



Duquesne Light

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August 13, 1984

United States Nuclear Regulatory Commission
Washington, DC 20555

ATTENTION: Mr. George W. Knighton, Chief
Licensing Branch 3
Office of Nuclear Reactor Regulation

SUBJECT: Beaver Valley Power Station - Unit No. 2
Docket No. 50-412
Auxiliary Systems Branch Open Items

Gentlemen:

This letter forwards responses to Auxiliary Systems Branch (ASB) draft SER open items 125, 127, 128, 129, 130, 133, 135, 139, and 148. The responses to Open Items 127, 128, 129, 130, and 133 provide details which were not included in the earlier submittal, letter 2NRC-4-099 dated July 2, 1984.

Responses to all twenty-eight of the ASB draft SER open items, 122 through 149, have now been formally submitted.

DUQUESNE LIGHT COMPANY

By E. J. Woolever
E. J. Woolever
Vice President

JJS/wjs
Attachment

cc: Ms. M. Ley, Project Manager (w/a)
Mr. E. A. Licitra, Project Manager (w/a)
Mr. G. Walton, NRC Resident Inspector (w/a)

SUBSCRIBED AND SWORN TO BEFORE ME THIS
10th DAY OF August, 1984.
Elva G. Lesondak
Notary Public

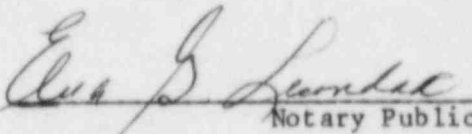
ELVA G. LESONDAK, NOTARY PUBLIC
ROBINSON TOWNSHIP, ALLEGHENY COUNTY
MY COMMISSION EXPIRES OCTOBER 20, 1986

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COMMONWEALTH OF PENNSYLVANIA)
) SS:
COUNTY OF ALLEGHENY)

On this 10th day of August, 1984, before me, a
Notary Public in and for said Commonwealth and County, personally appeared
E. J. Woolever, who being duly sworn, deposed and said that (1) he is Vice
President of Duquesne Light, (2) he is duly authorized to execute and file
the foregoing Submittal on behalf of said Company, and (3) the statements
set forth in the Submittal are true and correct to the best of his
knowledge.


Notary Public

ELVA G. LESONDAK, NOTARY PUBLIC
ROBINSON TOWNSHIP, ALLEGHENY COUNTY
MY COMMISSION EXPIRES OCTOBER 20, 1986

THE APPLICANT STATED THAT, IN GENERAL, CONSTRUCTION JOINTS OF THE EXTERIOR WALLS AND MATS BELOW ELEVATION 730 ARE PROVIDED WITH WATER STOPS. THE APPLICANT SHOULD PROVIDE A DISCUSSION WHICH DEMONSTRATES THAT WHEN USING THE TERM "IN GENERAL" CONSTRUCTION JOINTS... BELOW ELEVATION 730 ARE PROVIDED WITH WATER STOPS, ADEQUATE PROTECTION FOR ALL SEISMIC CATEGORY I STRUCTURES WILL BE PROVIDED FROM EXTERIOR FLOODS.

RESPONSE

ALL SEISMIC CATEGORY I STRUCTURES WHICH ENCLOSE SAFETY-RELATED SYSTEMS OR COMPONENTS IN AREAS AT FLOOR LEVELS BELOW ELEVATION 730'-0" HAVE WATER STOPS PLACED IN CONSTRUCTION JOINTS OF THE REINFORCED CONCRETE EXTERIOR. THESE WATER STOPS CONTINUE AT LEAST UP TO ELEVATION 730'-0". THIS TYPE OF FLOOD PROTECTION DOES NOT APPLY TO SAFETY-RELATED COMPONENTS THAT ARE EMBEDDED IN CONCRETE BELOW ELEVATION 730'-0", SUCH AS THE FUEL OIL TANKS.

PUMPS AND FANS OUTSIDE OF CONTAINMENT WERE EVALUATED FOR THE POTENTIAL OF MISSILE GENERATION AS A RESULT OF A FAILURE OR AN OVERSPEED CONDITION. REGARDING PUMPS AND FANS OTHER THAN AFW TDP, NO CREDIBLE MISSILES ARE POSTULATED AS IT WAS CONCLUDED THAT THE MAXIMUM NO LOAD SPEED IS EQUIVALENT TO THE MAXIMUM OPERATING SPEED OF THE MOTORS THEREFORE A PIPE BREAK OR SINGLE FAILURE COULD NOT RESULT IN A SPEED IN EXCESS OF THE NO LOAD CONDITION (NO OVERSPEED) AND THUS NO CREDIBLE MISSILES ARE POSTULATED. BASED ON RECENT EXPERIENCE WITH FAN FAILURES RESULTING IN MISSILES, WE REQUIRE FURTHER JUSTIFICATION FROM THE APPLICANT THAT ADEQUATE PROTECTION IS PROVIDED. THE APPLICANT HAS ALSO NOT ADDRESSED THE POTENTIAL OF AND CONSEQUENCES THAT FOLLOW THE FAILURE OF ANY OF THE FANS INSIDE CONTAINMENT.

RESPONSE

WE DO NOT CONSIDER THROUGH-FAN-HOUSING MISSILES THAT WOULD DAMAGE SAFETY-RELATED SYSTEMS, STRUCTURES, AND COMPONENTS TO BE CREDIBLE BECAUSE OF THE FOLLOWING REASONS:

1. THE ONLY PARTS WHICH MAY BECOME POSSIBLE MISSILES ARE THE BLADES. THEREFORE, THE METHOD OF BLADE ATTACHMENT HAS BEEN INVESTIGATED TO ENSURE THAT THE BLADE LOCKNUT TORQUE AND BLADE TIP ANGLE MEET THE MANUFACTURE'S SPECIFICATION. THE MARGIN OF SAFETY FOR THE ROTOR BLADE ATTACHING BOLTS AND BLADE RIVETS HAS BEEN SHOWN TO BE VERY HIGH.
2. USING THE CONSERVATIVE BALLISTIC RESEARCH LABORATORY (BRL) FORMULA, WE SHALL SHOW THAT THE REQUIRED THICKNESS OF STEEL CASING TO CONTAIN THE MISSILE IS LOWER THAN THE EXISTING FAN CASING THICKNESS. IF THE FAN BLADE DOES BECOME AN INTERNALLY GENERATED MISSILE, THE ABOVE ANALYSIS WILL DEMONSTRATE THAT THE FAN CASING WILL CONTAIN THE MISSILE.

IN REGARD TO THE AUXILIARY FEEDWATER TURBINE DRIVEN PUMP, IT IS LOCATED IN THE SAFEGUARDS BUILDING AT ELEVATION 718'-6" WITHIN ONE OF THE TWO CONCRETE COMPARTMENTS HOUSING THE TWO REDUNDANT MOTOR-DRIVEN AUXILIARY FEEDWATER PUMPS. THE

COMPARTMENT IS DESIGNED TO CONTAIN ANY GENERATED MISSILES AND AS SUCH TO PREVENT ANY MISSILES FROM AFFECTING OTHER SAFETY SYSTEMS AND THE MOTOR DRIVEN AUXILIARY FEEDWATER PUMPS. WE WILL REQUIRE THE APPLICANT TO PROVIDE ADDITIONAL INFORMATION REGARDING THE ADEQUACY OF THE TURBINE MISSILE BARRIER AS INDICATED IN SECTION 10.4.9 OF THIS SER. WHILE THE SEPARATE CUBICLE ENCLOSURE FOR THE TURBINE DRIVEN PUMP PROTECTS THE MOTOR-DRIVEN PUMPS FROM POTENTIAL MISSILES ORIGINATING FROM THE TURBINE-DRIVEN PUMP, THE APPLICANT HAS NOT PROVIDED THE RESULTS OF AN ANALYSIS WHICH SHOWS THAT POTENTIAL MISSILES FROM THE TURBINE-DRIVEN AFW PUMP CANNOT DAMAGE OTHER SAFETY-RELATED EQUIPMENT.

RESPONSE

THE AUXILIARY FEEDWATER TURBINE DRIVEN PUMP (AFWTDP) IS LOCATED WITHIN A CONCRETE COMPARTMENT IN THE SAFEGUARDS BUILDING DESIGNED TO PREVENT ANY GENERATED MISSILES FROM ADVERSELY AFFECTING ESSENTIAL SAFETY-RELATED EQUIPMENT. THE ADEQUACY OF THE CONCRETE BARRIER WAS DETERMINED USING CONCRETE BARRIER IMPACT TECHNIQUES AS DESCRIBED IN SECTION 3.5.3.

ALL SAFETY-RELATED EQUIPMENT POTENTIALLY IMPACTED BY POSTULATED (AFWTDP) MISSILES (I.E., WITHIN THE ZONE OF INFLUENCE AND NOT SEPARATED BY BARRIERS) HAS BEEN EVALUATED AND WAS FOUND TO BE NONESSENTIAL FOR ATTAINING AND MAINTAINING A SAFE SHUTDOWN CONDITION OR MITIGATING THE CONSEQUENCES OF AN ACCIDENT.

OI 129

IN REGARD TO THE POTENTIAL FOR MISSILES GENERATED BY PRESSURIZED TANKS AND CYLINDERS DAMAGING OR DEGRADING THOSE ITEMS REQUIRED FOR A SAFE SHUTDOWN, THE APPLICANT STATES AN EVALUATION IS IN PROGRESS, AND THAT FURTHER DOCUMENTATION AND REMEDIAL ACTIONS WILL BE COMPLETED BY THE END OF 1985.

RESPONSE

NON-ASME PRESSURIZED TANKS AND COMPRESSED AIR/GAS CYLINDERS WITH PRESSURE \geq 275 PSI ARE CONSIDERED AS CREDIBLE MISSILE SOURCES.

EACH MISSILE SOURCE HAS BEEN IDENTIFIED FOR LOCATION IN A Q.A. I BUILDING OR AREA. THAT AREA WAS EVALUATED FOR ESSENTIAL STRUCTURES, SYSTEMS, AND COMPONENTS (SSC) REQUIRED FOR SAFE PLANT SHUTDOWN, TO MITIGATE THE EFFECTS OF THE ACCIDENT, AND TO LIMIT THE OFFSITE RADIATION DOSAGE WITHIN 10CFR100 ALLOWABLES. WHERE NO ESSENTIAL SSC WERE IDENTIFIED, THAT MISSILE SOURCE REQUIRED NO FURTHER ANALYSIS.

WHERE ESSENTIAL SSC WERE IDENTIFIED IN THE AREA, AND NO PHYSICAL SEPARATION EXISTED BETWEEN THE ESSENTIAL SSC AND THE POSTULATED MISSILE, THE MISSILE SOURCE WAS RESTRAINED AND/OR CONTAINED BY THE SUPPORTING STRUCTURE AND SHIELDS.

OI 130

IN RESPONSE TO OUR REQUEST FOR INFORMATION RELATING TO THE POTENTIAL FOR TEMPERATURE AND PRESSURE SENSORS INSIDE AND OUTSIDE CONTAINMENT BECOMING MISSILES, THE APPLICANT STATES AN EVALUATION IS IN PROGRESS, AND THAT FURTHER DOCUMENTATION AND REMEDIAL ACTIONS WILL BE COMPLETED BY THE END OF 1985.

RESPONSE

TEMPERATURE SENSORS INSTALLED IN WELLS WHERE SYSTEM PRESSURE EQUALS OR EXCEEDS 275 PSI ARE EVALUATED. THERMOWELLS INSTALLED IN THIS PIPING MAY BECOME MISSILES IF THE FAILURE OF A SINGLE CIRCUMFERENTIAL WELD WOULD CAUSE THEIR EJECTION. TWO RUPTURE LOCATIONS HAVE BEEN POSTULATED.

1. AROUND THE WELDING BETWEEN THE BOSS AND THE PIPE WALL.
2. AT THE WELDING BETWEEN THE TEMPERATURE ELEMENT ASSEMBLY AND THE BOSS WITHOUT THE WELL ELEMENT, AND THE WELDING BETWEEN THE WELL AND THE BOSS WITH THE WELL ELEMENT.

THE ANALYSIS OF THE THERMOWELL INSTALLATION DEMONSTRATES THAT CONSERVATIVE SAFETY FACTORS EXIST FOR THE WELD STRESSES FOR THE INSTRUMENT TO PIPE BOSS WELD, THE WELL TO PIPE BOSS WELD, AND THE WELD BETWEEN THE BOSS AND THE PIPE WALL. BECAUSE OF THESE HIGHLY CONSERVATIVE DESIGN FEATURES, THERMOWELLS ARE NOT CONSIDERED AS CREDIBLE MISSILE SOURCES.

PRESSURE SENSORS CONNECTED TO SYSTEM PIPING WHERE THE PRESSURE EQUALS OR EXCEEDS 275 PSI WERE EVALUATED. THE FOLLOWING INSTALLATION DESIGN REQUIREMENTS WERE UTILIZED IN THE EVALUATION:

1. PRESSURE SENSORS ARE NOT INSTALLED DIRECTLY ON SYSTEM PIPING. THE INSTRUMENTS ARE INSTALLED USING STAND, WALL, OR RACK ARRANGEMENTS WITH INSTRUMENT TUBING ROUTED TO THE APPROPRIATE SENSING POINTS WITHIN THE SYSTEM PIPING.
2. CELL TUBING AND SUPPORTS FOR PRESSURE SENSORS INSTALLED IN SEISMIC AREAS ARE SEISMICALLY DESIGNED AND ANALYZED.

BASED ON THE ABOVE, THERE IS NO FAILURE MECHANISM WHICH WOULD RESULT IN THE GENERATION OF A MISSILE.

OI 133

THE APPLICANT'S ANALYSES FOR ALL PIPE BREAK LOCATIONS, INCLUDING PIPE WHIP, JET IMPINGEMENT, FLOODING, AND ENVIRONMENT EFFECTS OF POSTULATED HIGH AND MODERATE PIPE BREAKS ON SAFETY-RELATED EQUIPMENT AND STRUCTURES IN RESPONSE TO OUR QUESTION 410.10 IS NOT COMPLETE. THE APPLICANT HAS STATED THAT THIS INFORMATION WILL BE SUPPLIED AT A LATER DATE.

UNTIL RECEIPT OF ACCEPTABLE INFORMATION AS DISCUSSED ABOVE, WE CANNOT CONCLUDE THAT THE APPLICANT HAS ADEQUATELY DESIGNED AND PROTECTED AREAS AND SYSTEMS REQUIRED FOR SAFE PLANT SHUTDOWN FOLLOWING POSTULATED EVENTS, INCLUDING THE COMBINATION OF PIPE FAILURE AND SINGLE ACTIVE FAILURE.

RESPONSE

THE CRITERIA FOR POSTULATING BREAKS AND DETERMINING THEIR EFFECTS (I.E., PIPE WHIP AND JET IMPINGEMENT) IS PROVIDED IN SECTION 3.6.2. RESULTS OF THE PIPE WHIP AND JET IMPINGEMENT ANALYSES ARE TO BE PROVIDED IN SECTION 3.6.2.5. CURRENTLY, THE RESULTS OF THE PIPE WHIP ANALYSIS FOR THE FOLLOWING LINES ARE PROVIDED IN SECTION 3.6.2.5:

FEEDWATER LINES INSIDE CONTAINMENT FIGURE 3.6B-12
FEEDWATER LINES OUTSIDE CONTAINMENT FIGURE 3.6B-13
MAIN STEAM LINES OUTSIDE CONTAINMENT FIGURE 3.6B-14

THE FORMAT FOR THE PRESENTATION OF THE RESULTS OF THE JET IMPINGEMENT ANALYSES ALONG WITH THOSE OF THE PIPE WHIP ANALYSES WAS PROVIDED TO THE NRC, IN DLC LETTER 2NRC-4-097 DATED JULY 2, 1984, IN RESPONSE TO QUESTION 210.12.

OI 135

THE APPLICANT HAS NOT CONFIRMED THAT IN THE EVENT LIGHT LOADS (THOSE THAT WEIGH LESS THAN A FUEL ASSEMBLY PLUS HANDLING FIXTURE) ARE DROPPED OVER THE FUEL POOL OR REACTOR VESSEL FROM THEIR MAXIMUM NORMAL ELEVATION, THAT THE RESULTING KINETIC ENERGY DOES NOT EXCEED THAT OF A DROPPED FUEL ASSEMBLY AND ITS ASSOCIATED HANDLING TOOL. CONTINGENT UPON OUR RECEIVING SUCH A CONFIRMATION, WE CONCLUDE THAT THE REQUIREMENTS OF GENERAL DESIGN CRITERIA 61 "FUEL STORAGE AND HANDLING AND RADIOACTIVITY CONTROL" AND 62 "PREVENTION OF CRITICALITY IN FUEL STORAGE AND HANDLING" AND THE GUIDELINES OF REGULATORY GUIDE 1.13, "FUEL STORAGE FACILITY DESIGN BASIS" POSITIONS C.1, C.3, C.5, AND C.6 ARE SATISFIED.

RESPONSE

AN ANALYSIS HAS BEEN PERFORMED THAT SHOWS THAT THE DEVELOPED KINETIC ENERGY DUE TO A DROPPED TOOL EXCEEDS THAT OF A FUEL ASSEMBLY AND ITS ASSOCIATED HANDLING TOOL. THE FUEL RACKS WILL BE ANALYZED TO SHOW THAT THIS CAUSES NO ADVERSE SAFETY IMPACT. IF THE FUEL RACKS CANNOT WITHSTAND THIS IMPACT, THE DROP HEIGHT OF THESE LOADS WILL BE LIMITED BY ADMINISTRATIVE CONTROL TO A VALUE SUCH THAT THE KINETIC ENERGY DEVELOPED BY DROPPING THE TOOL IS LESS THAN THAT DEVELOPED BY THE DROP OF A FUEL ASSEMBLY AND ITS ASSOCIATED HANDLING TOOL.

OI 139

IN RESPONSE TO THE STAFF QUESTIONS REGARDING THE ADEQUACY OF FLOOD PROTECTION IN THE EVENT OF AN EARTHQUAKE WHEN THE EQUIPMENT AND FLOOR DRAINAGE SYSTEM HAD FAILED, THE APPLICANT HAS STATED THAT A RESPONSE WILL BE SUBMITTED AT A LATER DATE.

RESPONSE

THE FOLLOWING RESPONSE ADDRESSES THIS CONCERN AND IT WILL BE INCLUDED IN AMENDMENT 8 AS THE RESPONSE TO QUESTION 410.24.

SINCE BVPS-2 IS DESIGNED WITH A NON-SEISMIC FLOOR DRAINAGE SYSTEM, THE PLANT FLOOD LEVELS HAVE BEEN CALCULATED WITHOUT TAKING CREDIT FOR DRAINAGE THROUGH THE FLOOR DRAINS. THEREFORE, IT IS NOT NECESSARY TO VERIFY THAT THE DRAIN SIZE IS SUFFICIENT TO PASS THE MAXIMUM FLOOD CONDITIONS. COMPARTMENTS AND AREAS CONTAINING ESSENTIAL EQUIPMENT ARE EXAMINED FOR POTENTIAL FLOODS. IN AREA WHERE REDUNDANT TRAINS MAY BE EFFECTED, LEAK DETECTION SUMPS ARE EQUIPPED WITH REDUNDANT SAFETY-GRADE ALARMS LOCATED ABOVE THE FLOOD LEVEL WHICH ANNUNCIATE IN THE CONTROL ROOM. IN SEALED AREAS WHICH HOUSE ONLY ONE TRAIN OF COMPONENTS, A SINGLE SAFETY GRADE ALARM LOCATED ABOVE THE FLOOD LEVEL WHICH ANNUNCIATES IN THE CONTROL ROOM IS PROVIDED. THE MAXIMUM FLOOD LEVELS WERE CALCULATED ASSUMING A 30-MINUTE LEAK DURATION, THUS ALLOWING ENOUGH TIME FOR THE OPERATOR TO ISOLATE THE PROBLEM AREA BEFORE SAFETY-RELATED EQUIPMENT ARE ADVERSELY EFFECTED. ELECTRICAL EQUIPMENT POWERED FROM THE 1E BUS THAT HAS A POST ACCIDENT FUNCTION WILL BE QUALIFIED FOR THE WORST CASE ENVIRONMENT. SUCH EQUIPMENT WILL BE QUALIFIED FOR SUBMERGENCE OR LOCATED ABOVE THE FLOOD LEVEL.

THE FLOOR DRAINAGE SYSTEM HAS BEEN EVALUATED FOR THE POSSIBLE EFFECTS OF BACKFLOW DURING POSTULATED FLOODS. THERE ARE INDEPENDENT DRAINAGE SYSTEMS FOR EACH CATEGORY I BUILDING, WITH THE EXCEPTION OF THE BOTTOM ELEVATION (730'-6") OF THE SERVICE BUILDING (SB) DRAINS INTO A SUMP AT THE BOTTOM ELEVATION (718'-6") OF THE MAIN STEAM VALVE HOUSE (MV). CONSIDERING THE ELEVATION DIFFERENCE BETWEEN THE MV AND SB, AND THE FACT THAT THERE IS NO POSTULATED FLOOD ON THE BOTTOM ELEVATION OF THE SB, THERE IS NO CREDIBLE WAY THAT BACKFLOW THROUGH THIS PORTION OF THE BUILDING DRAIN SYSTEM CAN RESULT IN A WORSE FLOOD CONDITION THEN ALREADY CALCULATED. IN AREAS WITHIN THE SAME BUILDING WHERE THERE ARE INTERCONNECTED DRAINS SERVING REDUNDANT SAFETY RELATED EQUIPMENT, BACKFLOW WILL BE CONSIDERED AND ALL ESSENTIAL EQUIPMENT WILL BE EITHER QUALIFIED FOR SUBMERGENCE OR LOCATED ABOVE THE FLOOD LEVEL.

OI 148

THE APPLICANTS RESPONSE TO OUR REQUEST FOR PERFORMANCE OF A TEST TO DEMONSTRATE THAT THE POTENTIAL FOR FEEDWATER WATER HAMMER HAS BEEN ADEQUATELY PROVIDED IS UNACCEPTABLE. IT IS OUR POSITION THAT A TEST IS NECESSARY IN ORDER TO VERIFY THE EFFECTIVENESS OF THE DESIGN PROVISIONS. THEREFORE, WE WILL REQUIRE A COMMITMENT FOR SUCH A TEST. THE TEST SHOULD BE CONDUCTED AT SYSTEM CONDITIONS AS CLOSE TO THOSE EXPERIENCED DURING NORMAL PLANT OPERATIONS. AUTOMATIC INITIATION OF THE AUXILIARY FEEDWATER SYSTEM SHOULD BE ALLOWED TO OCCUR FOLLOWING THE TRIPPING OF THE MAIN FEEDWATER PUMPS. THE APPLICANT SHOULD OBSERVE AND RECORD THE INITIAL CONDITIONS AND THE TRANSIENT THAT FOLLOWS. THE APPLICANT SHOULD ALSO PROVIDE PHYSICAL DRAWINGS WHICH ILLUSTRATE THE SYSTEM WATERHAMMER PREVENTION DESIGN FEATURES.

RESPONSE

THE NRC STAFF RESPONSE TO THE WESTINGHOUSE COMMENTS ON NUREG-0927 INDICATES THAT THE STAFF AGREES THAT A QUALIFIED DESIGN THAT PRECLUDES SGWH SHOULD NOT REQUIRE TESTING IN-PLANT AT EACH APPLICATION. THE STAFF CONTENDS THAT THE TESTING IS NECESSARY BECAUSE NUMEROUS VARIABLES ARE GENERALLY FOUND IN THE IMPLEMENTATION OF THE DESIGN OF THE MAIN AND AUXILIARY FEEDWATER SYSTEMS AT THE DIFFERENT PLANTS.

THE DESIGN OF BVPS-2 WHICH RELATES DIRECTLY TO THE PREVENTION OF SGWH IS THE SAME AS THAT INSTALLED AND PROVEN EFFECTIVE AT BVPS-1 DURING 7 YEARS OF ACTUAL OPERATION. THE STEAM GENERATORS ARE THE SAME DESIGN AS BVPS-1 AND NORTH ANNA UNITS 1 AND 2, THE MAIN AND AUXILIARY FEEDWATER SYSTEMS INJECT WATER INTO THE SG'S VIA THE SAME INTERNAL FEED RING WHICH IS EQUIPPED WITH J-TUBES. THE FEEDWATER LINE EXTERNAL TO THE SG'S IS DESIGNED WITH AN ELEVATION CHANGE IN THE PIPING WHICH LIMITS THE LENGTH OF INTERIOR AND EXTERIOR HORIZONTAL PIPING DIRECTLY CONNECTED TO THE FEED RING WHICH IS SUBJECT TO DRAINING AND SUBSEQUENT RE-FILLING WITH STEAM WHEN FEEDWATER FLOW IS INTERRUPTED. THE PLANTS HAVE THE SAME CONTROL SCHEME FOR STARTING OF THE AUXILIARY FEEDWATER PUMPS AND THE SIZE OF THE AUXILIARY FEEDWATER PUMPS IS ESSENTIALLY THE SAME.

THE TOP DISCHARGING J-TUBES, THE SHORT HORIZONTAL FEEDWATER PIPE CONNECTED TO THE FEEDWATER RING AND THE SIZE AND AUTOMATIC INITIATION OF THE AUXILIARY FEEDWATER SYSTEM ARE THE DESIGN FEATURES WHICH RELATE TO THE PREVENTION OF SGWH. THE SGWH EVENT STARTS IN THE STEAM GENERATOR WHEN THE FEED RING DRAINS AND STEAM ENTERS THE RING AND IS SUBSEQUENTLY TRAPPED BY THE ADDITION OF SUBCOOLED FEEDWATER USUALLY SUPPLIED BY THE AFW SYSTEM. (SEE SECTION 2.4.2 OF NUREG-0927 FOR DETAILS)