

REPORTING
US regulations require reporting spills of this material that could reach any surface waters. The toll free number for the US Coast Guard National Response Center is:
1-800-424-8802

Environmental Impact Data
(percent by weight)

CFC	0.0%	VOC	88.6%
HCFC	0.0%	HFC	0.0%
Cl. Solv.	0.0%	ODP	0.0

For more information call:
1-800-645-5244

SECTION 13: DISPOSAL CONSIDERATIONS

Dispose of in accordance with all federal, state and local regulations. Water runoff can cause environmental damage.

SECTION 14: TRANSPORTATION INFORMATION

	Proper Shipping Name	UN Number	Hazard Class	Sub. Risk	Pkg. Group	Hazard Label	Pkg. Instr.	Max. Quantity
Air:	Aerosols, Flammable n.o.s	UN 1950	2.1	NA	NA	Flammable Gas	203	5L
							Y203	60L
Ground:	Consumer Commodity ORM-D	NA	ORM-D	NA	NA	ORM-D	Pkg. Auth.	173.306

SECTION 15: REGULATORY INFORMATION

SECTION 313 SUPPLIER NOTIFICATION
This product contains the following toxic chemicals subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-To-Know Act of 1986 (40 CFR 372).

Chemical Name	**CAS#**	**Wt. % Range**
Acetone	67-64-1	10.0-15.0
Toluene	108-88-3	1.0-5.0

This information should be included on all MSDSs copied and distributed for this material.
TOXIC SUBSTANCES CONTROL ACT (TSCA).
All ingredients of this product are listed on the TSCA Inventory.
CALIFORNIA PROPOSITION 65: This product contains Toluene a chemical known to the state of California to cause cancer.

Chemical Name	CAS Number	Percent Wt. Range
Toluene	108-88-3	1.0-5.0

SECTION 16: OTHER INFORMATION

Product is a Level 3 aerosol. Do not puncture or incinerate containers. Normal ventilation for standard manufacturing practices is usually adequate. Local exhaust should be used when large amounts are released.

REFERENCES 29 CFR 1910.1200 40 CFR 300 - 700 ANSI Z400.1-1993
GUIDE TO OCCUPATIONAL EXPOSURE VALUES 1996 (ACGIH)
RTECS by CHEM-BANK BY SILVERPLATTER

To the best of our knowledge, the information contained herein is accurate. However, all materials may present unknown hazards and should be used with caution. In particular, improper use of our products and their inappropriate combination with other products and substances may produce harmful results which cannot be anticipated. Final determination of the suitability of any material is the sole responsibility of the user. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that may exist.

Display without Links | Return to Results

Display Page

Display from REGISTRY

ANSWER 1

CAS Registry Number

68952-93-2 REGISTRY

Chemical Name

Siloxanes and Silicones, di-Me, Me methoxy, methoxy Ph, polymers with Me Ph silsesquioxanes (CA INDEX NAME)

Silsesquioxanes, Me Ph, polymers with di-Me, Me methoxy, methoxy Ph siloxanes

Molecular Formula

Unspecified

CAS REGISTRY

Search for information related to CAS RN **68952-93-2** in these categories:

- Material Safety (MSDS) [$2.00]
- Regulated Chemical Lists [$2.00]

with eScience

A Division of the American Chemical Society

Overview for Press and Media

CAS: The World's Most Comprehensive Resource - For Chemical and Related Scientific Information

CAS, a division of the American Chemical Society, is the world's leader in providing scientists online and web access to chemistry-related research data. CAS produces the world's largest and most comprehensive databases of chemical information and makes them available through sophisticated search and analysis software for the use of scientists engaged in new product and patent research, as well as academic research in the world's leading universities. CAS databases include more than 19 million abstracts of chemistry-related literature and patents and more than 30 million substance records.

CAS was founded in 1907 with the aim of monitoring, abstracting, and indexing the world's chemistry-related literature. This aim was first accomplished through the well known printed reference work CHEMICAL ABSTRACTS (CA), which CAS continues to publish after more than 90 years. CAS began to develop computer-based publication technologies in the 1960s in order to automate the publication of CA. Today, CAS editorial processes apply the best advantages of document analysis by highly trained scientists and the benefits of advanced information technology.

CAS indexes and abstracts patents, articles from approximately 8,000 scientific journals, conference proceedings, and other documents pertinent to chemistry, life sciences and many other fields. In 2000 alone, CAS scientists provided

- abstracts and indexing for 725,000 journal articles, patents, and other research materials
- CAS Registry Numbers and substance records for more than 5.1 million biosequences and 900,000 other organic and inorganic substances.

Through the printed CA, CA on CD, the STN International online network, the CAS files distributed through licensed vendors, the SciFinder and SciFinder Scholar desktop research tools, and the STN Easy or STN on the Web services, data produced by CAS is accessible to virtually any scientific researcher worldwide in industry, governmental research institutions, and academia.

Substance identification is a special strength of CAS, which is widely known for the CAS Chemical Registry, the largest substance identification system in existence. When a chemical substance is newly encountered in the literature processed by CAS, its molecular structure diagram, systematic chemical name, molecular formula, and other identifying information are added to the Registry and assigned a unique CAS Registry Number®. Registry now contains records for 18 million organic and inorganic substances and 12 million sequences.

CAS Registry Numbers are used in reference works, databases, and regulatory compliance documents by many organizations around the world to identify substances without the ambiguity of chemical nomenclature.

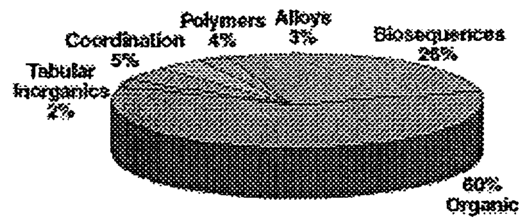
For More Information, Contact

CAS Customer Service
1-800-753-4227 or 614-447-3700
http://www.cas.org

3/01

CAS REGISTRY

CAS Registry, the world's preeminent substance database, now contains more than 30,000,000 substance records, including more than 16,000,000 organic and inorganic substances and 9,000,000 biosequences. The Registry is the world's largest collection of organic substance records.



CAS REGISTRY contains more than 26,000,000 substance records!

The CAS Registry System is an international resource for chemical substance identification for scientists, industry, and regulatory bodies.

CAS REGISTRY is the largest file of substance information in the world containing structures and chemical names. It has become the worldwide authority for chemical substance identification.

CAS Registry Numbers®

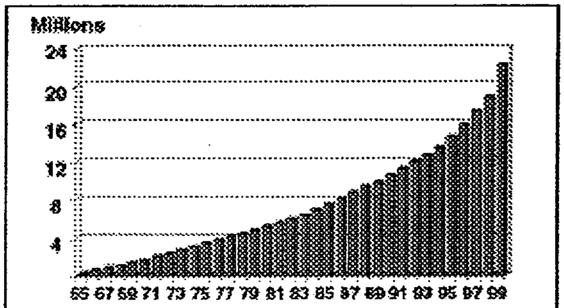
CAS REGISTRY is your complete and reliable source of CAS Registry Numbers. These unique identifiers bridge the many differences in systematic, generic, proprietary, and trivial names, linking them with the correct molecular structure. A Registry Number itself has no inherent chemical significance. CAS Registry Numbers are included in all CAS databases and the full set of Registry database information--structures, names, formulas, ring data--is available for searching on STN. CAS REGISTRY information is also

Types of substances

- Organic
- Inorganic
- Metals
- Alloys
- Minerals
- Coordination compounds
- Organometallics
- Elements
- Isotopes
- Nuclear Particles
- Nucleic Acids
- Proteins
- Polymers
- Nonstructurable materials

available in CAS databases offered by other online system vendors. CAS Registry Numbers are used in many public and private databases, chemical inventories, and many reference works.

CAS REGISTRY File: Comprehensive and Current!



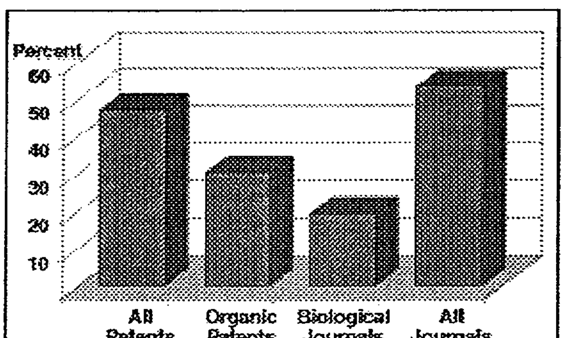
Number of Substances in the Registry Database 1965-1999

New substances in the CAS Registry System grew from an average of 262,000 in the first 5 years to an average of more than 1.3 million in the most recent 5 years. In 1998 alone, more than 1.7 million substances were added. Including information added retrospectively, CAS REGISTRY can be searched from 1957 to the present.

More Than 30 Million Substances Now Have CAS Registry Numbers!

Currency is a special strength of CAS. In an average working day, we add approximately 2,500 document records and 11,000 substance registrations. That amounts to a new substance registration every few seconds!

Organic Patents are a Significant Source of New Substance Registrations from the Literature



Percent of New Substance Registrations from 1998 Literature

In 1998, 47% of new substance registrations from the literature came from patents, with nearly 30% from organic patents. Of the new registrations, 19% came from biological journals.

CAS also produces the CASREACT database, which provides access to millions of single-step and mutlti-step reactions from the journal literature and patents.

Home | Products | Service | Search

American Chemical Society | ACS Publications

ENCLOSURE B

Risk Sensitivity to the Reliability of the SRVs
and
Risk Sensitivity to the HELB Area Environment Propagation Assumptions

(Related discussion is provided in Attachment 1)

Includes:

PSA-ES056, Revision 1
"Sensitivity Studies for PSA-ES-051"
B1 - (11 pages)

and

Components Considered to be in "Medium" Harsh Environment in PSA-ES051

B2 - (42 pages)

B1

PROBABILISTIC SAFETY ASSESSMENT

COOPER NUCLEAR STATION

ENGINEERING STUDY

Sensitivity Studies for PSA-ES051

PSA-ES056

Prepared: Richard M Wachowiak, Risk Management Date: May 3, 2001

5/3/2001

Reviewed: Glen A Seeman, Risk Management Engineer Date: May 3, 2001

Approved: Richard M Wachowiak, Risk Management Supervisor Date: May 3, 2001

Revisions:

Number	Description	Reviewed By	Date	Approved By	Date
0	Original Issue	Glen A. Seeman	May 2, 2001	Richard M Wachowiak	May 2, 2001
1	Added clarifying statements	See Above		See Above	

t:esd\psa\psa_engstdy\es056_r1.doc

Problem Statement

During the regulatory conference concerning the non-conforming EQ treatments at CNS, the NRC asked for two additional sensitivity analyses to be performed on the risk significance of the condition. The first sensitivity was to determine how much the reliability of the SRVs needed to degrade in order for the increase in CDF to cross the GREEN/WHITE threshold. The second sensitivity was to determine the importance of the assumption in PSA-ES051 that non-conforming splices would not fail until their temperature increased above 212 °F.

Assumptions

1) Configuration of the plant was as described in PSA-ES051 revision 3.

2) The assumptions and data in PSA-ES051 apply with the exception of those described in the problem statement.

3) PSA 96b model results apply.

4) For all cases, non-conforming treatments located in the HELB area are assumed to fail. This is the same assumption that was used is PSA-ES051.

5) For the second sensitivity, second method, non-conforming treatments will be assumed to fail if the temperature of the area in which they are located goes above a temperature for which it is known that the splices do not fail. The maximum normal temperatures in the reactor building and steam tunnel range from 104 °F to 150 °F, depending on the specific area. Non-conforming splices and non-EQ components evaluated in PSA-ES051 are located in areas that have been subject to actual temperatures of 145 °F for several days, with peaks reaching nearly 150 °F. This equipment has not failed in the past due to temperature effects. It is therefore assumed, with high confidence, that splices and non-EQ components will not degrade unless the temperature in the area in which they are located rises above 150 °F. For additional conservatism, it will be assumed that splices and non-EQ components in the 903' and 931' general areas and in the RHR heat exchanger rooms will begin to degrade at 120 °F. For other areas that normally experience higher temperatures during operation (such as the Quads, HPCI room, Torus Area, Injection Valve room, and the Steam Tunnel), a temperature of 140 °F will be used to establish the onset of degradation.

6) MAAP 4.0 and Gothic 6.1a models are able to accurately predict the bulk temperature effects in RX Bldg. rooms following a HELB.

7) There is initially 73,000 gallons of water in the Hotwell that is initially available for injection by Feedwater or Condensate. After this is depleted, it is assumed that the operators will have to take manual action to re-fill the Hotwell from the CSTs using the large makeup lines. The failure probability of the manual action is based on the time available to take the action prior to core damage, and it varies depending on the size of the break and whether it is a steam or liquid line break.

Limitations of this Evaluation

This study will be used to answer the NRC's questions from the regulatory conference. They do not alter the results of PSA-ES051 or PSA-ES-054.

Conclusion

Sensitivity 1

The common cause failure rate of all of the SRVs would need to be increased by a factor of 165 (16500%) in order for the results of PSA-ES051 to cross the GREEN/WHITE threshold for CDF. The drywell results in PSA-ES051 are not particularly sensitive to the failure rate of the SRVs.

Sensitivity 2

This sensitivity was addressed in two different ways.

First, the cases in PSA-ES051 were re-evaluated using an additional assumption. If a splice was in an area that was not physically protected from the effects of the break, the supported equipment was assumed to fail with a given probability. Four different cases were run, with the probability of equipment failure set to 0.01, 0.1, 0.5, and 1.0. The failure probability was applied at the system/train level rather than the component level. The results are as follows:

	PSA-ES051	P=0.01	P=0.1	P=0.5	P=1
Delta CDF	2.57E-07	2.87E-07	6.24E-07	3.75E-06	7.10E-05

The conclusion of this sensitivity is that all of the splices away from the HELB area would simultaneously need to degrade such that the associated SSCs have a 20% probability of failure in order to change the results of PSA-ES051. Because of the condition of the non-conformances (all splices are covered by splice material, and the material properties of the splices is not challenged by the environment experienced during the HELBs), it is judged that this type of impact is not realistic for the types of non-conformances found at CNS.

Second, the assumption that splices would not degrade until they were raised to a temperature of 212 °F was changed. In this sensitivity, this threshold was lowered to a temperature where splices were known to perform reliably. Splices located in the 903' and 931' general area and in the RHR HX rooms that went above 120 °F were assumed to fail. In the lower rooms, the Injection Valve room, and the Steam Tunnel, splices were assumed to fail if they were raised above 140 °F. If the temperature in an area did not cross the new threshold, operational data has shown that the splices in the area retain their nominal reliability (i.e. failure probability of these splices should not be increased). Changing the threshold temperature caused the increase in CDF to go from 2.57×10^{-7} per year to 7.15×10^{-7} per year. Most of this change can be attributed to breaks in the Torus area and the Injection Valve room. Virtually all of the increase is due to scenarios in which isolation is successful.

The conclusion, demonstrated by each these two methods of analysis, is that the results of PSA-ES051 are not sensitive to the HELB environment propagation assumptions used in that study and PSA-ES051 provides a realistic estimate of the significance of the as found configuration.

Evaluation

In all of the sensitivity evaluations, the CUTSETS generated for PSA-ES051 were used. The method used to quantify the CUTSETS were the same as in that study.

Sensitivity 1

During the regulatory conference on the CNS non-conforming EQ treatments, the NRC asked the District how sensitive the results of the drywell analysis were to the reliability assumed for the SRVs. To answer this question, the drywell case from PSA-ES051 was re-calculated using different failure rates for the SRVs. The objective was to find the failure rate that caused the CDF increase calculated in PSA-ES051 to exceed 10^{-6} per year.

The basic event that was used to perform this sensitivity was ADS-SRV-CF-ADSRV. This is the common cause failure of sufficient SRVs to prevent depressurization. Its base failure probability is 2.4×10^{-4} per demand. This value is based on the common cause failure of 6 SRVs. (Subsequent anaylses have shown that it would take 8 SRVs to fail to prevent depressurization during a LOCA at CNS.)

In each run, the value for the above basic event was increased by a given factor. All of the rest of the assumed non-conformances for the drywell cases were the same as in PSA-ES051. The cutsets for the LOCA in the drywell sequences were then re-quantified to determine the resulting CDF. The CDF for the non-drywell sequences (from PSA-ES051) was then added. This represents the total CDF for the non-conforming treatments and the sensitivity. The base CDF for these sequences was subtracted to obtain the increase in CDF for the sensitivity.

Table 1 – Results for SRV Failure Rate Sensitivity

Factor	P(ADS-SRV-CF-ADSRV)	Drywell CDF	Non-Drywell CDF	Base CDF	Results
1	2.4×10^{-4}	1.59×10^{-7}	2.60×10^{-7}	1.62×10^{-7}	2.57×10^{-7}
10	2.4×10^{-3}	1.99×10^{-7}	2.60×10^{-7}	1.62×10^{-7}	2.97×10^{-7}
100	2.4×10^{-2}	6.05×10^{-7}	2.60×10^{-7}	1.62×10^{-7}	7.03×10^{-7}
200	4.8×10^{-2}	1.06×10^{-6}	2.60×10^{-7}	1.62×10^{-7}	1.16×10^{-6}

Since only one basic event failure rate was manipulated, the results can be approximated as a linear function between the last two data points. Interpolation yields a factor of 165, or a basic event failure rate of 3.96×10^{-2} per demand. This shows that the drywell results are not particularly sensitive to the failure rate of the SRVs.

Sensitivity 2

In PSA-ES051, one of the assumptions concerning splice failure in the reactor building was that a splice needed to be heated above 212 °F before any degradation would occur. This was based on two facts. First, all of the non-conforming EQ splices had splice material covering the conductors. This was termed "no exposed metallics". In order for the splice to fail, the material properties of the splice material would need to be challenged. The second fact was derived from various test reports of EQ splices. In these reports, the activation temperature for the splice material was listed in the 235 °F to 310 °F range. PSA-ES051 assumed that 212 °F was low enough that the splice material properties would not be challenged, and consequently performance of those splices would not be degraded.

During the regulatory conference, the NRC asked the District to perform a sensitivity analysis on this assumption.

This sensitivity addresses the question in two different ways. The first way involved assuming a failure probability for splices located in rooms away from the break. This gives insights into the importance of the splice reliability itself. The second way was to adjust the threshold temperature for splice failure from 212 °F to a temperature for which there is high confidence that the performance of the splice will not be degraded. This gives insights into the overall affect of assuming a threshold temperature.

In order to address this sensitivity, other equipment that was not explicitly covered in PSA-ES051 needs to be discussed. This equipment had non-conforming splices located in areas that did not contain a HELB for any of the scenarios. The following tables describes this equipment and its impact on the PRA.

Table 2 – RX Bldg. 931' General Area Equipment with Non-Conforming Splices

Component	Effects on PRA
SW-MO-887MV SW-MO-886MV	Fails SW Crosstie to REC
SW-MO-650MV SW-MO-651MV	Fails SW to REC Heat Exchangers
REC-MOT-RECPA REC-MOT-RECPB	Fails REC System

REC-MOT-RECPC REC-MOT-RECPD	
REC-MO-695MV	No Effect - Critical loops may not be able to be separated
REC-PS-452A	No Additional Effect - Could trip non-Critical header
REC-MO-714MV REC-MO-713MV REC-MO-712MV REC-MO-711MV REC-MO-721MV REC-MO-722MV	No Additional Effect - These fail AS IS, and REC is already failed
REC-MO-700MV	No Effect - Maybe non-critical header could not be isolated
REC-MO-1329MV	No Effect - Maybe rad waste could not be isolated
PC-PT-512A	No Effect - One of many DW Pressure instruments

Table 3 – RX Bldg. 958' General Area Equipment with Non-Conforming Splices

Component	Effects on PRA
PC-MO-1310MV PC-MO-231MV PC-MO-306MV PC-SOV-SPV246	No Effect - Fails DW vent path

Table 4 – RX Bldg. 903' General Area Equipment with Non-Conforming Splices

Component	Effects on PRA
SW-MO-888MV SW-MO-889MV	Fails SW Crosstie to REC
RHR-MO-MO15A	No Significant Effect - Reduces reliability of RHR for SDC. Along with MO25B, this will only leave the C pump available for SDC
RHR-MO-MO25B	Fails RHR B Loop injection path
RHR-MO-MO34A	Fails A Loop of torus cooling
CS-MO-MO26A	Splices in test return line are assumed to fail A Loop of Core Spray
RR-MO-MO53A	No Effect - May lose isolation of A Recirc Loop
PC-MO-1311MV PC-MO-1312MV	No Effect - May lose DW dilution function
CRD-SOV-SO140A CRD-SOV-SO140B	No Effect - Backup Scram valves are done with their function within a few seconds of the event. Also, they do not contribute significantly to the reliability of RPS.

Each of the components in these areas that had an effect on the PRA already had a corresponding basic event in PSA-ES051 that could be used to simulate the failure of the splice. Therefore, the sequence CUTSETS from PSA-ES051 were applicable for this sensitivity.

The first sensitivity addressed here is the failure probability of non-conformances in areas away from the break. The basic events failure rates associated with these non-conformances were increased by 0.01, 0.1, 0.5, and 1.0 (limited to a value of 1.0). The CUTSETS for each HELB were then re-quantified to determine the resultant CDF. One thing to note is that the individual non-conformances were not set to the above value, but the representative basic event. This simulates a train or system reliability rather than a splice reliability.

In the scenarios where the failure probability was set to 1.0, it is recognized that all equipment located in the RX Bldg. that has been credited in the PRA is assumed to be failed. This leaves only BOP systems and Service Water injection available to mitigate the consequences of the break. Since the event trees used in PSA-ES051 are based on LOCA sequences and nominal reliability of systems located in the RX Bldg., BOP systems are not appropriately credited in HELB scenarios. This was not an issue in PSA-ES051 (in fact it added a small amount of conservatism to the results) because some RX Bldg. equipment remained available in all scenarios. In this sensitivity analysis, this credit needs to be explicitly accounted for.

There is an initial inventory of at least 73,000 gallons in the Hotwell at the beginning of the scenario. This is based on the minimum operating level in the Hotwell. This water is available for initial injection without any operator action. The normal (automatic) makeup is at a rate of ~200 gpm, which in not sufficient to balance decay heat until several hours into the scenario. It is assumed in this study that manual action needs to be taken to re-fill the Hotwell to continue the use of Feedwater and/or Condensate, even in the cases where isolation of the break is successful.

In the scenarios in which the operators have a limited time to establish Hotwell makeup, a system failure probability of 0.25 is assumed. This is based on the operators having approximately 20 minutes to establish makeup to the condenser. The time to make the decision to perform the action was set to 8 minutes to account for the transit time to the turbine building to take the action. (PAG-006, HRA, has a mean value of 0.13 and an upper bound of 0.23 for an 8 minute operator action, with procedures, and more than one abnormal event.) These scenarios include medium and large unisolated "liquid" breaks.

In the scenarios in which the operators have more time to establish Hotwell makeup, a system failure probability of 0.1 is assumed. This is based on the operators having approximately 1 hour to establish makeup to the condenser. The time to make the decision to perform the action was set to 20 minutes because the initial Hotwell depletion may not be apparent to the operators. (PAG-006, HRA, has a mean value of 2.7×10^{-2} and an upper bound of 6.4×10^{-2} for a 20 minute operator action, with procedures, and more than one abnormal event.) These scenarios include small unisolated "liquid" breaks and large unisolated "steam" breaks. (Analysis shows that the large steam breaks would have an operator action time frame of several hours, however this study assumes the shorter time frames for this class of HELB.)

In the scenarios in which the operators have ample time to establish Hotwell makeup, a system failure probability of 0.01 is assumed. This is based on the operators having more than an hour to establish makeup to the condenser. (PAG-006, HRA, has a mean value of 0. 2×10^{-3} and an upper bound of 7×10^{-3} for a 60 minute operator action, with procedures, and more than one abnormal event.) These scenarios include isolated breaks and unisolated "small-steam" breaks.

Finally, for large breaks in the steam tunnel, regardless of isolation, the value was set to 1.0. This is because the turbine building temperature is also affected for these breaks, and Condensate is assumed unavailable.

In the scenarios where the failure probability was set to 0.1 or greater, some of the sequences give a result that is higher than the 1.0 cases (above). This is attributed to one of two reasons. First, if the sequence came from a LOCA based event tree, the BOP systems may not have been fully credited. Second, the method that the District uses to quantify the scenarios uses the "rare event approximation" when quantifying the success branches in the event trees. This approximation can cause some sequences to be artificially high in some cases. This phenomena is not a concern unless a system failure probability is high (greater than 0.1). This can occur in these scenarios. To balance this, the CCDP for these scenarios will be limited to the failure probability 1.0 cases described above.

This sensitivity does not affect breaks in the drywell because there is no propagation path for the steam from the LOCA to the areas in the RX Bldg. It was determined that breaks in the steam tunnel that are 4" equivalent diameter will not cause the door between the steam tunnel and the RX Bldg. to open. (The blowout panels to the Turbine Building relieve the pressure prior to opening the door to the RX Bldg.) This prevents the effects of the HELB from propagating into the RX Bldg. and affecting splices. The analysis also shows that 10" equivalent diameter breaks will cause the door to open. For the purposes of this sensitivity, it is assumed that a large HELB in the steam tunnel will have a 50% probability of opening the door. Medium and small breaks will not cause the door to open. If the door does open, splices in the reactor building will be included in the sensitivity. If it does not, the PSA-ES051 CCDP values will be used.

The result for each of these scenarios is summarized below. The total breakdown for each room and each break size can be found in the spreadsheet file "Components-Splices in Areas.XLS". These are listed as cases 3 through 6 for each area.

Table 5 – Results for Non-Conforming Splices in Areas Away from the Break

	Base	ES051	P=0.01	P=0.1	P=0.5	P=1
Drywell	1.39E-07	1.59E-07	1.59E-07	1.59E-07	1.59E-07	1.59E-07
Steam Tunnel	2.16E-08	2.37E-07	2.38E-07	2.62E-07	1.49E-06	6.52E-05
HPCI Room	2.22E-10	4.59E-10	5.22E-10	1.34E-09	1.98E-07	1.77E-06
NE Quad	5.21E-11	5.44E-11	8.21E-11	4.22E-10	4.71E-08	4.20E-07
SW Quad	8.45E-12	1.89E-11	2.14E-11	5.52E-11	6.69E-09	5.83E-08
Torus Room	2.48E-10	1.35E-08	3.98E-08	3.17E-07	6.14E-07	6.93E-07
RHR HX A Room	2.52E-11	3.54E-11	4.50E-11	3.09E-10	3.66E-08	1.84E-07
RHR HX B Room	8.29E-12	1.21E-11	1.43E-11	9.07E-11	1.36E-08	6.73E-08
Inj Valve Room	6.06E-11	8.58E-09	1.01E-08	4.39E-08	2.21E-07	4.61E-07
RWCU P A Room	1.48E-11	1.48E-11	6.32E-11	4.05E-10	2.57E-07	4.56E-07
RWCU P B Room	1.48E-11	1.48E-11	6.32E-11	4.05E-10	2.57E-07	4.56E-07
RWCU HX Room	4.19E-11	4.19E-11	1.56E-10	9.62E-10	6.06E-07	1.15E-06
Total	1.61E-07	4.19E-07	4.48E-07	7.85E-07	3.91E-06	7.11E-05
Increase		2.57E-07	2.87E-07	6.24E-07	3.75E-06	7.10E-05

The results above are expected because virtually all of the sequences would require more than one failure of equipment affected by splices to occur to cause core damage. In many cases, 3 to 5 failures are necessary. This makes the CDF vary proportionally to the increase in splice failure probability raised to the power of the number of components required to fail. Specifically:

- When the failure probability is increased by 0.01, this is effectively doubling the failure rate of the affected components. A minimal increase in the CDF is expected because each component would only contribute an additional few percent. Sequences are still dominated by common cause failures of support systems, and not the combination of multiple splice failures.

- When the failure probability is increased by 0.1, the effect of double and triple splice failure should begin to be apparent. In those cases, these failures would be comparable to increasing the common cause terms in the model.

- When the failure probability is increased by 0.5 to 1.0, the model results should be driven by scenarios that have multiple splice failures. The overall probability is maintained at the level reported due to the relatively low initiating event frequency, and the availability of equipment outside the reactor building to mitigate most sequences.

The results from Table 5 were graphed to determine the failure probability that would cause the results of the sensitivity to go above 10^{-6} per year. This value is approximately 20%.

The conclusion of this sensitivity is that all of the splices away from the HELB area would simultaneously need to degrade such that the associated SSCs have a 20% probability of failure in order to change the results of PSA-ES051. Because of the condition of the non-conformances (all splices are covered by splice material, and the material properties of the splices is not challenged by the environment experienced during the HELBs), it is judged that this type of impact is not realistic for the types of non-conformances found at CNS.

The next sensitivity addressed here lowers the threshold for splice failure from 212 °F at the splice to a temperature of the room containing the splice for which there is high confidence that the non-conforming splices will not fail. The maximum normal temperatures in the reactor building and steam tunnel range from 104 °F to 150 °F, depending on the specific area. Non-conforming splices and non-EQ components evaluated in PSA-ES051 are located in areas that have been subject to actual temperatures of 145 °F for several days, with peaks reaching nearly 150 °F. This equipment has not failed in the past due to temperature effects. It is therefore assumed, with high confidence, that splices and non-EQ components will not degrade (i.e. failure probability remains at their nominal values) unless the temperature in the area in which they are located rises above 150 °F. For additional conservatism, it will be assumed that splices and non-EQ components in the 903' and 931' general areas and in the RHR heat exchanger rooms will begin to degrade at 120 °F. For other areas that normally experience higher temperatures during operation (such as the Quads, HPCI room, Torus Area, Injection Valve room, and the Steam Tunnel), a temperature of 140 °F will be used to establish the onset of degradation. The steam tunnel design temperature is irrelevant, since only steam tunnel breaks affect that area.

All areas and break sizes were analyzed to determine if an isolation signal would be generated. It was verified that all HELBs (with the exception of the RCIC critical crack in the Steam Tunnel and Feedwater injection line breaks) would generate at least one isolation signal. Most would generate at least two.

Also, the steam tunnel will be protected from the effects of HELBs in the RX Bldg. by a door. This door is effectively sealed (only a ½" gap at the bottom) and will not allow environmental effects from the RX Bldg. into the steam tunnel.

Finally, this method also has the same limitation for the LOCA event trees as the splice failure probability sensitivity. Because of this, in sequences where the LOCA event trees showed no mitigating capability and it was determined that BOP systems or Service Water injection were actually viable mitigating systems, the CCDPs from the sensitivity above were used. To assess the impact of this, an additional column was added to the table that left those CCDPs at 1.0.

Just as in PSA-ES051, this study will look at each break area individually.

Drywell

Breaks in the drywell do not propagate a harsh steam environment into the reactor building or steam tunnel, so the values in PSA-ES051 remain valid.

Steam Tunnel

All breaks in the steam tunnel will affect all non-conforming equipment in the steam tunnel. Gothic analysis indicates that 4" steam line breaks will not cause the door between the steam tunnel and the reactor building to open, while 10" steam line breaks will. Also, Gothic shows that 18" feedwater injection line breaks will cause the door to open, but temperatures will not be sufficient to affect the equipment in the reactor building.

For the purposes of this sensitivity analysis, 50% of the large breaks in the steam tunnel will affect equipment in the reactor building. If the break isolates, only the equipment in the 903' general area will be affected. If it does not isolate, the 931' level will also be affected. Equipment in the RHR Heat Exchanger rooms and the Injection Valve room will be protected by their doors. Neither the Torus area nor the Quads are affected by these breaks.

All other breaks will have no effect on equipment in the reactor building. For these, the results from PSA-ES051 remain valid.

HPCI Room

All breaks in the HPCI room will affect both the HPCI room and the SW Quad, since the flow path out of the HPCI room is through that Quad. 4" breaks that isolate will only affect the HPCI room and SW Quad, while 10" isolated breaks can also affect the Torus area and the 903' general area. For unisolated breaks 2" and larger, 903' and 931' levels will eventually be affected. The Torus area will also be affected. If the unisolated break is smaller than 2", only the HPCI room and the SW Quad will be affected.

In all cases, the RHR HX rooms and the Injection Valve room will be protected by their doors. The NE and SE Quads will also be protected because there is no significant flow path through those rooms.

NE Quad

If the break isolates, only the NE Quad will be affected. If the break does not isolate and it is larger than 2", the Torus Area, NW and SW Quads, 903' general area, and eventually the 931' general area would be affected. Smaller breaks will only affect the NE Quad.

In all cases, the RHR HX rooms and the Injection Valve room will be protected by their doors. The SE Quad will also be protected because there is no significant flow path through that room.

SW Quad

All breaks in the SW Quad will affect both the HPCI room and the SW Quad. 4" breaks that isolate will only affect the HPCI room and SW Quad, while 10" isolated breaks can also affect the Torus area and the 903' general area. For unisolated breaks 2" and larger, 903' and 931' levels will eventually be affected. The Torus area will also be affected. If the unisolated break is smaller than 2", only the HPCI room and the SW Quad will be affected.

In all cases, the RHR HX rooms and the Injection Valve room will be protected by their doors. The NE and SE Quads will also be protected because there is no significant flow path through those rooms.

Torus Area

Isolated breaks larger than 4" will affect the NW and SW Quads and the 903' general area. Smaller isolated breaks will only affect the Torus area. (All HPCI steam line breaks in the Torus area are assumed to also affect the SW Quad.) Unisolated breaks larger than 2" will affect the NW and SW Quads, the 903' general area, and eventually the 931' general area. Smaller unisolated breaks will only affect the Torus area. Both HPCI and RCIC will isolate on high area temperature for any break in the Torus Area.

In all cases, the RHR HX rooms and the Injection Valve room will be protected by their doors. The NE and SE Quads will also be protected because there is no significant flow path through those rooms.

RHR A Heat Exchanger Room

MAAP analysis shows that 4" isolated breaks will affect the 903' general area, while 10" breaks will eventually affect the 931' general area. This sensitivity assumes that the large isolated breaks will affect 931' and all isolated breaks will affect 903'. Without isolation, breaks smaller than 4" will affect 903' and 931'. If it is larger than 4", the entire reactor building will be affected.

In all cases, the opposite RHR HX room and the Injection Valve room will be protected by their doors.

RHR B Heat Exchanger Room

MAAP analysis shows that 4" isolated breaks will affect the 903' general area, while 10" breaks will eventually affect the 931' general area. This sensitivity assumes that the large isolated breaks will affect 931' and all isolated breaks will affect 903'. Without isolation, breaks smaller than 4" will affect 903' and 931'. If it is larger than 4", the entire reactor building will be affected.

In all cases, the opposite RHR HX room and the Injection Valve room will be protected by their doors.

Injection Valve Room

MAAP analysis shows that 4" isolated breaks will affect the 903' general area, while 10" breaks will eventually affect the 931' general area. This sensitivity assumes that the large isolated breaks will affect 931' and all isolated breaks will affect 903'. Without isolation, breaks smaller than 4" will affect 903' and 931'. If it is larger than 4", the entire reactor building will be affected (however reactor depressurization should prevent this).

In all cases, the RHR HX rooms will be protected by their doors.

RWCU Pump A Room

If the break isolates, only 931' level is affected. If it does not, 903' is also affected.

In all cases, the RHR HX rooms and the Injection Valve room will be protected by their doors.

RWCU Pump B Room

If the break isolates, only 931' level is affected. If it does not, 903' is also affected.

In all cases, the RHR HX rooms and the Injection Valve room will be protected by their doors.

RWCU Heat Exchanger Room

All breaks 4" and larger affect both the 931' and 903' levels, regardless of isolation. Smaller breaks do not affect 903' if isolation is successful.

In all cases, the A RHR HX room and the Injection Valve room will be protected by their doors. The B RHR HX room is not protected for the larger breaks because it is in part of the main flow path for the steam.

The following table summarizes the results for each of the rooms.

Table 6 – Results for Design Temperature Sensitivity

	Base	ES051	Plant Experience Temperature with BOP	Plant Experience Temperature without BOP
Drywell	1.39E-07	1.59E-07	1.59E-07	1.59E-07
Steam Tunnel	2.16E-08	2.37E-07	2.38E-07	2.38E-07
HPCI Room	2.22E-10	4.59E-10	1.98E-08	1.98E-08
NE Quad	5.21E-11	5.44E-11	3.61E-10	3.61E-10
SW Quad	8.45E-12	1.89E-11	1.74E-09	1.74E-09
Torus Room	2.48E-10	1.35E-08	1.83E-07	2.03E-07
RHR HX A Room	2.52E-11	3.54E-11	8.89E-10	8.25E-09
RHR HX B Room	8.29E-12	1.21E-11	1.16E-10	9.52E-10
Inj Valve Room	6.06E-11	8.58E-09	2.70E-07	4.23E-07
RWCU P A Room	1.48E-11	1.48E-11	1.46E-10	1.46E-10
RWCU P B Room	1.48E-11	1.48E-11	1.46E-10	1.46E-10
RWCU HX Room	4.19E-11	4.19E-11	2.35E-09	2.35E-09
Total	1.61E-07	4.19E-07	8.76E-07	1.06E-06
Increase		2.57E-07	7.15E-07	8.96E-07

These results are expected, since nearly every scenario retains multiple means of mitigating the initiating event. Specifically:

- Only one break location leads to a loss of all injection from systems located in the Reactor Building, the unisolated breaks in the injection valve room. In this scenario, condensate is capable of providing long term means of core cooling.
- Only one break location results in a single (inside reactor building) core cooling train remaining available for all breaks, regardless of break size or isolation. This is the torus room. The rest of the locations have multiple core cooling trains available for smaller unisolated and all isolated breaks.
- The steam tunnel and torus room are the only locations where the break results in a loss both HPCI and RCIC, regardless of break size or isolation.
- All other isolated breaks have more than one train of core cooling equipment available, requiring multiple failures to occur before a core damage event would occur. All other unisolated breaks have at least one train of core cooling equipment available, requiring multiple failures to occur before a core damage event would result (i.e. loss of at least one isolation valve plus failure of at least one core cooling train).

Table 6 shows that most of the risk is a result in breaks where limited capability is retained, the torus room, injection valve room, and steam tunnel. Credit for the re-fill of the hotwell is most important for the injection valve room HELBs, however it does not provide sufficient impact to change the results of the sensitivity analysis.

The conclusion of this sensitivity analysis is that the results of PSA-ES051 are not sensitive to the temperature picked as the threshold for splice material degradation.

References

1) CNS PSA 96b

2) PSA-ES051 revision 3

3) PAG-006, Project Analysis Guideline for the Cooper Nuclear Station Probabilistic Risk Assessment Human Reliability Analysis Task

4) PRA00006, Plant Response to Spurious Operation of all SRV's due to Fire in Panel 9-3

4) PRA01013, Calculation of Condensate Flow Rates to the Condenser

Files

All of the results from the various runs conducted for this study can be found in:

Components-Splices in Areas rev 1.XLS
HELB Analysis – NRC Sensitivities.XLS

These files are being retained as part of the tier 2 documentation for the non-conforming EQ treatment issue.

B2

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
SW-MO-888MV	Emergency Return from North Critical Loop	Fails SW Crosstie to REC	903' General		X					X
SW-MO-889MV	Emergency Return from South Critical Loop	Fails SW Crosstie to REC	903' General		X					X
RHR-MO-MO15A	RHR Pump A SDC Suction	Reduces reliability of RHR for SDC. Along with MO25B, this will only leave the C pump available for SDC	903' General		X					X
RHR-MO-MO25B	RHR Loop B Inject Inboard Isolation	Fails RHR B Loop injection path	903' General		X					X
RHR-MO-MO34A	Torus Cooling Loop A Inboard Throttle	Fails A Loop of torus cooling	903' General		X					X
CS-MO-MO26A	CS A Test Line Recirc	Fails A Loop of Core Spray	903' General		X					X
RR-MO-MO53A	Reactor Recirculation Pump Discharge Isolation	No Effect - May lose isolation of A Recirc Loop	903' General		X					X
PC-MO-1311MV	Drywell Dilution Supply Isolation	No Effect - May lose DW dilution function	903' General		X					X
PC-MO-1312MV	Drywell Dilution Supply Isolation	No Effect - May lose DW dilution function	903' General		X					X
CRD-SOV-SO140A/B	Trip System Backup Scram Valves	No Effect - Backup Scram valves are done with their function within a few seconds of the event. Also, they do not contribute significantly to the reliability of RPS.	903' General		X					X
SW-MO-887MV	Emergency Supply to REC South Critical Loop	Fails SW Crosstie to REC	931' General							X
SW-MO-886MV	Emergency Supply to REC North Critical Loop	Fails SW Crosstie to REC	931' General							X
SW-MO-650MV	REC Heat Exchanger A Outlet	Fails SW to REC Heat Exchangers	931' General							X
SW-MO-651MV	REC Heat Exchanger B Outlet	Fails SW to REC Heat Exchangers	931' General							X
REC-MOT-RECPA	REC Pump A	Fails REC System	931' General							X
REC-MOT-RECPB	REC Pump B	Fails REC System	931' General							X
REC-MOT-RECPC	REC Pump C	Fails REC System	931' General							X
REC-MOT-RECPD	REC Pump D	Fails REC System	931' General							X

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
REC-MO-695MV	REC Critical Loop Supply Crosstie	No Effect - Critical loops may not be able to be separated	931' General							X
REC-PS-452A	REC HX Outlet Header Low Pressure Switch	Could trip non-Critical header	931' General							X
REC-MO-714MV	South Critical Loop Supply	No Additional Effect - These fail AS IS	931' General							X
REC-MO-713MV	REC HX B Outlet	No Additional Effect - These fail AS IS	931' General							X
REC-MO-712MV	REC HX A Outlet	No Additional Effect - These fail AS IS	931' General							X
REC-MO-711MV	North Critical Loop Supply	No Additional Effect - These fail AS IS	931' General							X
REC-MO-721MV	Non-Critical Return to REC-P-A and REC-P-B	No Additional Effect - These fail AS IS	931' General							X
REC-MO-722MV	Non-Critical Return to REC-P-C and REC-P-D	No Additional Effect - These fail AS IS	931' General							X
REC-MO-700MV	Non-Critical Supply Header Shutoff	No Effect - Maybe non-critical header could not be isolated	931' General							X
REC-MO-1329MV	ARW Building Supply	No Effect - Maybe rad waste could not be isolated	931' General							X
PC-PT-512A	Drywell Pressure Indication	No Effect - One of many DW Pressure instruments	931' General							X

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
SW-SOV-SPV451A/B	Pilot valve for SW-AO-AO451 (SW flow control from REC HX)	Fails both REC heat exchangers and the SW backup to REC.	Torus Room		X		X	X	X	X
PC-MO-230MV	Torus Purge vent inboard isolation	Normally closed valve fails closed which, along with the failure of PC-MO-305MV, eliminates the alternate vent flow path. No impact on PRA	Torus Room		X		X	X	X	X
PC-MO-232MV	Drywell purge supply Inboard Isolation	Normally closed valve fails in the closed position that blocks drywell purge flow. No impact on PRA	Torus Room		X		X	X	X	X
PC-MO-305MV	PC-MOV-230MV Bypass	Normally closed valve fails closed which, along with the failure of PC-MO-230MV, eliminates the alternate vent flow path. No impact on PRA	Torus Room		X		X	X	X	X
PC-MO-1305MV	Drywell Dilution – Train A	Normally closed valve fails closed preventing N2 injection to the drywell through train A. No impact on PRA.	Torus Room		X		X	X	X	X
PC-MO-1308MV	Suppression Chamber Vent Isolation	Normally closed valve fails closed preventing venting of the wetwell during standby N2 injection. No impact on PRA.	Torus Room		X		X	X	X	X
PC-SOV-SPV238	Pilot valve for 238 AV (outboard drywell purge supply isolation)	Valve fails AO238 in the closed position which blocks nitrogen purge to the drywell. No impact on PRA.	Torus Room		X		X	X	X	X
PC-SOV-SPV245	Pilot valve for PC-AO-245AV (wetwell purge vent outboard isolation)	Normally closed valve fails closed. This blocks wetwell vent flow. If the valve fails open, the inboard MO provides isolation and venting is possible. No impact on PRA	Torus Room		X		X	X	X	X
PC-SOV-SPV32	Pilot Valve on PC-AO-AO32 (Hard Pipe Vent)	Valve fails open which is the desired position. No impact on PRA.	Torus Room		X		X	X	X	X
PC-MO-233MV	Wetwell Purge Supply Inboard Isolation	Normally closed valve fails in the closed position which blocks flow through the supply duct and fails the hard pipe vent.	Torus Room		X		X	X	X	X

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
PC-MO-1301MV	Suppression Chamber Standby N2 Supply – Train B	Valve closes on a group 2 isolation and fails closed preventing N2 injection to the wetwell if train A also fails. No impact on PRA.	Torus Room		X		X	X	X	X
PC-MO-1302MV	Suppression Chamber Standby N2 Supply – Train B	Valve closes on a group 2 isolation and fails closed preventing N2 injection to the wetwell if train A also fails. No impact on PRA.	Torus Room		X		X	X	X	X
PC-MO-1303MV	Suppression Chamber Standby N2 Supply – Train A	Normally closed valve fails closed preventing N2 injection to the wetwell if train B also fails. No impact on PRA.	Torus Room		X		X	X	X	X
PC-MO-1304MV	Suppression Chamber Standby N2 Supply – Train A	Normally closed valve fails closed preventing N2 injection to the wetwell if train B also fails. No impact on PRA.	Torus Room		X		X	X	X	X
PC-TE-1/2A-H	Torus water temperature	EOP containment parameter for HCTL, per ESP 5.8.9, several alternate temperature indications and recorders available (e.g. RHR HX inlet). No impact on PRA	Torus Room		X		X	X	X	X
PC-SOV-SPV237	Pilot valve for 237 AV (outboard wetwell purge supply isolation)	Valve fails AO237 in the closed position which blocks flow through the supply duct and fails the hard pipe vent. Inadvertent opening is not a problem since the inboard valve is closed.	Torus Room		X		X	X	X	X
RHR-MO-920MV	Steam supply valve to AOG	Designed to close to prevent diversion of steam from HPCI. No impact on PRA.	Torus Room		X		X	X	X	X
SW-MO-888MV	Emergency Return from North Critical Loop	Fails SW Crosstie to REC	903' General		X		X	X	X	X
SW-MO-889MV	Emergency Return from South Critical Loop	Fails SW Crosstie to REC	903' General		X		X	X	X	X
RHR-MO-MO15A	RHR Pump A SDC Suction	Reduces reliability of RHR for SDC. Along with MO25B, this will only leave the C pump available for SDC	903' General		X		X	X	X	X
RHR-MO-MO25B	RHR Loop B Inject Inboard Isolation	Fails RHR B Loop injection path	903' General		X		X	X	X	X
RHR-MO-MO34A	Torus Cooling Loop A Inboard Throttle	Fails A Loop of torus cooling	903' General		X		X	X	X	X

Components With More Than Mild Environment But Less Than 212 F For Breaks In The HPCI Room

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
CS-MO-MO26A	CS A Test Line Recirc	Fails A Loop of Core Spray	903' General		X		X	X	X	X
RR-MO-MO53A	Reactor Recirculation Pump Discharge Isolation	No Effect - May lose isolation of A Recirc Loop	903' General		X		X	X	X	X
PC-MO-1311MV	Drywell Dilution Supply Isolation	No Effect - May lose DW dilution function	903' General		X		X	X	X	X
PC-MO-1312MV	Drywell Dilution Supply Isolation	No Effect - May lose DW dilution function	903' General		X		X	X	X	X
CRD-SOV-SO140A/B	Trip System Backup Scram Valves	No Effect - Backup Scram valves are done with their function within a few seconds of the event. Also, they do not contribute significantly to the reliability of RPS.	903' General		X		X	X	X	X
SW-MO-887MV	Emergency Supply to REC South Critical Loop	Fails SW Crosstie to REC	931' General				X	X	X	X
SW-MO-886MV	Emergency Supply to REC North Critical Loop	Fails SW Crosstie to REC	931' General				X	X	X	X
SW-MO-650MV	REC Heat Exchanger A Outlet	Fails SW to REC Heat Exchangers	931' General				X	X	X	X
SW-MO-651MV	REC Heat Exchanger B Outlet	Fails SW to REC Heat Exchangers	931' General				X	X	X	X
REC-MOT-RECPA	REC Pump A	Fails REC System	931' General				X	X	X	X
REC-MOT-RECPB	REC Pump B	Fails REC System	931' General				X	X	X	X
REC-MOT-RECPC	REC Pump C	Fails REC System	931' General				X	X	X	X
REC-MOT-RECPD	REC Pump D	Fails REC System	931' General				X	X	X	X
REC-MO-695MV	REC Critical Loop Supply Crosstie	No Effect - Critical loops may not be able to be separated	931' General				X	X	X	X
REC-PS-452A	REC HX Outlet Header Low Pressure Switch	Could trip non-Critical header	931' General				X	X	X	X
REC-MO-714MV	South Critical Loop Supply	No Additional Effect - These fail AS IS	931' General				X	X	X	X
REC-MO-713MV	REC HX B Outlet	No Additional Effect - These fail AS IS	931' General				X	X	X	X
REC-MO-712MV	REC HX A Outlet	No Additional Effect - These fail AS IS	931' General				X	X	X	X
REC-MO-711MV	North Critical Loop Supply	No Additional Effect - These fail AS IS	931' General				X	X	X	X

Components With More Than Mild Environment But Less Than 212 F For Breaks In The HPCI Room

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
REC-MO-721MV	Non-Critical Return to REC-P-A and REC-P-B	No Additional Effect - These fail AS IS	931' General				X	X	X	X
REC-MO-722MV	Non-Critical Return to REC-P-C and REC-P-D	No Additional Effect - These fail AS IS	931' General				X	X	X	X
REC-MO-700MV	Non-Critical Supply Header Shutoff	No Effect - Maybe non-critical header could not be isolated	931' General				X	X	X	X
REC-MO-1329MV	ARW Building Supply	No Effect - Maybe rad waste could not be isolated	931' General				X	X	X	X
PC-PT-512A	Drywell Pressure Indication	No Effect - One of many DW Pressure instruments	931' General				X	X	X	X

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
SW-SOV-SPV451A/B	Pilot valve for SW-AO-AO451 (SW flow control from REC HX)	Fails both REC heat exchangers and the SW backup to REC.	Torus Room				X	X	X	X
PC-MO-230MV	Torus Purge vent inboard isolation	Normally closed valve fails closed which, along with the failure of PC-MO-305MV, eliminates the alternate vent flow path. No impact on PRA	Torus Room				X	X	X	X
PC-MO-232MV	Drywell purge supply Inboard Isolation	Normally closed valve fails in the closed position that blocks drywell purge flow. No impact on PRA	Torus Room				X	X	X	X
PC-MO-305MV	PC-MOV-230MV Bypass	Normally closed valve fails closed which, along with the failure of PC-MO-230MV, eliminates the alternate vent flow path. No impact on PRA	Torus Room				X	X	X	X
PC-MO-1305MV	Drywell Dilution – Train A	Normally closed valve fails closed preventing N2 injection to the drywell through train A. No impact on PRA.	Torus Room				X	X	X	X
PC-MO-1308MV	Suppression Chamber Vent Isolation	Normally closed valve fails closed preventing venting of the wetwell during standby N2 injection. No impact on PRA.	Torus Room				X	X	X	X
PC-SOV-SPV238	Pilot valve for 238 AV (outboard drywell purge supply isolation)	Valve fails AO238 in the closed position which blocks nitrogen purge to the drywell. No impact on PRA.	Torus Room				X	X	X	X
PC-SOV-SPV245	Pilot valve for PC-AO-245AV (wetwell purge vent outboard isolation)	Normally closed valve fails closed. This blocks wetwell vent flow. If the valve fails open, the inboard MO provides isolation and venting is possible. No impact on PRA	Torus Room				X	X	X	X
PC-SOV-SPV32	Pilot Valve on PC-AO-AO32 (Hard Pipe Vent)	Valve fails open which is the desired position. No impact on PRA.	Torus Room				X	X	X	X
PC-MO-233MV	Wetwell Purge Supply Inboard Isolation	Normally closed valve fails in the closed position which blocks flow through the supply duct and fails the hard pipe vent.	Torus Room				X	X	X	X

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
PC-MO-1301MV	Suppression Chamber Standby N2 Supply – Train B	Valve closes on a group 2 isolation and fails closed preventing N2 injection to the wetwell if train A also fails. No impact on PRA.	Torus Room				X	X	X	X
PC-MO-1302MV	Suppression Chamber Standby N2 Supply – Train B	Valve closes on a group 2 isolation and fails closed preventing N2 injection to the wetwell if train A also fails. No impact on PRA.	Torus Room				X	X	X	X
PC-MO-1303MV	Suppression Chamber Standby N2 Supply – Train A	Normally closed valve fails closed preventing N2 injection to the wetwell if train B also fails. No impact on PRA.	Torus Room				X	X	X	X
PC-MO-1304MV	Suppression Chamber Standby N2 Supply – Train A	Normally closed valve fails closed preventing N2 injection to the wetwell if train B also fails. No impact on PRA.	Torus Room				X	X	X	X
PC-TE-1/2A-H	Torus water temperature	EOP containment parameter for HCTL, per ESP 5.8.9, several alternate temperature indications and recorders available (e.g. RHR HX inlet). No impact on PRA	Torus Room				X	X	X	X
PC-SOV-SPV237	Pilot valve for 237 AV (outboard wetwell purge supply isolation)	Valve fails AO237 in the closed position which blocks flow through the supply duct and fails the hard pipe vent. Inadvertent opening is not a problem since the inboard valve is closed.	Torus Room				X	X	X	X
RHR-MO-920MV	Steam supply valve to AOG	Designed to close to prevent diversion of steam from HPCI. HPCI assumed failed due to high area temperature isolation. No impact on PRA.	Torus Room				X	X	X	X
HV-MOT-(FC-R-1H)	SW Quad Fan Coil Unit	FCU fails to run which fails RHR loop B and HPCI injection	SW Quad				X	X	X	X
RHR-MO-MO16B	RHR Pump B & D Min Flow	Normally open valve will fail closed but will only fail RHR Loop B pumps if vessel pressure is too high to inject	SW Quad				X	X	X	X
RHR-MO-MO38B	Suppression Chamber Spray Loop B Inboard Throttle	The normally closed valve will fail closed which fails Loop B of Torus Spray	SW Quad				X	X	X	X

Components With More Than Mild Environment But Less Than 212 F For Breaks In The NE Quad

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
RHR-MO-MO39B	Suppression Chamber Cooling Loop B Outboard Isolation	The normally closed valve will fail closed which fails Loop B of Suppression Pool Cooling and Torus Spray	SW Quad				X	X	X	X
RHR-DPIS-125B	B RHR HX Discharge Min Flow Control	Signal fails which prevents auto reclosing of minimum flow valve after pump start. No impact on PRA.	SW Quad				X	X	X	X
HV-MOT-(FC-R-1J)	NW Quad Fan Coil Unit	FCU fails to run which fails RHR loop A	NW Quad				X	X	X	X
RHR-MO-MO16A	RHR Pump A & C Min Flow	Normally open valve will fail closed but will only fail RHR Loop A pumps if vessel pressure is too high to inject	NW Quad				X	X	X	X
RHR-MO-MO38A	Suppression Chamber Spray Loop A Inboard Throttle	The normally closed valve will fail closed which fails Loop A of Torus Spray	NW Quad				X	X	X	X
RHR-MO-MO39A	Suppression Chamber Cooling Loop A Outboard Isolation	The normally closed valve will fail closed which fails Loop A of Suppression Pool Cooling and Torus Spray	NW Quad				X	X	X	X
RHR-DPIS-125A	A RHR HX Discharge Min Flow Control	Signal fails which prevents auto reclosing of minimum flow valve after pump start. No impact on PRA.	NW Quad				X	X	X	X
SW-MO-888MV	Emergency Return from North Critical Loop	Fails SW Crosstie to REC	903' General				X	X	X	X
SW-MO-889MV	Emergency Return from South Critical Loop	Fails SW Crosstie to REC	903' General				X	X	X	X
RHR-MO-MO15A	RHR Pump A SDC Suction	Reduces reliability of RHR for SDC. Along with MO25B, this will only leave the C pump available for SDC	903' General				X	X	X	X
RHR-MO-MO25B	RHR Loop B Inject Inboard Isolation	Fails RHR B Loop injection path	903' General				X	X	X	X
RHR-MO-MO34A	Torus Cooling Loop A Inboard Throttle	Fails A Loop of torus cooling	903' General				X	X	X	X
CS-MO-MO26A	CS A Test Line Recirc	Fails A Loop of Core Spray	903' General				X	X	X	X
RR-MO-MO53A	Reactor Recirculation Pump Discharge Isolation	No Effect - May lose isolation of A Recirc Loop	903' General				X	X	X	X

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
PC-MO-1311MV	Drywell Dilution Supply Isolation	No Effect - May lose DW dilution function	903' General				X	X	X	X
PC-MO-1312MV	Drywell Dilution Supply Isolation	No Effect - May lose DW dilution function	903' General				X	X	X	X
CRD-SOV-SO140A/B	Trip System Backup Scram Valves	No Effect - Backup Scram valves are done with their function within a few seconds of the event. Also, they do not contribute significantly to the reliability of RPS.	903' General				X	X	X	X
SW-MO-887MV	Emergency Supply to REC South Critical Loop	Fails SW Crosstie to REC	931' General				X	X	X	X
SW-MO-886MV	Emergency Supply to REC North Critical Loop	Fails SW Crosstie to REC	931' General				X	X	X	X
SW-MO-650MV	REC Heat Exchanger A Outlet	Fails SW to REC Heat Exchangers	931' General				X	X	X	X
SW-MO-651MV	REC Heat Exchanger B Outlet	Fails SW to REC Heat Exchangers	931' General				X	X	X	X
REC-MOT-RECPA	REC Pump A	Fails REC System	931' General				X	X	X	X
REC-MOT-RECPB	REC Pump B	Fails REC System	931' General				X	X	X	X
REC-MOT-RECPC	REC Pump C	Fails REC System	931' General				X	X	X	X
REC-MOT-RECPD	REC Pump D	Fails REC System	931' General				X	X	X	X
REC-MO-695MV	REC Critical Loop Supply Crosstie	No Effect - Critical loops may not be able to be separated	931' General				X	X	X	X
REC-PS-452A	REC HX Outlet Header Low Pressure Switch	Could trip non-Critical header	931' General				X	X	X	X
REC-MO-714MV	South Critical Loop Supply	No Additional Effect - These fail AS IS	931' General				X	X	X	X
REC-MO-713MV	REC HX B Outlet	No Additional Effect - These fail AS IS	931' General				X	X	X	X
REC-MO-712MV	REC HX A Outlet	No Additional Effect - These fail AS IS	931' General				X	X	X	X
REC-MO-711MV	North Critical Loop Supply	No Additional Effect - These fail AS IS	931' General				X	X	X	X
REC-MO-721MV	Non-Critical Return to REC-P-A and REC-P-B	No Additional Effect - These fail AS IS	931' General				X	X	X	X
REC-MO-722MV	Non-Critical Return to REC-P-C and REC-P-D	No Additional Effect - These fail AS IS	931' General				X	X	X	X

Components With More Than Mild Environment But Less Than 212 F For Breaks In The NE Quad

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
REC-MO-700MV	Non-Critical Supply Header Shutoff	No Effect - Maybe non-critical header could not be isolated	931' General				X	X	X	X
REC-MO-1329MV	ARW Building Supply	No Effect - Maybe rad waste could not be isolated	931' General				X	X	X	X
PC-PT-512A	Drywell Pressure Indication	No Effect - One of many DW Pressure instruments	931' General				X	X	X	X

Components With More Than Mild Environment But Less Than 212 F For Breaks In The SW Quad

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
SW-SOV-SPV451A/B	Pilot valve for SW-AO-AO451 (SW flow control from REC HX)	Fails both REC heat exchangers and the SW backup to REC.	Torus Room		X		X	X	X	X
PC-MO-230MV	Torus Purge vent inboard isolation	Normally closed valve fails closed which, along with the failure of PC-MO-305MV, eliminates the alternate vent flow path. No impact on PRA	Torus Room		X		X	X	X	X
PC-MO-232MV	Drywell purge supply Inboard Isolation	Normally closed valve fails in the closed position that blocks drywell purge flow. No impact on PRA	Torus Room		X		X	X	X	X
PC-MO-305MV	PC-MOV-230MV Bypass	Normally closed valve fails closed which, along with the failure of PC-MO-230MV, eliminates the alternate vent flow path. No impact on PRA	Torus Room		X		X	X	X	X
PC-MO-1305MV	Drywell Dilution – Train A	Normally closed valve fails closed preventing N2 injection to the drywell through train A. No impact on PRA.	Torus Room		X		X	X	X	X
PC-MO-1308MV	Suppression Chamber Vent Isolation	Normally closed valve fails closed preventing venting of the wetwell during standby N2 injection. No impact on PRA.	Torus Room		X		X	X	X	X
PC-SOV-SPV238	Pilot valve for 238 AV (outboard drywell purge supply isolation)	Valve fails AO238 in the closed position which blocks nitrogen purge to the drywell. No impact on PRA.	Torus Room		X		X	X	X	X
PC-SOV-SPV245	Pilot valve for PC-AO-245AV (wetwell purge vent outboard isolation)	Normally closed valve fails closed. This blocks wetwell vent flow. If the valve fails open, the inboard MO provides isolation and venting is possible. No impact on PRA	Torus Room		X		X	X	X	X
PC-SOV-SPV32	Pilot Valve on PC-AO-AO32 (Hard Pipe Vent)	Valve fails open which is the desired position. No impact on PRA.	Torus Room		X		X	X	X	X
PC-MO-233MV	Wetwell Purge Supply Inboard Isolation	Normally closed valve fails in the closed position which blocks flow through the supply duct and fails the hard pipe vent.	Torus Room		X		X	X	X	X

Components With More Than Mild Environment But Less Than 212 F For Breaks In The SW Quad

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
PC-MO-1301MV	Suppression Chamber Standby N2 Supply – Train B	Valve closes on a group 2 isolation and fails closed preventing N2 injection to the wetwell if train A also fails. No impact on PRA.	Torus Room		X		X	X	X	X
PC-MO-1302MV	Suppression Chamber Standby N2 Supply – Train B	Valve closes on a group 2 isolation and fails closed preventing N2 injection to the wetwell if train A also fails. No impact on PRA.	Torus Room		X		X	X	X	X
PC-MO-1303MV	Suppression Chamber Standby N2 Supply – Train A	Normally closed valve fails closed preventing N2 injection to the wetwell if train B also fails. No impact on PRA.	Torus Room		X		X	X	X	X
PC-MO-1304MV	Suppression Chamber Standby N2 Supply – Train A	Normally closed valve fails closed preventing N2 injection to the wetwell if train B also fails. No impact on PRA.	Torus Room		X		X	X	X	X
PC-TE-1/2A-H	Torus water temperature	EOP containment parameter for HCTL, per ESP 5.8.9, several alternate temperature indications and recorders available (e.g. RHR HX inlet). No impact on PRA	Torus Room		X		X	X	X	X
PC-SOV-SPV237	Pilot valve for 237 AV (outboard wetwell purge supply isolation)	Valve fails AO237 in the closed position which blocks flow through the supply duct and fails the hard pipe vent. Inadvertent opening is not a problem since the inboard valve is closed.	Torus Room		X		X	X	X	X
RHR-MO-920MV	Steam supply valve to AOG	Designed to close to prevent diversion of steam from HPCI. HPCI assumed failed due to high area temperature isolation. No impact on PRA.	Torus Room		X		X	X	X	X
SW-MO-888MV	Emergency Return from North Critical Loop	Fails SW Crosstie to REC	903' General		X		X	X	X	X
SW-MO-889MV	Emergency Return from South Critical Loop	Fails SW Crosstie to REC	903' General		X		X	X	X	X
RHR-MO-MO15A	RHR Pump A SDC Suction	Reduces reliability of RHR for SDC. Along with MO25B, this will only leave the C pump available for SDC	903' General		X		X	X	X	X
RHR-MO-MO25B	RHR Loop B Inject Inboard Isolation	Fails RHR B Loop injection path	903' General		X		X	X	X	X

Components With More Than Mild Environment But Less Than 212 F For Breaks In The SW Quad

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
RHR-MO-MO34A	Torus Cooling Loop A Inboard Throttle	Fails A Loop of torus cooling	903' General		X		X	X	X	X
CS-MO-MO26A	CS A Test Line Recirc	Fails A Loop of Core Spray	903' General		X		X	X	X	X
RR-MO-MO53A	Reactor Recirculation Pump Discharge Isolation	No Effect - May lose isolation of A Recirc Loop	903' General		X		X	X	X	X
PC-MO-1311MV	Drywell Dilution Supply Isolation	No Effect - May lose DW dilution function	903' General		X		X	X	X	X
PC-MO-1312MV	Drywell Dilution Supply Isolation	No Effect - May lose DW dilution function	903' General		X		X	X	X	X
CRD-SOV-SO140A/B	Trip System Backup Scram Valves	No Effect - Backup Scram valves are done with their function within a few seconds of the event. Also, they do not contribute significantly to the reliability of RPS.	903' General		X		X	X	X	X
SW-MO-887MV	Emergency Supply to REC South Critical Loop	Fails SW Crosstie to REC	931' General				X	X	X	X
SW-MO-886MV	Emergency Supply to REC North Critical Loop	Fails SW Crosstie to REC	931' General				X	X	X	X
SW-MO-650MV	REC Heat Exchanger A Outlet	Fails SW to REC Heat Exchangers	931' General				X	X	X	X
SW-MO-651MV	REC Heat Exchanger B Outlet	Fails SW to REC Heat Exchangers	931' General				X	X	X	X
REC-MOT-RECPA	REC Pump A	Fails REC System	931' General				X	X	X	X
REC-MOT-RECPB	REC Pump B	Fails REC System	931' General				X	X	X	X
REC-MOT-RECPC	REC Pump C	Fails REC System	931' General				X	X	X	X
REC-MOT-RECPD	REC Pump D	Fails REC System	931' General				X	X	X	X
REC-MO-695MV	REC Critical Loop Supply Crosstie	No Effect - Critical loops may not be able to be separated	931' General				X	X	X	X
REC-PS-452A	REC HX Outlet Header Low Pressure Switch	Could trip non-Critical header	931' General				X	X	X	X
REC-MO-714MV	South Critical Loop Supply	No Additional Effect - These fail AS IS	931' General				X	X	X	X
REC-MO-713MV	REC HX B Outlet	No Additional Effect - These fail AS IS	931' General				X	X	X	X
REC-MO-712MV	REC HX A Outlet	No Additional Effect - These fail AS IS	931' General				X	X	X	X

Components With More Than Mild Environment But Less Than 212 F For Breaks In The SW Quad

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
REC-MO-711MV	North Critical Loop Supply	No Additional Effect - These fail AS IS	931' General				X	X	X	X
REC-MO-721MV	Non-Critical Return to REC-P-A and REC-P-B	No Additional Effect - These fail AS IS	931' General				X	X	X	X
REC-MO-722MV	Non-Critical Return to REC-P-C and REC-P-D	No Additional Effect - These fail AS IS	931' General				X	X	X	X
REC-MO-700MV	Non-Critical Supply Header Shutoff	No Effect - Maybe non-critical header could not be isolated	931' General				X	X	X	X
REC-MO-1329MV	ARW Building Supply	No Effect - Maybe rad waste could not be isolated	931' General				X	X	X	X
PC-PT-512A	Drywell Pressure Indication	No Effect - One of many DW Pressure instruments	931' General				X	X	X	X

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
HV-MOT-(FC-R-1H)	SW Quad Fan Coil Unit	FCU fails to run which fails RHR loop B and HPCI injection	SW Quad		X		X	X	X	X
RHR-MO-MO16B	RHR Pump B & D Min Flow	Normally open valve will fail closed but will only fail RHR Loop B pumps if vessel pressure is too high to inject	SW Quad		X		X	X	X	X
RHR-MO-MO38B	Suppression Chamber Spray Loop B Inboard Throttle	The normally closed valve will fail closed which fails Loop B of Torus Spray	SW Quad		X		X	X	X	X
RHR-MO-MO39B	Suppression Chamber Cooling Loop B Outboard Isolation	The normally closed valve will fail closed which fails Loop B of Suppression Pool Cooling and Torus Spray	SW Quad		X		X	X	X	X
RHR-DPIS-125B	B RHR HX Discharge Min Flow Control	Signal fails which prevents auto reclosing of minimum flow valve after pump start. No impact on PRA.	SW Quad		X		X	X	X	X
HV-MOT-(FC-R-1J)	NW Quad Fan Coil Unit	FCU fails to run which fails RHR loop A	NW Quad		X		X	X	X	X
RHR-MO-MO16A	RHR Pump A & C Min Flow	Normally open valve will fail closed but will only fail RHR Loop A pumps if vessel pressure is too high to inject	NW Quad		X		X	X	X	X
RHR-MO-MO38A	Suppression Chamber Spray Loop A Inboard Throttle	The normally closed valve will fail closed which fails Loop A of Torus Spray	NW Quad		X		X	X	X	X
RHR-MO-MO39A	Suppression Chamber Cooling Loop A Outboard Isolation	The normally closed valve will fail closed which fails Loop A of Suppression Pool Cooling and Torus Spray	NW Quad		X		X	X	X	X
RHR-DPIS-125A	A RHR HX Discharge Min Flow Control	Signal fails which prevents auto reclosing of minimum flow valve after pump start. No impact on PRA.	NW Quad		X		X	X	X	X
SW-MO-888MV	Emergency Return from North Critical Loop	Fails SW Crosstie to REC	903' General		X		X	X	X	X
SW-MO-889MV	Emergency Return from South Critical Loop	Fails SW Crosstie to REC	903' General		X		X	X	X	X
RHR-MO-MO15A	RHR Pump A SDC Suction	Reduces reliability of RHR for SDC. Along with MO25B, this will only leave the C pump available for SDC	903' General		X		X	X	X	X

Components With More Than Mild Environment But Less Than 212 F For Breaks In The Torus Room

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
RHR-MO-MO25B	RHR Loop B Inject Inboard Isolation	Fails RHR B Loop injection path	903' General		X		X	X	X	X
RHR-MO-MO34A	Torus Cooling Loop A Inboard Throttle	Fails A Loop of torus cooling	903' General		X		X	X	X	X
CS-MO-MO26A	CS A Test Line Recirc	Fails A Loop of Core Spray	903' General		X		X	X	X	X
RR-MO-MO53A	Reactor Recirculation Pump Discharge Isolation	No Effect - May lose isolation of A Recirc Loop	903' General		X		X	X	X	X
PC-MO-1311MV	Drywell Dilution Supply Isolation	No Effect - May lose DW dilution function	903' General		X		X	X	X	X
PC-MO-1312MV	Drywell Dilution Supply Isolation	No Effect - May lose DW dilution function	903' General		X		X	X	X	X
CRD-SOV-SO140A/B	Trip System Backup Scram Valves	No Effect - Backup Scram valves are done with their function within a few seconds of the event. Also, they do not contribute significantly to the reliability of RPS.	903' General		X		X	X	X	X
SW-MO-887MV	Emergency Supply to REC South Critical Loop	Fails SW Crosstie to REC	931' General				X	X	X	X
SW-MO-886MV	Emergency Supply to REC North Critical Loop	Fails SW Crosstie to REC	931' General				X	X	X	X
SW-MO-650MV	REC Heat Exchanger A Outlet	Fails SW to REC Heat Exchangers	931' General				X	X	X	X
SW-MO-651MV	REC Heat Exchanger B Outlet	Fails SW to REC Heat Exchangers	931' General				X	X	X	X
REC-MOT-RECPA	REC Pump A	Fails REC System	931' General				X	X	X	X
REC-MOT-RECPB	REC Pump B	Fails REC System	931' General				X	X	X	X
REC-MOT-RECPC	REC Pump C	Fails REC System	931' General				X	X	X	X
REC-MOT-RECPD	REC Pump D	Fails REC System	931' General				X	X	X	X
REC-MO-695MV	REC Critical Loop Supply Crosstie	No Effect - Critical loops may not be able to be separated	931' General				X	X	X	X
REC-PS-452A	REC HX Outlet Header Low Pressure Switch	Could trip non-Critical header	931' General				X	X	X	X
REC-MO-714MV	South Critical Loop Supply	No Additional Effect - These fail AS IS	931' General				X	X	X	X
REC-MO-713MV	REC HX B Outlet	No Additional Effect - These fail AS IS	931' General				X	X	X	X

Components With More Than Mild Environment But Less Than 212 F For Breaks In The Torus Room

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
REC-MO-712MV	REC HX A Outlet	No Additional Effect - These fail AS IS	931' General				X	X	X	X
REC-MO-711MV	North Critical Loop Supply	No Additional Effect - These fail AS IS	931' General				X	X	X	X
REC-MO-721MV	Non-Critical Return to REC-P-A and REC-P-B	No Additional Effect - These fail AS IS	931' General				X	X	X	X
REC-MO-722MV	Non-Critical Return to REC-P-C and REC-P-D	No Additional Effect - These fail AS IS	931' General				X	X	X	X
REC-MO-700MV	Non-Critical Supply Header Shutoff	No Effect - Maybe non-critical header could not be isolated	931' General				X	X	X	X
REC-MO-1329MV	ARW Building Supply	No Effect - Maybe rad waste could not be isolated	931' General				X	X	X	X
PC-PT-512A	Drywell Pressure Indication	No Effect - One of many DW Pressure instruments	931' General				X	X	X	X

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
SW-SOV-SPV451A/B	Pilot valve for SW-AO-AO451 (SW flow control from REC HX)	Fails both REC heat exchangers and the SW backup to REC.	Torus Room						X	X
PC-MO-230MV	Torus Purge vent inboard isolation	Normally closed valve fails closed which, along with the failure of PC-MO-305MV, eliminates the alternate vent flow path. No impact on PRA	Torus Room						X	X
PC-MO-232MV	Drywell purge supply Inboard Isolation	Normally closed valve fails in the closed position that blocks drywell purge flow. No impact on PRA	Torus Room						X	X
PC-MO-305MV	PC-MOV-230MV Bypass	Normally closed valve fails closed which, along with the failure of PC-MO-230MV, eliminates the alternate vent flow path. No impact on PRA	Torus Room						X	X
PC-MO-1305MV	Drywell Dilution – Train A	Normally closed valve fails closed preventing N2 injection to the drywell through train A. No impact on PRA.	Torus Room						X	X
PC-MO-1308MV	Suppression Chamber Vent Isolation	Normally closed valve fails closed preventing venting of the wetwell during standby N2 injection. No impact on PRA.	Torus Room						X	X
PC-SOV-SPV238	Pilot valve for 238 AV (outboard drywell purge supply isolation)	Valve fails AO238 in the closed position which blocks nitrogen purge to the drywell. No impact on PRA.	Torus Room						X	X
PC-SOV-SPV245	Pilot valve for PC-AO-245AV (wetwell purge vent outboard isolation)	Normally closed valve fails closed. This blocks wetwell vent flow. If the valve fails open, the inboard MO provides isolation and venting is possible. No impact on PRA	Torus Room						X	X
PC-SOV-SPV32	Pilot Valve on PC-AO-AO32 (Hard Pipe Vent)	Valve fails open which is the desired position. No impact on PRA.	Torus Room						X	X
PC-MO-233MV	Wetwell Purge Supply Inboard Isolation	Normally closed valve fails in the closed position which blocks flow through the supply duct and fails the hard pipe vent.	Torus Room						X	X

Components With More Than Mild Environment But Less Than 212 F For Breaks In The RHR HX A Room

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
PC-MO-1301MV	Suppression Chamber Standby N2 Supply – Train B	Valve closes on a group 2 isolation and fails closed preventing N2 injection to the wetwell if train A also fails. No impact on PRA.	Torus Room						X	X
PC-MO-1302MV	Suppression Chamber Standby N2 Supply – Train B	Valve closes on a group 2 isolation and fails closed preventing N2 injection to the wetwell if train A also fails. No impact on PRA.	Torus Room						X	X
PC-MO-1303MV	Suppression Chamber Standby N2 Supply – Train A	Normally closed valve fails closed preventing N2 injection to the wetwell if train B also fails. No impact on PRA.	Torus Room						X	X
PC-MO-1304MV	Suppression Chamber Standby N2 Supply – Train A	Normally closed valve fails closed preventing N2 injection to the wetwell if train B also fails. No impact on PRA.	Torus Room						X	X
PC-TE-1/2A-H	Torus water temperature	EOP containment parameter for HCTL, per ESP 5.8.9, several alternate temperature indications and recorders available (e.g. RHR HX inlet). No impact on PRA	Torus Room						X	X
PC-SOV-SPV237	Pilot valve for 237 AV (outboard wetwell purge supply isolation)	Valve fails AO237 in the closed position which blocks flow through the supply duct and fails the hard pipe vent. Inadvertent opening is not a problem since the inboard valve is closed.	Torus Room						X	X
RHR-MO-920MV	Steam supply valve to AOG	Designed to close to prevent diversion of steam from HPCI. HPCI assumed failed due to high area temperature isolation. No impact on PRA.	Torus Room						X	X
HV-MOT-(FC-R-1H)	SW Quad Fan Coil Unit	FCU fails to run which fails RHR loop B and HPCI injection	SW Quad						X	X
RHR-MO-MO16B	RHR Pump B & D Min Flow	Normally open valve will fail closed but will only fail RHR Loop B pumps if vessel pressure is too high to inject	SW Quad						X	X
RHR-MO-MO38B	Suppression Chamber Spray Loop B Inboard Throttle	The normally closed valve will fail closed which fails Loop B of Torus Spray	SW Quad						X	X

Components With More Than Mild Environment But Less Than 212 F For Breaks In The RHR HX A Room

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
RHR-MO-MO39B	Suppression Chamber Cooling Loop B Outboard Isolation	The normally closed valve will fail closed which fails Loop B of Suppression Pool Cooling and Torus Spray	SW Quad						X	X
RHR-DPIS-125B	B RHR HX Discharge Min Flow Control	Signal fails which prevents auto reclosing of minimum flow valve after pump start. No impact on PRA.	SW Quad						X	X
HV-MOT-(FC-R-1J)	NW Quad Fan Coil Unit	FCU fails to run which fails RHR loop A	NW Quad						X	X
RHR-MO-MO16A	RHR Pump A & C Min Flow	Normally open valve will fail closed but will only fail RHR Loop A pumps if vessel pressure is too high to inject	NW Quad						X	X
RHR-MO-MO38A	Suppression Chamber Spray Loop A Inboard Throttle	The normally closed valve will fail closed which fails Loop A of Torus Spray	NW Quad						X	X
RHR-MO-MO39A	Suppression Chamber Cooling Loop A Outboard Isolation	The normally closed valve will fail closed which fails Loop A of Suppression Pool Cooling and Torus Spray	NW Quad						X	X
RHR-DPIS-125A	A RHR HX Discharge Min Flow Control	Signal fails which prevents auto reclosing of minimum flow valve after pump start. No impact on PRA.	NW Quad						X	X
RCIC-P-CP	RCIC Condensate Pump	No impact on PRA.	NE Quad						X	X
RCIC-P-VP	RCIC Vacuum Pump	No impact on PRA.	NE Quad						X	X
RCIC-MO-MO14	RCIC Turbine Trip & Throttle Valve	Valve failure would fail RCIC injection; however, RCIC was failed due to the HELB.	NE Quad						X	X
RCIC-MO-MO131	Steam Supply to RCIC Turbine	Valve would close on RCIC isolation due to high area temperatures and would fail closed which would fail RCIC injection; however, RCIC was failed due to the HELB	NE Quad						X	X
RCIC-MO-MO132	Turbine Oil Cooling Water Supply	Normally open valve would fail open. No impact on PRA.	NE Quad						X	X
RCIC-MO-MO41	Torus Suction	Valve could inadvertently close which fails RCIC injection; however, RCIC was failed due to the HELB	NE Quad						X	X

Components With More Than Mild Environment But Less Than 212 F For Breaks In The RHR HX A Room

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
RCIC-MO-MO27	RCIC Pump Min Flow Recirc to Torus	No impact on PRA	NE Quad						X	X
RCIC-MO-MO18	RCIC Supply from Cond Storage	Normally open valve would fail open. No impact on PRA.	NE Quad						X	X
RCIC-MO-MO20	RCIC Pump Discharge	Normally open valve would fail open. No impact on PRA	NE Quad						X	X
RCIC-AO-PCV23	Aux Cool Supply PCV	Valve fails open. No impact on PRA	NE Quad						X	X
CM-PS-269	Cond to RCIC Low Alarm	No impact on PRA	NE Quad						X	X
REC-AO-TCV864	FC-R-F Inlet	Valve fails open. No impact on PRA	NE Quad						X	X
REC-FI-475A	REC to 1-FC-R-1F	No impact on PRA	NE Quad						X	X
HV-MOT-(FC-R-1F)	NE Quad FCU	FCU fails which, with the steam environment, fails CS loop A and fails RCIC	NE Quad						X	X
CS-MO-5B	CS B Min Flow Valve	No impact	SE Quad						X	X
HV-MOT-(FC-R-1E)	SE Quad FCU	FCU fails which, with the steam environment, fails CS loop B	SE Quad						X	X
SW-MO-888MV	Emergency Return from North Critical Loop	Fails SW Crosstie to REC	903' General	X	X	X	X	X	X	X
SW-MO-889MV	Emergency Return from South Critical Loop	Fails SW Crosstie to REC	903' General	X	X	X	X	X	X	X
RHR-MO-MO15A	RHR Pump A SDC Suction	Reduces reliability of RHR for SDC. Along with MO25B, this will only leave the C pump available for SDC	903' General	X	X	X	X	X	X	X
RHR-MO-MO25B	RHR Loop B Inject Inboard Isolation	Fails RHR B Loop injection path	903' General	X	X	X	X	X	X	X
RHR-MO-MO34A	Torus Cooling Loop A Inboard Throttle	Fails A Loop of torus cooling	903' General	X	X	X	X	X	X	X
CS-MO-MO26A	CS A Test Line Recirc	Fails A Loop of Core Spray	903' General	X	X	X	X	X	X	X
RR-MO-MO53A	Reactor Recirculation Pump Discharge Isolation	No Effect - May lose isolation of A Recirc Loop	903' General	X	X	X	X	X	X	X
PC-MO-1311MV	Drywell Dilution Supply Isolation	No Effect - May lose DW dilution function	903' General	X	X	X	X	X	X	X
PC-MO-1312MV	Drywell Dilution Supply Isolation	No Effect - May lose DW dilution function	903' General	X	X	X	X	X	X	X

Components With More Than Mild Environment But Less Than 212 F For Breaks In The RHR HX A Room

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
CRD-SOV-SO140A/B	Trip System Backup Scram Valves	No Effect - Backup Scram valves are done with their function within a few seconds of the event. Also, they do not contribute significantly to the reliability of RPS.	903' General	X	X	X	X	X	X	X
SW-MO-887MV	Emergency Supply to REC South Critical Loop	Fails SW Crosstie to REC	931' General		X	X	X	X	X	X
SW-MO-886MV	Emergency Supply to REC North Critical Loop	Fails SW Crosstie to REC	931' General		X	X	X	X	X	X
SW-MO-650MV	REC Heat Exchanger A Outlet	Fails SW to REC Heat Exchangers	931' General		X	X	X	X	X	X
SW-MO-651MV	REC Heat Exchanger B Outlet	Fails SW to REC Heat Exchangers	931' General		X	X	X	X	X	X
REC-MOT-RECPA	REC Pump A	Fails REC System	931' General		X	X	X	X	X	X
REC-MOT-RECPB	REC Pump B	Fails REC System	931' General		X	X	X	X	X	X
REC-MOT-RECPC	REC Pump C	Fails REC System	931' General		X	X	X	X	X	X
REC-MOT-RECPD	REC Pump D	Fails REC System	931' General		X	X	X	X	X	X
REC-MO-695MV	REC Critical Loop Supply Crosstie	No Effect - Critical loops may not be able to be separated	931' General		X	X	X	X	X	X
REC-PS-452A	REC HX Outlet Header Low Pressure Switch	Could trip non-Critical header	931' General		X	X	X	X	X	X
REC-MO-714MV	South Critical Loop Supply	No Additional Effect - These fail AS IS	931' General		X	X	X	X	X	X
REC-MO-713MV	REC HX B Outlet	No Additional Effect - These fail AS IS	931' General		X	X	X	X	X	X
REC-MO-712MV	REC HX A Outlet	No Additional Effect - These fail AS IS	931' General		X	X	X	X	X	X
REC-MO-711MV	North Critical Loop Supply	No Additional Effect - These fail AS IS	931' General		X	X	X	X	X	X
REC-MO-721MV	Non-Critical Return to REC-P-A and REC-P-B	No Additional Effect - These fail AS IS	931' General		X	X	X	X	X	X
REC-MO-722MV	Non-Critical Return to REC-P-C and REC-P-D	No Additional Effect - These fail AS IS	931' General		X	X	X	X	X	X
REC-MO-700MV	Non-Critical Supply Header Shutoff	No Effect - Maybe non-critical header could not be isolated	931' General		X	X	X	X	X	X
REC-MO-1329MV	ARW Building Supply	No Effect - Maybe rad waste could not be isolated	931' General		X	X	X	X	X	X

Components With More Than Mild Environment But Less Than 212 F For Breaks In The RHR HX A Room

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
PC-PT-512A	Drywell Pressure Indication	No Effect - One of many DW Pressure instruments	931' General		X	X	X	X	X	X

Components With More Than Mild Environment But Less Than 212 F For Breaks In The RHR HX B Room

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
SW-SOV-SPV451A/B	Pilot valve for SW-AO-AO451 (SW flow control from REC HX)	Fails both REC heat exchangers and the SW backup to REC.	Torus Room						X	X
PC-MO-230MV	Torus Purge vent inboard isolation	Normally closed valve fails closed which, along with the failure of PC-MO-305MV, eliminates the alternate vent flow path. No impact on PRA	Torus Room						X	X
PC-MO-232MV	Drywell purge supply Inboard Isolation	Normally closed valve fails in the closed position that blocks drywell purge flow. No impact on PRA	Torus Room						X	X
PC-MO-305MV	PC-MOV-230MV Bypass	Normally closed valve fails closed which, along with the failure of PC-MO-230MV, eliminates the alternate vent flow path. No impact on PRA	Torus Room						X	X
PC-MO-1305MV	Drywell Dilution – Train A	Normally closed valve fails closed preventing N2 injection to the drywell through train A. No impact on PRA.	Torus Room						X	X
PC-MO-1308MV	Suppression Chamber Vent Isolation	Normally closed valve fails closed preventing venting of the wetwell during standby N2 injection. No impact on PRA.	Torus Room						X	X
PC-SOV-SPV238	Pilot valve for 238 AV (outboard drywell purge supply isolation)	Valve fails AO238 in the closed position which blocks nitrogen purge to the drywell. No impact on PRA.	Torus Room						X	X
PC-SOV-SPV245	Pilot valve for PC-AO-245AV (wetwell purge vent outboard isolation)	Normally closed valve fails closed. This blocks wetwell vent flow. If the valve fails open, the inboard MO provides isolation and venting is possible. No impact on PRA	Torus Room						X	X
PC-SOV-SPV32	Pilot Valve on PC-AO-AO32 (Hard Pipe Vent)	Valve fails open which is the desired position. No impact on PRA.	Torus Room						X	X
PC-MO-233MV	Wetwell Purge Supply Inboard Isolation	Normally closed valve fails in the closed position which blocks flow through the supply duct and fails the hard pipe vent.	Torus Room						X	X

Components With More Than Mild Environment But Less Than 212 F For Breaks In The RHR HX B Room

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
PC-MO-1301MV	Suppression Chamber Standby N2 Supply – Train B	Valve closes on a group 2 isolation and fails closed preventing N2 injection to the wetwell if train A also fails. No impact on PRA.	Torus Room						X	X
PC-MO-1302MV	Suppression Chamber Standby N2 Supply – Train B	Valve closes on a group 2 isolation and fails closed preventing N2 injection to the wetwell if train A also fails. No impact on PRA.	Torus Room						X	X
PC-MO-1303MV	Suppression Chamber Standby N2 Supply – Train A	Normally closed valve fails closed preventing N2 injection to the wetwell if train B also fails. No impact on PRA.	Torus Room						X	X
PC-MO-1304MV	Suppression Chamber Standby N2 Supply – Train A	Normally closed valve fails closed preventing N2 injection to the wetwell if train B also fails. No impact on PRA.	Torus Room						X	X
PC-TE-1/2A-H	Torus water temperature	EOP containment parameter for HCTL, per ESP 5.8.9, several alternate temperature indications and recorders available (e.g. RHR HX inlet). No impact on PRA	Torus Room						X	X
PC-SOV-SPV237	Pilot valve for 237 AV (outboard wetwell purge supply isolation)	Valve fails AO237 in the closed position which blocks flow through the supply duct and fails the hard pipe vent. Inadvertent opening is not a problem since the inboard valve is closed.	Torus Room						X	X
RHR-MO-920MV	Steam supply valve to AOG	Designed to close to prevent diversion of steam from HPCI. HPCI assumed failed due to high area temperature isolation. No impact on PRA.	Torus Room						X	X
HV-MOT-(FC-R-1H)	SW Quad Fan Coil Unit	FCU fails to run which fails RHR loop B and HPCI injection	SW Quad						X	X
RHR-MO-MO16B	RHR Pump B & D Min Flow	Normally open valve will fail closed but will only fail RHR Loop B pumps if vessel pressure is too high to inject	SW Quad						X	X
RHR-MO-MO38B	Suppression Chamber Spray Loop B Inboard Throttle	The normally closed valve will fail closed which fails Loop B of Torus Spray	SW Quad						X	X

Components With More Than Mild Environment But Less Than 212 F For Breaks In The RHR HX B Room

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
RHR-MO-MO39B	Suppression Chamber Cooling Loop B Outboard Isolation	The normally closed valve will fail closed which fails Loop B of Suppression Pool Cooling and Torus Spray	SW Quad						X	X
RHR-DPIS-125B	B RHR HX Discharge Min Flow Control	Signal fails which prevents auto reclosing of minimum flow valve after pump start. No impact on PRA.	SW Quad						X	X
HV-MOT-(FC-R-1J)	NW Quad Fan Coil Unit	FCU fails to run which fails RHR loop A	NW Quad						X	X
RHR-MO-MO16A	RHR Pump A & C Min Flow	Normally open valve will fail closed but will only fail RHR Loop A pumps if vessel pressure is too high to inject	NW Quad						X	X
RHR-MO-MO38A	Suppression Chamber Spray Loop A Inboard Throttle	The normally closed valve will fail closed which fails Loop A of Torus Spray	NW Quad						X	X
RHR-MO-MO39A	Suppression Chamber Cooling Loop A Outboard Isolation	The normally closed valve will fail closed which fails Loop A of Suppression Pool Cooling and Torus Spray	NW Quad						X	X
RHR-DPIS-125A	A RHR HX Discharge Min Flow Control	Signal fails which prevents auto reclosing of minimum flow valve after pump start. No impact on PRA.	NW Quad						X	X
RCIC-P-CP	RCIC Condensate Pump	No impact on PRA.	NE Quad						X	X
RCIC-P-VP	RCIC Vacuum Pump	No impact on PRA.	NE Quad						X	X
RCIC-MO-MO14	RCIC Turbine Trip & Throttle Valve	Valve failure would fail RCIC injection; however, RCIC was failed due to the HELB.	NE Quad						X	X
RCIC-MO-MO131	Steam Supply to RCIC Turbine	Valve would close on RCIC isolation due to high area temperatures and would fail closed which would fail RCIC injection; however, RCIC was failed due to the HELB	NE Quad						X	X
RCIC-MO-MO132	Turbine Oil Cooling Water Supply	Normally open valve would fail open. No impact on PRA.	NE Quad						X	X
RCIC-MO-MO41	Torus Suction	Valve could inadvertently close which fails RCIC injection; however, RCIC was failed due to the HELB	NE Quad						X	X

Components With More Than Mild Environment But Less Than 212 F For Breaks In The RHR HX B Room

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
RCIC-MO-MO27	RCIC Pump Min Flow Recirc to Torus	No impact on PRA	NE Quad						X	X
RCIC-MO-MO18	RCIC Supply from Cond Storage	Normally open valve would fail open. No impact on PRA.	NE Quad						X	X
RCIC-MO-MO20	RCIC Pump Discharge	Normally open valve would fail open. No impact on PRA	NE Quad						X	X
RCIC-AO-PCV23	Aux Cool Supply PCV	Valve fails open. No impact on PRA	NE Quad						X	X
CM-PS-269	Cond to RCIC Low Alarm	No impact on PRA	NE Quad						X	X
REC-AO-TCV864	FC-R-F Inlet	Valve fails open. No impact on PRA	NE Quad						X	X
REC-FI-475A	REC to 1-FC-R-1F	No impact on PRA	NE Quad						X	X
HV-MOT-(FC-R-1F)	NE Quad FCU	FCU fails which, with the steam environment, fails CS loop A and fails RCIC	NE Quad						X	X
CS-MO-5B	CS B Min Flow Valve	No impact	SE Quad						X	X
HV-MOT-(FC-R-1E)	SE Quad FCU	FCU fails which, with the steam environment, fails CS loop B	SE Quad						X	X
SW-MO-888MV	Emergency Return from North Critical Loop	Fails SW Crosstie to REC	903' General	X	X	X	X	X	X	X
SW-MO-889MV	Emergency Return from South Critical Loop	Fails SW Crosstie to REC	903' General	X	X	X	X	X	X	X
RHR-MO-MO15A	RHR Pump A SDC Suction	Reduces reliability of RHR for SDC. Along with MO25B, this will only leave the C pump available for SDC	903' General	X	X	X	X	X	X	X
RHR-MO-MO25B	RHR Loop B Inject Inboard Isolation	Fails RHR B Loop injection path	903' General	X	X	X	X	X	X	X
RHR-MO-MO34A	Torus Cooling Loop A Inboard Throttle	Fails A Loop of torus cooling	903' General	X	X	X	X	X	X	X
CS-MO-MO26A	CS A Test Line Recirc	Fails A Loop of Core Spray	903' General	X	X	X	X	X	X	X
RR-MO-MO53A	Reactor Recirculation Pump Discharge Isolation	No Effect - May lose isolation of A Recirc Loop	903' General	X	X	X	X	X	X	X
PC-MO-1311MV	Drywell Dilution Supply Isolation	No Effect - May lose DW dilution function	903' General	X	X	X	X	X	X	X
PC-MO-1312MV	Drywell Dilution Supply Isolation	No Effect - May lose DW dilution function	903' General	X	X	X	X	X	X	X

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
CRD-SOV-SO140A/B	Trip System Backup Scram Valves	No Effect - Backup Scram valves are done with their function within a few seconds of the event. Also, they do not contribute significantly to the reliability of RPS.	903' General	X	X	X	X	X	X	X
SW-MO-887MV	Emergency Supply to REC South Critical Loop	Fails SW Crosstie to REC	931' General		X	X	X	X	X	X
SW-MO-886MV	Emergency Supply to REC North Critical Loop	Fails SW Crosstie to REC	931' General		X	X	X	X	X	X
SW-MO-650MV	REC Heat Exchanger A Outlet	Fails SW to REC Heat Exchangers	931' General		X	X	X	X	X	X
SW-MO-651MV	REC Heat Exchanger B Outlet	Fails SW to REC Heat Exchangers	931' General		X	X	X	X	X	X
REC-MOT-RECPA	REC Pump A	Fails REC System	931' General		X	X	X	X	X	X
REC-MOT-RECPB	REC Pump B	Fails REC System	931' General		X	X	X	X	X	X
REC-MOT-RECPC	REC Pump C	Fails REC System	931' General		X	X	X	X	X	X
REC-MOT-RECPD	REC Pump D	Fails REC System	931' General		X	X	X	X	X	X
REC-MO-695MV	REC Critical Loop Supply Crosstie	No Effect - Critical loops may not be able to be separated	931' General		X	X	X	X	X	X
REC-PS-452A	REC HX Outlet Header Low Pressure Switch	Could trip non-Critical header	931' General		X	X	X	X	X	X
REC-MO-714MV	South Critical Loop Supply	No Additional Effect - These fail AS IS	931' General		X	X	X	X	X	X
REC-MO-713MV	REC HX B Outlet	No Additional Effect - These fail AS IS	931' General		X	X	X	X	X	X
REC-MO-712MV	REC HX A Outlet	No Additional Effect - These fail AS IS	931' General		X	X	X	X	X	X
REC-MO-711MV	North Critical Loop Supply	No Additional Effect - These fail AS IS	931' General		X	X	X	X	X	X
REC-MO-721MV	Non-Critical Return to REC-P-A and REC-P-B	No Additional Effect - These fail AS IS	931' General		X	X	X	X	X	X
REC-MO-722MV	Non-Critical Return to REC-P-C and REC-P-D	No Additional Effect - These fail AS IS	931' General		X	X	X	X	X	X
REC-MO-700MV	Non-Critical Supply Header Shutoff	No Effect - Maybe non-critical header could not be isolated	931' General		X	X	X	X	X	X
REC-MO-1329MV	ARW Building Supply	No Effect - Maybe rad waste could not be isolated	931' General		X	X	X	X	X	X

Components With More Than Mild Environment But Less Than 212 F For Breaks In The RHR HX B Room

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
PC-PT-512A	Drywell Pressure Indication	No Effect - One of many DW Pressure instruments	931' General		X	X	X	X	X	X

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
SW-SOV-SPV451A/B	Pilot valve for SW-AO-AO451 (SW flow control from REC HX)	Fails both REC heat exchangers and the SW backup to REC.	Torus Room						X	X
PC-MO-230MV	Torus Purge vent inboard isolation	Normally closed valve fails closed which, along with the failure of PC-MO-305MV, eliminates the alternate vent flow path. No impact on PRA	Torus Room						X	X
PC-MO-232MV	Drywell purge supply Inboard Isolation	Normally closed valve fails in the closed position that blocks drywell purge flow. No impact on PRA	Torus Room						X	X
PC-MO-305MV	PC-MOV-230MV Bypass	Normally closed valve fails closed which, along with the failure of PC-MO-230MV, eliminates the alternate vent flow path. No impact on PRA	Torus Room						X	X
PC-MO-1305MV	Drywell Dilution – Train A	Normally closed valve fails closed preventing N2 injection to the drywell through train A. No impact on PRA.	Torus Room						X	X
PC-MO-1308MV	Suppression Chamber Vent Isolation	Normally closed valve fails closed preventing venting of the wetwell during standby N2 injection. No impact on PRA.	Torus Room						X	X
PC-SOV-SPV238	Pilot valve for 238 AV (outboard drywell purge supply isolation)	Valve fails AO238 in the closed position which blocks nitrogen purge to the drywell. No impact on PRA.	Torus Room						X	X
PC-SOV-SPV245	Pilot valve for PC-AO-245AV (wetwell purge vent outboard isolation)	Normally closed valve fails closed. This blocks wetwell vent flow. If the valve fails open, the inboard MO provides isolation and venting is possible. No impact on PRA	Torus Room						X	X
PC-SOV-SPV32	Pilot Valve on PC-AO-AO32 (Hard Pipe Vent)	Valve fails open which is the desired position. No impact on PRA.	Torus Room						X	X
PC-MO-233MV	Wetwell Purge Supply Inboard Isolation	Normally closed valve fails in the closed position which blocks flow through the supply duct and fails the hard pipe vent.	Torus Room						X	X

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
PC-MO-1301MV	Suppression Chamber Standby N2 Supply – Train B	Valve closes on a group 2 isolation and fails closed preventing N2 injection to the wetwell if train A also fails. No impact on PRA.	Torus Room						X	X
PC-MO-1302MV	Suppression Chamber Standby N2 Supply – Train B	Valve closes on a group 2 isolation and fails closed preventing N2 injection to the wetwell if train A also fails. No impact on PRA.	Torus Room						X	X
PC-MO-1303MV	Suppression Chamber Standby N2 Supply – Train A	Normally closed valve fails closed preventing N2 injection to the wetwell if train B also fails. No impact on PRA.	Torus Room						X	X
PC-MO-1304MV	Suppression Chamber Standby N2 Supply – Train A	Normally closed valve fails closed preventing N2 injection to the wetwell if train B also fails. No impact on PRA.	Torus Room						X	X
PC-TE-1/2A-H	Torus water temperature	EOP containment parameter for HCTL, per ESP 5.8.9, several alternate temperature indications and recorders available (e.g. RHR HX inlet). No impact on PRA	Torus Room						X	X
PC-SOV-SPV237	Pilot valve for 237 AV (outboard wetwell purge supply isolation)	Valve fails AO237 in the closed position which blocks flow through the supply duct and fails the hard pipe vent. Inadvertent opening is not a problem since the inboard valve is closed.	Torus Room						X	X
RHR-MO-920MV	Steam supply valve to AOG	Designed to close to prevent diversion of steam from HPCI. HPCI assumed failed due to high area temperature isolation. No impact on PRA.	Torus Room						X	X
HV-MOT-(FC-R-1H)	SW Quad Fan Coil Unit	FCU fails to run which fails RHR loop B and HPCI injection	SW Quad						X	X
RHR-MO-MO16B	RHR Pump B & D Min Flow	Normally open valve will fail closed but will only fail RHR Loop B pumps if vessel pressure is too high to inject	SW Quad						X	X
RHR-MO-MO38B	Suppression Chamber Spray Loop B Inboard Throttle	The normally closed valve will fail closed which fails Loop B of Torus Spray	SW Quad						X	X

Components With More Than Mild Environment But Less Than 212 F For Breaks In The Injection Valve Room

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
RHR-MO-MO39B	Suppression Chamber Cooling Loop B Outboard Isolation	The normally closed valve will fail closed which fails Loop B of Suppression Pool Cooling and Torus Spray	SW Quad						X	X
RHR-DPIS-125B	B RHR HX Discharge Min Flow Control	Signal fails which prevents auto reclosing of minimum flow valve after pump start. No impact on PRA.	SW Quad						X	X
HV-MOT-(FC-R-1J)	NW Quad Fan Coil Unit	FCU fails to run which fails RHR loop A	NW Quad						X	X
RHR-MO-MO16A	RHR Pump A & C Min Flow	Normally open valve will fail closed but will only fail RHR Loop A pumps if vessel pressure is too high to inject	NW Quad						X	X
RHR-MO-MO38A	Suppression Chamber Spray Loop A Inboard Throttle	The normally closed valve will fail closed which fails Loop A of Torus Spray	NW Quad						X	X
RHR-MO-MO39A	Suppression Chamber Cooling Loop A Outboard Isolation	The normally closed valve will fail closed which fails Loop A of Suppression Pool Cooling and Torus Spray	NW Quad						X	X
RHR-DPIS-125A	A RHR HX Discharge Min Flow Control	Signal fails which prevents auto reclosing of minimum flow valve after pump start. No impact on PRA.	NW Quad						X	X
RCIC-P-CP	RCIC Condensate Pump	No impact on PRA.	NE Quad						X	X
RCIC-P-VP	RCIC Vacuum Pump	No impact on PRA.	NE Quad						X	X
RCIC-MO-MO14	RCIC Turbine Trip & Throttle Valve	Valve failure would fail RCIC injection; however, RCIC was failed due to the HELB.	NE Quad						X	X
RCIC-MO-MO131	Steam Supply to RCIC Turbine	Valve would close on RCIC isolation due to high area temperatures and would fail closed which would fail RCIC injection; however, RCIC was failed due to the HELB	NE Quad						X	X
RCIC-MO-MO132	Turbine Oil Cooling Water Supply	Normally open valve would fail open. No impact on PRA.	NE Quad						X	X
RCIC-MO-MO41	Torus Suction	Valve could inadvertently close which fails RCIC injection; however, RCIC was failed due to the HELB	NE Quad						X	X

Components With More Than Mild Environment But Less Than 212 F For Breaks In The Injection Valve Room

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
RCIC-MO-MO27	RCIC Pump Min Flow Recirc to Torus	No impact on PRA	NE Quad						X	X
RCIC-MO-MO18	RCIC Supply from Cond Storage	Normally open valve would fail open. No impact on PRA.	NE Quad						X	X
RCIC-MO-MO20	RCIC Pump Discharge	Normally open valve would fail open. No impact on PRA	NE Quad						X	X
RCIC-AO-PCV23	Aux Cool Supply PCV	Valve fails open. No impact on PRA	NE Quad						X	X
CM-PS-269	Cond to RCIC Low Alarm	No impact on PRA	NE Quad						X	X
REC-AO-TCV864	FC-R-F Inlet	Valve fails open. No impact on PRA	NE Quad						X	X
REC-FI-475A	REC to 1-FC-R-1F	No impact on PRA	NE Quad						X	X
HV-MOT-(FC-R-1F)	NE Quad FCU	FCU fails which, with the steam environment, fails CS loop A and fails RCIC	NE Quad						X	X
CS-MO-5B	CS B Min Flow Valve	No impact	SE Quad						X	X
HV-MOT-(FC-R-1E)	SE Quad FCU	FCU fails which, with the steam environment, fails CS loop B	SE Quad						X	X
SW-MO-888MV	Emergency Return from North Critical Loop	Fails SW Crosstie to REC	903' General	X	X	X	X	X	X	X
SW-MO-889MV	Emergency Return from South Critical Loop	Fails SW Crosstie to REC	903' General	X	X	X	X	X	X	X
RHR-MO-MO15A	RHR Pump A SDC Suction	Reduces reliability of RHR for SDC. Along with MO25B, this will only leave the C pump available for SDC	903' General	X	X	X	X	X	X	X
RHR-MO-MO25B	RHR Loop B Inject Inboard Isolation	Fails RHR B Loop injection path	903' General	X	X	X	X	X	X	X
RHR-MO-MO34A	Torus Cooling Loop A Inboard Throttle	Fails A Loop of torus cooling	903' General	X	X	X	X	X	X	X
CS-MO-MO26A	CS A Test Line Recirc	Fails A Loop of Core Spray	903' General	X	X	X	X	X	X	X
RR-MO-MO53A	Reactor Recirculation Pump Discharge Isolation	No Effect - May lose isolation of A Recirc Loop	903' General	X	X	X	X	X	X	X
PC-MO-1311MV	Drywell Dilution Supply Isolation	No Effect - May lose DW dilution function	903' General	X	X	X	X	X	X	X
PC-MO-1312MV	Drywell Dilution Supply Isolation	No Effect - May lose DW dilution function	903' General	X	X	X	X	X	X	X

Components With More Than Mild Environment But Less Than 212 F For Breaks In The Injection Valve Room

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
CRD-SOV-SO140A/B	Trip System Backup Scram Valves	No Effect - Backup Scram valves are done with their function within a few seconds of the event. Also, they do not contribute significantly to the reliability of RPS.	903' General	X	X	X	X	X	X	X
SW-MO-887MV	Emergency Supply to REC South Critical Loop	Fails SW Crosstie to REC	931' General		X	X	X	X	X	X
SW-MO-886MV	Emergency Supply to REC North Critical Loop	Fails SW Crosstie to REC	931' General		X	X	X	X	X	X
SW-MO-650MV	REC Heat Exchanger A Outlet	Fails SW to REC Heat Exchangers	931' General		X	X	X	X	X	X
SW-MO-651MV	REC Heat Exchanger B Outlet	Fails SW to REC Heat Exchangers	931' General		X	X	X	X	X	X
REC-MOT-RECPA	REC Pump A	Fails REC System	931' General		X	X	X	X	X	X
REC-MOT-RECPB	REC Pump B	Fails REC System	931' General		X	X	X	X	X	X
REC-MOT-RECPC	REC Pump C	Fails REC System	931' General		X	X	X	X	X	X
REC-MOT-RECPD	REC Pump D	Fails REC System	931' General		X	X	X	X	X	X
REC-MO-695MV	REC Critical Loop Supply Crosstie	No Effect - Critical loops may not be able to be separated	931' General		X	X	X	X	X	X
REC-PS-452A	REC HX Outlet Header Low Pressure Switch	Could trip non-Critical header	931' General		X	X	X	X	X	X
REC-MO-714MV	South Critical Loop Supply	No Additional Effect - These fail AS IS	931' General		X	X	X	X	X	X
REC-MO-713MV	REC HX B Outlet	No Additional Effect - These fail AS IS	931' General		X	X	X	X	X	X
REC-MO-712MV	REC HX A Outlet	No Additional Effect - These fail AS IS	931' General		X	X	X	X	X	X
REC-MO-711MV	North Critical Loop Supply	No Additional Effect - These fail AS IS	931' General		X	X	X	X	X	X
REC-MO-721MV	Non-Critical Return to REC-P-A and REC-P-B	No Additional Effect - These fail AS IS	931' General		X	X	X	X	X	X
REC-MO-722MV	Non-Critical Return to REC-P-C and REC-P-D	No Additional Effect - These fail AS IS	931' General		X	X	X	X	X	X
REC-MO-700MV	Non-Critical Supply Header Shutoff	No Effect - Maybe non-critical header could not be isolated	931' General		X	X	X	X	X	X
REC-MO-1329MV	ARW Building Supply	No Effect - Maybe rad waste could not be isolated	931' General		X	X	X	X	X	X

Components With More Than Mild Environment But Less Than 212 F For Breaks In The Injection Valve Room

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
PC-PT-512A	Drywell Pressure Indication	No Effect - One of many DW Pressure instruments	931' General		X	X	X	X	X	X

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
SW-MO-888MV	Emergency Return from North Critical Loop	Fails SW Crosstie to REC	903' General			X	X	X	X	X
SW-MO-889MV	Emergency Return from South Critical Loop	Fails SW Crosstie to REC	903' General			X	X	X	X	X
RHR-MO-MO15A	RHR Pump A SDC Suction	Reduces reliability of RHR for SDC. Along with MO25B, this will only leave the C pump available for SDC	903' General			X	X	X	X	X
RHR-MO-MO25B	RHR Loop B Inject Inboard Isolation	Fails RHR B Loop injection path	903' General			X	X	X	X	X
RHR-MO-MO34A	Torus Cooling Loop A Inboard Throttle	Fails A Loop of torus cooling	903' General			X	X	X	X	X
CS-MO-MO26A	CS A Test Line Recirc	Fails A Loop of Core Spray	903' General			X	X	X	X	X
RR-MO-MO53A	Reactor Recirculation Pump Discharge Isolation	No Effect - May lose isolation of A Recirc Loop	903' General			X	X	X	X	X
PC-MO-1311MV	Drywell Dilution Supply Isolation	No Effect - May lose DW dilution function	903' General			X	X	X	X	X
PC-MO-1312MV	Drywell Dilution Supply Isolation	No Effect - May lose DW dilution function	903' General			X	X	X	X	X
CRD-SOV-SO140A/B	Trip System Backup Scram Valves	No Effect - Backup Scram valves are done with their function within a few seconds of the event. Also, they do not contribute significantly to the reliability of RPS.	903' General			X	X	X	X	X
SW-MO-887MV	Emergency Supply to REC South Critical Loop	Fails SW Crosstie to REC	931' General	X	X	X	X	X	X	X
SW-MO-886MV	Emergency Supply to REC North Critical Loop	Fails SW Crosstie to REC	931' General	X	X	X	X	X	X	X
SW-MO-650MV	REC Heat Exchanger A Outlet	Fails SW to REC Heat Exchangers	931' General	X	X	X	X	X	X	X
SW-MO-651MV	REC Heat Exchanger B Outlet	Fails SW to REC Heat Exchangers	931' General	X	X	X	X	X	X	X
REC-MOT-RECPA	REC Pump A	Fails REC System	931' General	X	X	X	X	X	X	X
REC-MOT-RECPB	REC Pump B	Fails REC System	931' General	X	X	X	X	X	X	X
REC-MOT-RECPC	REC Pump C	Fails REC System	931' General	X	X	X	X	X	X	X
REC-MOT-RECPD	REC Pump D	Fails REC System	931' General	X	X	X	X	X	X	X

Components With More Than Mild Environment But Less Than 212 F For Breaks In The RWCU A Pump Room

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
REC-MO-695MV	REC Critical Loop Supply Crosstie	No Effect - Critical loops may not be able to be separated	931' General	X	X	X	X	X	X	X
REC-PS-452A	REC HX Outlet Header Low Pressure Switch	Could trip non-Critical header	931' General	X	X	X	X	X	X	X
REC-MO-714MV	South Critical Loop Supply	No Additional Effect - These fail AS IS	931' General	X	X	X	X	X	X	X
REC-MO-713MV	REC HX B Outlet	No Additional Effect - These fail AS IS	931' General	X	X	X	X	X	X	X
REC-MO-712MV	REC HX A Outlet	No Additional Effect - These fail AS IS	931' General	X	X	X	X	X	X	X
REC-MO-711MV	North Critical Loop Supply	No Additional Effect - These fail AS IS	931' General	X	X	X	X	X	X	X
REC-MO-721MV	Non-Critical Return to REC-P-A and REC-P-B	No Additional Effect - These fail AS IS	931' General	X	X	X	X	X	X	X
REC-MO-722MV	Non-Critical Return to REC-P-C and REC-P-D	No Additional Effect - These fail AS IS	931' General	X	X	X	X	X	X	X
REC-MO-700MV	Non-Critical Supply Header Shutoff	No Effect - Maybe non-critical header could not be isolated	931' General	X	X	X	X	X	X	X
REC-MO-1329MV	ARW Building Supply	No Effect - Maybe rad waste could not be isolated	931' General	X	X	X	X	X	X	X
PC-PT-512A	Drywell Pressure Indication	No Effect - One of many DW Pressure instruments	931' General	X	X	X	X	X	X	X
PC-MO-1310MV	Drywell Vent Isolation	Fails DW vent path	958' General	X	X	X	X	X	X	X
PC-MO-231MV	Drywell Inboard Isolation	Fails DW vent path	958' General	X	X	X	X	X	X	X
PC-MO-306MV	Drywell Inboard Isolation Bypass	Fails DW vent path	958' General	X	X	X	X	X	X	X
PC-SOV-SPV246	Drywell Exharst Outboard Isolation	Fails DW vent path	958' General	X	X	X	X	X	X	X

Components With More Than Mild Environment But Less Than 212 F For Breaks In The RWCU B Pump Room

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
SW-MO-888MV	Emergency Return from North Critical Loop	Fails SW Crosstie to REC	903' General			X	X	X	X	X
SW-MO-889MV	Emergency Return from South Critical Loop	Fails SW Crosstie to REC	903' General			X	X	X	X	X
RHR-MO-MO15A	RHR Pump A SDC Suction	Reduces reliability of RHR for SDC. Along with MO25B, this will only leave the C pump available for SDC	903' General			X	X	X	X	X
RHR-MO-MO25B	RHR Loop B Inject Inboard Isolation	Fails RHR B Loop injection path	903' General			X	X	X	X	X
RHR-MO-MO34A	Torus Cooling Loop A Inboard Throttle	Fails A Loop of torus cooling	903' General			X	X	X	X	X
CS-MO-MO26A	CS A Test Line Recirc	Fails A Loop of Core Spray	903' General			X	X	X	X	X
RR-MO-MO53A	Reactor Recirculation Pump Discharge Isolation	No Effect - May lose isolation of A Recirc Loop	903' General			X	X	X	X	X
PC-MO-1311MV	Drywell Dilution Supply Isolation	No Effect - May lose DW dilution function	903' General			X	X	X	X	X
PC-MO-1312MV	Drywell Dilution Supply Isolation	No Effect - May lose DW dilution function	903' General			X	X	X	X	X
CRD-SOV-SO140A/B	Trip System Backup Scram Valves	No Effect - Backup Scram valves are done with their function within a few seconds of the event. Also, they do not contribute significantly to the reliability of RPS.	903' General			X	X	X	X	X
SW-MO-887MV	Emergency Supply to REC South Critical Loop	Fails SW Crosstie to REC	931' General	X	X	X	X	X	X	X
SW-MO-886MV	Emergency Supply to REC North Critical Loop	Fails SW Crosstie to REC	931' General	X	X	X	X	X	X	X
SW-MO-650MV	REC Heat Exchanger A Outlet	Fails SW to REC Heat Exchangers	931' General	X	X	X	X	X	X	X
SW-MO-651MV	REC Heat Exchanger B Outlet	Fails SW to REC Heat Exchangers	931' General	X	X	X	X	X	X	X
REC-MOT-RECPA	REC Pump A	Fails REC System	931' General	X	X	X	X	X	X	X
REC-MOT-RECPB	REC Pump B	Fails REC System	931' General	X	X	X	X	X	X	X
REC-MOT-RECPC	REC Pump C	Fails REC System	931' General	X	X	X	X	X	X	X
REC-MOT-RECPD	REC Pump D	Fails REC System	931' General	X	X	X	X	X	X	X

Components With More Than Mild Environment But Less Than 212 F For Breaks In The RWCU B Pump Room

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
REC-MO-695MV	REC Critical Loop Supply Crosstie	No Effect - Critical loops may not be able to be separated	931' General	X	X	X	X	X	X	X
REC-PS-452A	REC HX Outlet Header Low Pressure Switch	Could trip non-Critical header	931' General	X	X	X	X	X	X	X
REC-MO-714MV	South Critical Loop Supply	No Additional Effect - These fail AS IS	931' General	X	X	X	X	X	X	X
REC-MO-713MV	REC HX B Outlet	No Additional Effect - These fail AS IS	931' General	X	X	X	X	X	X	X
REC-MO-712MV	REC HX A Outlet	No Additional Effect - These fail AS IS	931' General	X	X	X	X	X	X	X
REC-MO-711MV	North Critical Loop Supply	No Additional Effect - These fail AS IS	931' General	X	X	X	X	X	X	X
REC-MO-721MV	Non-Critical Return to REC-P-A and REC-P-B	No Additional Effect - These fail AS IS	931' General	X	X	X	X	X	X	X
REC-MO-722MV	Non-Critical Return to REC-P-C and REC-P-D	No Additional Effect - These fail AS IS	931' General	X	X	X	X	X	X	X
REC-MO-700MV	Non-Critical Supply Header Shutoff	No Effect - Maybe non-critical header could not be isolated	931' General	X	X	X	X	X	X	X
REC-MO-1329MV	ARW Building Supply	No Effect - Maybe rad waste could not be isolated	931' General	X	X	X	X	X	X	X
PC-PT-512A	Drywell Pressure Indication	No Effect - One of many DW Pressure instruments	931' General	X	X	X	X	X	X	X
PC-MO-1310MV	Drywell Vent Isolation	Fails DW vent path	958' General	X	X	X	X	X	X	X
PC-MO-231MV	Drywell Inboard Isolation	Fails DW vent path	958' General	X	X	X	X	X	X	X
PC-MO-306MV	Drywell Inboard Isolation Bypass	Fails DW vent path	958' General	X	X	X	X	X	X	X
PC-SOV-SPV246	Drywell Exharst Outboard Isolation	Fails DW vent path	958' General	X	X	X	X	X	X	X

Components With More Than Mild Environment But Less Than 212 F For Breaks In The RWCU HX Room

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
SW-MO-888MV	Emergency Return from North Critical Loop	Fails SW Crosstie to REC	903' General		X	X	X	X	X	X
SW-MO-889MV	Emergency Return from South Critical Loop	Fails SW Crosstie to REC	903' General		X	X	X	X	X	X
RHR-MO-MO15A	RHR Pump A SDC Suction	Reduces reliability of RHR for SDC. Along with MO25B, this will only leave the C pump available for SDC	903' General		X	X	X	X	X	X
RHR-MO-MO25B	RHR Loop B Inject Inboard Isolation	Fails RHR B Loop injection path	903' General		X	X	X	X	X	X
RHR-MO-MO34A	Torus Cooling Loop A Inboard Throttle	Fails A Loop of torus cooling	903' General		X	X	X	X	X	X
CS-MO-MO26A	CS A Test Line Recirc	Fails A Loop of Core Spray	903' General		X	X	X	X	X	X
RR-MO-MO53A	Reactor Recirculation Pump Discharge Isolation	No Effect - May lose isolation of A Recirc Loop	903' General		X	X	X	X	X	X
PC-MO-1311MV	Drywell Dilution Supply Isolation	No Effect - May lose DW dilution function	903' General		X	X	X	X	X	X
PC-MO-1312MV	Drywell Dilution Supply Isolation	No Effect - May lose DW dilution function	903' General		X	X	X	X	X	X
CRD-SOV-SO140A/B	Trip System Backup Scram Valves	No Effect - Backup Scram valves are done with their function within a few seconds of the event. Also, they do not contribute significantly to the reliability of RPS.	903' General		X	X	X	X	X	X
SW-MO-887MV	Emergency Supply to REC South Critical Loop	Fails SW Crosstie to REC	931' General	X	X	X	X	X	X	X
SW-MO-886MV	Emergency Supply to REC North Critical Loop	Fails SW Crosstie to REC	931' General	X	X	X	X	X	X	X
SW-MO-650MV	REC Heat Exchanger A Outlet	Fails SW to REC Heat Exchangers	931' General	X	X	X	X	X	X	X
SW-MO-651MV	REC Heat Exchanger B Outlet	Fails SW to REC Heat Exchangers	931' General	X	X	X	X	X	X	X
REC-MOT-RECPA	REC Pump A	Fails REC System	931' General	X	X	X	X	X	X	X
REC-MOT-RECPB	REC Pump B	Fails REC System	931' General	X	X	X	X	X	X	X
REC-MOT-RECPC	REC Pump C	Fails REC System	931' General	X	X	X	X	X	X	X
REC-MOT-RECPD	REC Pump D	Fails REC System	931' General	X	X	X	X	X	X	X

CIC	Description	PRA Impact	Location	Break Size						
				Isolated		Unisolated				
				Small	Large	Very Small (<2")	Small	Medium	Large	Very Large (>6")
REC-MO-695MV	REC Critical Loop Supply Crosstie	No Effect - Critical loops may not be able to be separated	931' General	X	X	X	X	X	X	X
REC-PS-452A	REC HX Outlet Header Low Pressure Switch	Could trip non-Critical header	931' General	X	X	X	X	X	X	X
REC-MO-714MV	South Critical Loop Supply	No Additional Effect - These fail AS IS	931' General	X	X	X	X	X	X	X
REC-MO-713MV	REC HX B Outlet	No Additional Effect - These fail AS IS	931' General	X	X	X	X	X	X	X
REC-MO-712MV	REC HX A Outlet	No Additional Effect - These fail AS IS	931' General	X	X	X	X	X	X	X
REC-MO-711MV	North Critical Loop Supply	No Additional Effect - These fail AS IS	931' General	X	X	X	X	X	X	X
REC-MO-721MV	Non-Critical Return to REC-P-A and REC-P-B	No Additional Effect - These fail AS IS	931' General	X	X	X	X	X	X	X
REC-MO-722MV	Non-Critical Return to REC-P-C and REC-P-D	No Additional Effect - These fail AS IS	931' General	X	X	X	X	X	X	X
REC-MO-700MV	Non-Critical Supply Header Shutoff	No Effect - Maybe non-critical header could not be isolated	931' General	X	X	X	X	X	X	X
REC-MO-1329MV	ARW Building Supply	No Effect - Maybe rad waste could not be isolated	931' General	X	X	X	X	X	X	X
PC-PT-512A	Drywell Pressure Indication	No Effect - One of many DW Pressure instruments	931' General	X	X	X	X	X	X	X
PC-MO-1310MV	Drywell Vent Isolation	Fails DW vent path	958' General	X	X	X	X	X	X	X
PC-MO-231MV	Drywell Inboard Isolation	Fails DW vent path	958' General	X	X	X	X	X	X	X
PC-MO-306MV	Drywell Inboard Isolation Bypass	Fails DW vent path	958' General	X	X	X	X	X	X	X
PC-SOV-SPV246	Drywell Exharst Outboard Isolation	Fails DW vent path	958' General	X	X	X	X	X	X	X
RHR-MO-MO12B	RHR HX B Outlet	Normally open valve fails open. No impact on PRA	RHR HX B Room		X	X	X	X	X	X
RHR-MO-MO65B	RHR HX B Inlet	Normally open valve fails open. No impact on PRA	RHR HX B Room		X	X	X	X	X	X
RHR-MO-MO66B	RHR HX B Bypass Throttle	Valve starts event in open position and fails open which fails the RHR HX B.	RHR HX B Room		X	X	X	X	X	X
RHR-MO-MO166B	RHR HX B Vent	No impact on PRA	RHR HX B Room		X	X	X	X	X	X
RHR-SO-SSV61	RHR Effluent Sample Valve	No impact on PRA	RHR HX B Room		X	X	X	X	X	X