Attachment 1

VEGP UNITS 1 & 2

FIRE EVENT SAFE SHUTDOWN EVALUATION REPORT (PER BRANCH TECHNICAL POSITION CMEB 9.5-1)

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I. INTRODUCTION

It is expected that the systems normally used to achieve and maintain cold shutdown will be available any time the operator chooses to perform a reactor shutdown and cooldown. However, the fire event safe shutdown capability ensures that a safe (cold) plant shutdown condition can be achieved and maintained, with or without offsite power available, assuming a postulated fire at any plant location.

The engineering analysis performed to define the fire event safe shutdown capability does not necessarily consider all the systems and components associated with a normal shutdown. The approach of the evaluation was to show that there is at least one means available to accomplish safe shutdown. However, the limitations of the analysis do not require implementation of the fire event safe shutdown scenario in all cases. For fires located outside the control room, a functional recovery approach to safe shutdown is prudent. The operators would utilize the systems normally employed to achieve cold shutdown as long as the critical parameters indicate that the necessary safe shutdown functions were being accomplished. A key assumption in the analysis is that the operators would be observant of the critical parameters which are those plant process indications included within the scope of the fire event safe shutdown analysis and which have been evaluated and found to be operational for the fires under consideration.

However, for a fire in the control room, because the operator must control the plant from local control stations, because the information available to the operator to ascertain plant status is less exhaustive than that available in the main control room, and because realistic damage assessments are not practicable in the analysis, it is more prudent for the operators to achieve and maintain a safe shutdown in accordance with specific procedures. These procedures for the control room fire event safe shutdown take into consideration the assessment uncertainties by placing the plant in a known configuration thereby allowing an orderly shutdown within the bounds of that plant configuration as analyzed. This procedure would only be implemented at the direction of the senior shift supervisor who would assess the fire situation prior to evacuating the control room.

In each of the postulated fire situations involving various physical plant locations (referred to as fire areas), the engineering evaluation defines the limitations of the fire event safe shutdown capability and provides the operator with the strategy for achieving safe shutdown.

II. FIRE EVENT SAFE SHUTDOWN FUNCTIONS

To achieve safe shutdown, specific functions must be accomplished. There may be redundant and diverse means to accomplish these functions, but not all of these means may be available for any given postulated fire event. Table 1 defines the fire event safe shutdown functions and success paths available to achieve the functions. The following discussions are provided to augment the Table 1 functional descriptions.

A. Reactivity Control

Initial reactor shutdown from a normal operating condition is achieved by control rod insertion. This is accomplished by the following means:

- o Opening of reactor trip breakers from the control room (for all fires located outside the control room except when the fire is located at the reactor trip switchgear breakers).
- o Deenergizing the control rod drive mechanism by opening the non-class 1E power supply breakers feeding the rod drive MG sets. (The analysis assumes that all four reactor trip breakers could mechanically fail due to heat damage from a fire at the breakers).
- o Opening the reactor trip breakers locally at the breakers in the event of a fire in the control room. Reactor trip breaker opening for this fire can also be accomplished by opening the circuit breakers in the DC power feeder panels that power the reactor trip switchgear breaker control circuit. (This action is not strictly required by the analysis because it assumes that the reactor trip is accomplished by the plant operators prior to leaving the control room.)

TABLE 1

SAFE SHUTDOWN FUNCTION SUCCESS PATHS

FUNCTION	**PURPOSE**	**SUCCESS PATHS**	
		PREFERRED	**ALTERNATE**
Reactivity Control	Shutdown reactor to reduce heat production	Control rod insertion followed by boration from BAST	Control rod insertion followed by boration from RWST with head vent system letdown.
RCS Inventory Control	Keep core covered	Charging with letdown isolation	Same as preferred
RCS Pressure Control	Maintain subcooled margin/prevent overpressurization	Pressurizer heaters(a) and code safety valves or PORV's	Charging and code safety valves or PORV's
Core Heat Removal	Transfer of heat to coolant	Reactor coolant pumps(a)	Natural Circulation
RCS Heat Removal	Transfer of heat from coolant	RCS temp. >350F: Auxiliary feedwater system and main steam bypass control(a) and code safety valves. RCS temp. <350F: Shutdown cooling	RCS temp. >350F: Main steam code safety valves along with auxiliary feedwater system and main steam power operated relief valves. RCS temp. <350F: Same as preferred
Maintenance of Vital Auxiliaries	Maintain operability of necessary support systems	Offsite power, normal HVAC, normal cooling and chilled water, etc.(a)	Onsite power, essential HVAC essential cooling and chilled water, etc.

Note: a. Preferred path not actually evaluated. Alternate path is redundant and is assured to to be operable with or without offsite power

Reactivity control for a cold shutdown condition requires boration to account for xenon decay and cooldown reactivity effects. The boron addition to the RCS is achieved by charging borated water into the RCS from either the Boric Acid Storage Tank (BAST) (preferred source due to the high concentration of boric acid) or the Refueling Water Storage Tank (RWST).

When the source of RCS makeup for volume contraction due to cooldown is the BAST, supplemented by the RWST, the necessary RCS boric acid concentration may be accomplished without the need for letdown. When the source of RCS makeup is the RWST only, RCS letdown must be employed (see RCS inventory control) to obtain the necessary boric acid concentration due to the nominal 2,000 ppm boric acid concentration in the RWST. During a natural circulation cooldown, the plant is maintained in a hot standby condition for approximately 4 hours to allow boration from the BAST (about 17 hours if boration is from the RWST).

To preclude inadvertent boron dilution during RCS makeup addition, the charging pump suction from the volume control tank is isolated.

The status of core reactivity is determined by monitoring reactor power through use of the Reg. Guide 1.97 neutron fission chambers.

B. RCS INVENTORY CONTROL

RCS inventory control is necessary to ensure that the core remains covered. RCS inventory control includes both the capability to makeup to and letdown from the RCS as necessary to accommodate cooldown boration and pressure control.

Reactor coolant system makeup for the fire event safe shutdown is accomplished using either of the two (Train A or B) centrifugal charging pumps. There are two sources of makeup water (see reactivity control). Because of the relatively low concentration of boric acid in the RWST, a feed and bleed type operation must be implemented to raise the RCS boric acid concentration to a value necessary to ensure shutdown margin during plant cold shutdown. There are two means to accomplish letdown:

o The preferred means of letdown is the normal letdown path through the regenerative and letdown heat exchangers. However, for many fires outside the containment and for a limited number of fires inside the containment, this flow path can be isolated by fire damage to electrical cables.

- The alternate letdown path is the reactor vessel head vent system. This system consists of redundant flow paths - one of which can be assured, through separation, for all plant fires except the postulated fire at the valve location. Because these valves are located inside containment, there is no need for letdown should they be damaged by a fire because the BAST flow path components and cables are all located outside containment.

The preferred Train A charging path to the RCS is via the regenerative heat exchanger, bypassing the normal charging path control valve HV-0182. This preferred flow path is provided with flow control but is subject to being isolated due to fire induced spurious closure of the Train B containment isolation valve HV-8105. Therefore, an unthrottled but acceptable alternate Train A makeup flow path is available to the plant operators via the high head safety injection boration path by opening valve HV-8801A. This alternate flow path also contains a normally open Train B valve (HV-8438) which could be assumed to close by fire induced hot shorts. However, within the bounds of the analysis, it is not credible that a fire could cause simultaneous isolation of both valves precluding makeup addition to the RCS using the Train A charging pump. When using the alternate Train A charging path, flow control is accomplished either through intermittent pump operation or by operation of the valve HV-8801A.

The Train B charging path to the RCS is via the high head safety injection boration path (HV-8801B). This path is also provided with flow control. An alternate Train B charging path is not necessary as there are no Train A valves in the Train B flow path.

Because the circuits for the charging flow control valves are not isolated from the control room by operation of the transfer of control switches at the remote shutdown panels it may be necessary to control charging flow during the control room fire either through intermittent pump operation or by operation of the RCS injection valve.

There are limitations associated with intermittent charging pump operation. If the charging pump is cold, the motor can tolerate two consecutive starts with no limitations. If the motor is at its normal operating temperature, it should be run for at least 15 minutes following its starting or it may be necessary to allow the motor to cool for up to 45 minutes following its stopping.

During charging pump operation, minimum flow must be maintained through the pump to preclude overheating. The preferred flow path for mini-flow when using either the Train A or Train B pump is through the seal water heat exchanger (flow returns to pump suction). However, one valve in this flow path for each pump is of the opposite train (HV-8111A for the Train A pump and HV-8110 for the Train B pump) and can be postulated to isolate the flow path due to fire induced spurious valve closure. To ensure an available mini-flow path for the charging pumps the valve isolating the alternate flow paths back to the RWST for each pump are aligned by opening their respective train related block valves (HV-8508A for the Train A pump and HV-8508B for the Train B Pump). While these flow paths also contain a normally open block valve of the opposite train which could spuriously close due to fire damage, two hot shorts would be required to cause both the preferred and the alternate flow paths to be isolated simultaneously.

The reactor coolant pump seals are subject to failure during hot RCS conditions if both charging system seal injection and auxiliary cooling water system operation is lost simultaneously. When auxiliary cooling water system operability cannot be assured, RCP seal injection is verified to be operational.

The status of RCS inventory control is monitored through use of the pressurizer level instrumentation.

BAST and RWST level indication is provided in the control room. Because the alternate shutdown panel indication of BAST and RWST level is not independent of the control room, a postulated control room fire can result in loss of these tank level indications. A local tank level indicator (LI-0990C)is provided at the RWST and a local pressure indicator (PI-10115 or PI-10116) is available in the vicinity of the BAST which can be used to determine the volume in these tanks.

C. RCS PRESSURE CONTROL

RCS pressure control is necessary to ensure that the reactor coolant is maintained in a subcooled condition ensuring that steam voiding does not preclude RCS heat removal.

RCS pressure control is normally accomplished by operation of the pressurizer heaters and the pressurizer spray control valves. The fire event safe shutdown does not require pressurizer heater or spray valve operation as RCS positive pressure can be controlled by adjusting the cooldown rate and negative pressure control can be achieved by use of the pressurizer PORVs, code safety valves or reactor vessel head vent letdown system. RCS positive pressure control can also be accomplished by filling the RCS by charging pump operation and performance of a solid plant cooldown. RCS overpressurization is precluded by pressurizer code safety valves.

The status of RCS pressure control is monitored through the use of the RCS wide range pressure instruments.

D. CORE HEAT REMOVAL

Transfer of heat from the core is accomplished by the thermal gradient between the fuel and the cooling water. Circulation of the reactor coolant is normally accomplished by operation of the reactor coolant pumps. However, natural circulation of reactor coolant will occur upon inability of the reactor coolant pumps to operate (i.e., loss of offsite power) and is adequate to achieve a safe shutdown plant condition.

The status of core heat removal is monitored through the use of the RCS wide range pressure and temperature instrumentation.

E. RCS HEAT REMOVAL

Initial RCS heat removal is accomplished by the steam generator code safety valves which release steam to the atmosphere. These valves are independent of electrical power and are not subject to fire induced spurious actuation.

RCS heat removal is accomplished in two phases. At RCS temperatures above 350°F, heat is removed by releasing steam through the main steam atmospheric relief valves and maintaining steam generator levels using the motor driven auxiliary feedwater pumps taking a suction from the condensate storage tanks. At RCS temperatures below 350°F RCS heat removal is accomplished by operation of the RHR system.

Only 2 steam generators are necessary to accomplish this function. Steam generators 1 and 4 are associated with the Train A auxiliary feedwater system and steam generators 2 and 3 are associated with the Train B, auxiliary feedwater system. Each steam generator has an atmospheric steam dump valve and wide range level indicator which also have a safe shutdown train association identical to the auxiliary feedwater system.

A plant hot standby condition is achieved without operation of the main steam atmospheric relief valves (i.e., steam is released to atmosphere via the steam generator code safety valves). While cooldown of the RCS can be achieved using only two steam generators it is desirable to establish steam flow out of the idle steam generators within approximately 8 hours. If steam generator level indication is available for either of the idle steam generators then it is also desirable to maintain a level in that steam generator. If level indication is not available in either of the idle steam generators, then steam flow should be established and feedwater flow (including auxiliary feedwater flow) should be terminated.

Because the control circuits for the Train A main steam atmospheric steam dump valves are not electrically independent of the control room, (transfer of control switches at the remote shutdown panels do not isolate the operator interface module (OIM) circuits from the control room it may be necessary to operate or disable operation of these valves through local manual operator actions for the control room fire safe shutdown event. The capability to operate the Train B main steam atmospheric steam dump valves is provided at the remote shutdown panel through the use of a portable signal generating device. The hydraulic pumps associated with these electro-hydraulicly operated valves will continue to operate properly as they do not have electrical circuitry routed to or from the control room. The capability to locally operate an atmospheric steam dump valve is also provided.

A natural circulation symmetric cooldown rate should not exceed 50°F per hour when the RCS is in a solid condition to preclude forming a bubble in the RPV head. In addition, the RCS pressure must be controlled to maintain at least 100°F indicated subcooling during the depressurization phase. A two steam generator cooldown and depressurization of the RCS should not be necessary as at least 4 hours are available to establish steam flow from an idle steam generator.

The status of RCS heat removal is monitored through the use of the RCS temperature instrumentation. When releasing steam to obtain the desired cooldown, the operators also monitor steam generator wide range level and steam line wide range pressure and condensate storage tank level. Because the alternate shutdown panel indication of steam line pressure and condensate storage tank level is not independent of the control room, a postulated control room fire can result in loss of these indications. A local tank level indicator is provided at the two condensate storage tanks (LI-5100 and LI-5115) and steam generator pressure can be indirectly determined by evaluation of the Train B steam generator RCS T-cold indications at the remote shutdown panel.

F. MAINTENANCE OF VITAL AUXILIARIES

Maintenance of vital auxiliaries refers to the systems and equipment required to directly or indirectly support the operating of the systems and equipment required to accomplish the other safe shutdown functions. Maintenance of vital auxiliaries includes the ultimate heat sink, the heating and ventilating systems and the plant electrical power systems.

III. FIRE EVENT SAFE SHUTDOWN SYSTEMS/EQUIPMENT

The systems and equipment required to accomplish the fire event safe shutdown functions previously described are identified in FSAR Table 9.5.1-1. The flow paths and inter-relationships of these systems and components are depicted in the attached simplified P&IDs (SK-4-SSD-001 through 013) and electrical single line diagrams (SK-3-SSD-001-1, 001-2, 002-1 and 002-2). The heavy weight lines on the simplified P&IDs indicate the safe shutdown flow paths. The existence of control/indication symbols for the depicted equipment indicates that the component is included in the scope of the safe shutdown evaluation. Other flow paths and equipment are shown for orientation purposes only.

A. REACTOR COOLANT SYSTEM (RCS) - See figure SK-4-SSD-001

1. Short Term Requirements

    a. Ensure RCS boundary integrity.

    b. Natural circulation core cooling.

    c. Overpressure control by pressurizer safety valves.

    d. Maintain subcooled RCS conditions.

2. Long Term Requirements

   a. RCS volume control (letdown using reactor head vent system).

   b. RCS pressure control using pressurizer PORVs, charging pumps, or reactor head vents system (solid plant operation).

3. Spurious Actuation Considerations

   a. Item 4 addresses the potential for fire induced spurious actuations resulting in an uncontrolled loss of coolant accident (LOCA). This requirement for the RCS is unique in that multiple hot shorts, open circuits and shorts to ground must be considered.

   b. Spurious opening of the auxiliary spray valve HV-8145 while using the normal charging path (considered Train A path) could result in undesired pressure reductions.

   c. Spurious opening of a normal spray valve PV-0455B or PV-0455C while the reactor coolant pumps are operating could result in undesired pressure reductions.

4. Fire Induced LOCA Considerations

   a. RCS influent line connections have a check valve in series with electrically controlled valves. The check valve is not subject to fire induced spurious valve openings. Therefore, RCS influent lines are not fire induced LOCA problems.

   b. The RCS effluent lines are potential fire induced LOCA problems and are identified in Table 2.

TABLE 2

RCS Effluent Line Description[a]	Line Size	Normally Closed Series Valves	
		Number	Fail Position
1. Train A RHR pump suction	12"	2	as is[b]
2. Train B RHR pump suction	12"	2	as is[b]
3. Train A pressurizer PORV	3"	1[c]	closed
4. Train B pressurizer PORV	3"	1[c]	closed
5. Train A RPV head vent path	1"	3	closed
6. Train B RPV head vent path	1"	3	closed
7. Normal letdown path	1"	0[d]	------
8. Excess letdown path	1"	3	closed

Notes:

a. RCS sample lines are not listed because manual isolation valves are normally closed or because flow is otherwise limited.

b. Valve power supply breakers are locked in the tripped position and are also interlocked to preclude opening when RCS pressure is greater than RHR system design pressure.

c. Pressurizer PORVs (solenoid valves) are backed up by normally open fail-as-is motor operated valves.

d. Normal letdown path flow is limited by orifices. Two normally open, fail-closed, air-operated valves serve as the containment isolation valves. Two additional, normally open fail-closed, pneumatic operated valves in series with the two containment isolation valves close automatically when low pressurizer level occurs.

B. <u>Chemical and Volume Control System (CVCS)</u> - See Figure SK-4-SSD-002

1. Short Term Requirements/Long Term Requirements

    a. Provide RCS inventory control

        - o Normal charging path - Train A
        - o High head safety injection boration path - Train B, alternate Train A path
        - o Makeup source is RWST.

    b. Provide reactivity control - boron injection

        - o BAST without letdown preferred
        - o RWST with letdown is alternative
        - o Boron dilution precluded by isolating VCT.

    c. Provides RCS pressure control - solid RCS operation.

    d. Reactor coolant pump seal injection is only required when auxiliary cooling water system operation can not be assured.

2. Spurious Actuation Considerations

    a. Normal charging path (Train A path) can be spuriously isolated by fire induced closure of HV-8105 (Train B). Alternate Train A flow path is available via the high head safety injection boration path.

    b. Normal minimum flow path for centrifugal charging pumps is through the seal water heat exchanger. The Train A pump mini-flow can be spuriously isolated by fire induced closure of HV-8111A (Train B). The Train B pump mini-flow can be spuriously isolated by fire induced closure of HV-8110 (Train A). Alternate minimum flow paths to the RWST are available.

    c. Either auxiliary component cooling water system operation or CVCS seal injection is required to maintain the integrity of the reactor coolant pump seals. These systems are physically independent of each other and each system has redundant pumps (powered from the redundant Class 1E electrical distribution system) which share common piping within the respective system. There is no single signal caused by fire damage that can result in loss of both means of cooling (temporary loss of seal cooling during load shedding and load sequencing is acceptable).

d. The charging pump normal suction path from the VCT can be spuriously isolated by fire induced closure of LV-0112B or LV-0112C. Closure of these valves before opening the suction path from the RWST could cause damage to a running charging pump.

C. <u>Main Steam System</u> - See figure SK-4-SSD-003

1. Short Term/Long Term Requirements

   a. Initial core heat removal via steam generator safety valves.

   b. Control of RCS heat removal by steam generator isolation (main steam, feedwater, and blowdown)

   c. Control of RCS heat removal by operation of steam generator atmospheric relief valves

   d. Only two steam generators required to achieve safe shutdown. Steam generators 1 and 4 are associated with Train A. Steam generators 2 and 3 are associated with Train B.

2. Spurious Actuation Considerations

   Spurious opening of an atmospheric relief valve.

D. <u>Auxiliary Feedwater System (AFWS)</u> - See figure SK-4-SSD-004

1. Short Term/Long Term Requirements

   a. One of two motor driven pumps required.

   b. Train A pump and valves associated with steam generators 1 and 4. Train B pump and valves associated with steam generators 2 and 3.

   c. Pump suctions from CST.

   d. Isolation of main feedwater required.

2. Spurious Actuation Considerations

   Spurious starting of the turbine-driven or a motor-driven pump (the discharge valves are normally open).

E. <u>Residual Heat Removal System (RHR)</u> - See figure SK-4-SSD-005

   1. Short Term Requirements - None

   2. Long Term Requirements

      a. Circulate RCS

      b. Remove decay heat

      c. One of two flow paths required.

   3. Spurious Actuation Considerations

      a. Spurious closing of RHR heat exchanger outlet valve.

      b. Spurious opening of RHR heat exchanger bypass valve.

      c. Spurious opening of system vent valves.

      d. Spurious opening of HV-8804A or HV-8804B during shutdown cooling system operation.

F. <u>Safety Injection System (SI)</u> - See figure SK-4-SSD-005

   1. Short Term Requirement/Long Term Requirement -

      Venting or isolation of SI accumulator tanks required to ensure RCS inventory and pressure control.

   2. Spurious Actuation Considerations - None

G. <u>Component Cooling Water System (CCWS)</u> See figure SK-4-SSD-006

   1. Short Term Requirement/Long Term Requirement -

      a. Support system for RHR system operation.

      b. Any two of three pumps adequate to ensure system operability.

      c. Makeup water is not required for at least 72 hours.

2. Spurious Actuation Concerns - None

H. Nuclear Service Cooling Water System (NSCW) See figures SK-4-SSD-007-1, 007-2, and 007-3

1. Short Term Requirement/Long Term Requirement

a. Provides cooling for the following safe shutdown equipment:

- Diesel generators
- Centrifugal charging pumps
- RHR pumps
- Essential chilled water chillers
- CCWS pumps
- CCWS heat exchanger
- ACWS heat exchanger

b. Any two pumps and 3 cooling tower fans are adequate for cooldown.

c. Makeup water is not required for at least 72 hours.

2. Spurious Actuation Considerations

Both the cooling tower inlet valve and the bypass valve could be spuriously closed in a control room fire event. The diesel generators are protected by a high temperature trip and the essential chiller is protected by a flow interlock. The analysis assumes that these systems are manually started for the control room fire event.

I. Diesel Generator System - See figure SK-4-SSD-008

1. Short Term Requirement/Long Term Requirement

a. Diesel generators required if offsite power is not available.

b. Either of the two fuel oil transfer pumps is capable of supplying fuel to the day tanks.

2. Spurious Actuation Consideration - None

J. ESF Chilled Water System - see figures SK-4-SSD-009-1 and 009-2

1. Short Term Requirement/Long Term Requirement -

   a. Required to ensure suitable environment for operation of safe shutdown equipment/systems.

   b. Makeup water is not required for at least 72 hours.

2. Spurious Actuation Consideration - None

K. Control Room HVAC System - See figure SK-4-SSD-10

1. Short Term Requirement/Long Term Requirement

   a. Required to ensure suitable environment for operation of safe shutdown equipment/-systems.

   b. Not required for the control room fire event.

2. Spurious Actuation Considerations - None

L. Control Building ESF Equipment HVAC - See figure SK-4-SSD-011

1. Short Term Requirement/Long Term Requirement

   Required to ensure suitable environment for operation of safe shutdown equipment/systems.

2. Spurious Actuation Considerations - None

M. Miscellaneous ESF Area Cooling Systems - See figures SK-4-SSD-012-1, 012-2, 012-3

1. Short Term Requirement/Long Term Requirement -

   Required to ensure suitable environment for operation of safe shutdown equipment/systems

2. Spurious Actuation Considerations - None.

N. Auxiliary Component Cooling Water System (ACCWS) - See figure SK-4-SSD-013

1. Short Term Requirement/Long Term Requirement -

   a. Provides cooling for reactor coolant pump seals.

b. CVCS seal injection is an alternative to seal cooling.

c. Makeup is not required for at least 72 hours.

2. Spurious Actuation Considerations -

Either auxiliary cooling water system operation or CVCS seal injection is required to maintain the integrity of the reactor coolant pump seals. These systems are physically independent of each other and each system has redundant pumps (powered from the redundant Class 1E electrical distribution systems) which share common piping within the respective system. There is no single signal caused by fire damage that can result in loss of both means of cooling (temporary loss of seal cooling during load shedding and load sequencing is acceptable).

O. Electrical Distribution System - See figures SK-3-SSD-001-1, 001-2, 002-1 and 002-2

1. Short Term Requirement/Long Term Requirement -

a. Provide electrical power for operation of all components and instrumentation needed to achieve and maintain safe shutdown.

b. Loss of offsite power is considered.

2. Spurious Actuation Considerations - None.

P. ESFAS Concerns

1. ESFAS is not relied upon to ensure the ability to achieve safe shutdown

2. Some ESFAS situations place the plant in a desired configuration:

- Main steam isolation
- Main feedwater isolation
- Control room ventilation isolation
- NSCW actuation
- CCW actuation
- Control building ESF HVAC actuation

- o Auxiliary building ESF HVAC actuation
- o AFW pump house ESF HVAC actuation
- o Electrical tunnel ESF HVAC actuation
- o D.G. fuel oil system actuation

3. Some ESFAS situations have no impact on the ability to achieve safe shutdown:

   - o Containment isolation (CVCS valve HV-8105 isolated on S.I.)
   - o Containment heat removal.

4. Spurious ESFAS considerations:

   a. Safety Injection

   - o Manual — 1 out of 2
     - HS-40003
     - HS-40008
   - o Containment pressure — 2 out of 3
     - PT-0934
     - PT-0935
     - PT-0936
   - o Pressurizer pressure — 2 out of 4
     - PT-0455
     - PT-0456
     - PT-0457
     - PT-0458
   - o Steam line pressure — 2 out of 3 per steamline

- PT-0514	S/G No. 1
- PT-0515	
- PT-0516	
- PT-0524	S/G No. 2
- PT-0525	
- PT-0526	
- PT-0534	S/G No. 3
- PT-0535	
- PT-0536	
- PT-0544	S/G No. 4
- PT-0545	
- PT-0546	

b. Containment Spray

- o Manual — 2 out of 4
  - HS-40004
  - HS-40005
  - HS-40010
  - HS-40011
- o Containment pressure — 2 out of 4
  - PT-0934
  - PT-0935
  - PT-0936
  - PT-0937

c. Auxiliary Feedwater Actuation

- o Main feedwater pump trip — 2 out of 3 (motor driven pumps only)
  - PS-5344
  - PS-5345
- o Steam generator level
  - (motor driven) — 2 out of 4 per steam generator
  - (turbine driven) — 2 out of 4 in two steam generators
  - LT-0517
  - LT-0518 S/G 1
  - LT-0519
  - LT-0551

  - LT-0527
  - LT-0528 S/G 2
  - LT-0529
  - LT-0552

  - LT-0537
  - LT-0538 S/G 3
  - LT-0539
  - LT-0553

  - LT-0547
  - LT-0548 S/G 4
  - LT-0549
  - LT-0554
- o Station blackout (LOP signal in sequencer) (turbine driven pump only)
- o SI (motor driven pumps only)

- Feedwater flow (AMSAC) 3 loops out of 4
  - FT-0510/FT-0511 Loop 1
  - FT-0520/FT-0521 Loop 2
  - FT-0530/FT-0531 Loop 3
  - FT-0540/FT-0541 Loop 4

IV. FIRE EVENT SAFE SHUTDOWN EVALUATION METHODOLOGY

A. Define the safe shutdown functions

B. Define the systems/equipment necessary to accomplish these functions. (See FSAR Table 9.5.1-1)

1. Minimum scope

2. Alternative safe shutdown equipment required

3. Spurious actuation devices not considererd as concerns.

   - Two normally closed valves in series will preclude flow

   - Two normally open valves in parallel will ensure flow

C. Determine the equipment locations in the plant by fire zone/area.

D. Identify the cables required for equipment operation.

1. Minimum scope

2. Instrumentation, control and power cables

3. The circuits which are required for the operation of the safe shutdown devices and equipment are identified from elementary diagrams based on a circuit operational analysis. Only those circuits which are pertinent to the control or the operation of the devices and equipment are considered essential circuits for safe shutdown. The following types of circuits are not considered essential for safe shutdown:

   a. Power for a fail safe device.

   b. Space heater.

   c. Component status indication such as inputs to system bypass status and monitor light boxes.

d. Input to annunciator.

e. Input to the plant computer and/or ERF computer.

f. Unit 1 indicating light circuits, when a short or open circuit will not affect the control power sources integrity. (Device will operate but status light may not.)

g. The circuits not required to maintain safe shutdown equipment operational.

h. The circuit cannot adversely affect the ability of equipment to operate for safe shutdown. (Isolation device is provided for the circuits.)

E. Determine the cable locations in the plant by fire zone/area.

The physical boundaries of the E4 Code locations are depicted on the fire area drawings, (AX4DJ8000 series) and correspond to the boundaries of various fire zones. One or more fire zone and hence, one or more E4 Code location make up a fire area.

Safe shutdown raceway are identified by EE-580 from the "R Circuit" (E1R) data base. The raceways are located on the electrical raceway (conduit and tray) drawings. The same physical location is then found on the fire area drawings and hence the E4 Code location is determined. The E4 Code location assignment is entered into the EE-580 data base.

Conduit and cable trays can traverse more than one E4 Code location. Multiple E4 Code locations assignments are listed consecutively. Embedded raceway (conduit, junction boxes and pull boxes) are assigned E4 Code locations only where the raceway is exposed (i.e. embedded junction box and pull box faces and at conduit terminal ends).

F. Define the component for each circuit.

An "R-Note" is assigned in the EE580 data base to associate each circuit with its applicable component for ease of evaluation.

G. List the circuits/components for each fire area.

Computerized sorting of safe shutdown circuits with "R-Notes" by E4 code location.

H. Evaluate separation by fire area.

1. One train of equipment/cables free of fire damage

    a. Separated by 3-hour fire barriers

    b. Separated by 1 hour fire barrier with fire detection and automatic suppression

    c. Separated by 20 horizontal feet with fire detection and automatic suppression and with no intervening combustible materials

    d. Separated by noncombustible radiant energy shield (inside containment only)

2. Equipment/cables required for cold shutdown capable of being repaired so as to achieve safe shutdown within 72 hours.

3. Where separation per above can not be achieved use alternative shutdown capability (main control room).

I. Evaluate associated circuits

1. Common power source

    Coordination between protective breakers, relays and fuses ensures that circuit faults will not result in deenergization of an electrical bus serving safe shutdown equipment necessary to achieve safe shutdown for the fire under consideration. The design of the VEGP 120 VAC vital busses with respect to safe shutdown and non-safe shutdown essential loads has been evaluated as acceptable although a faulted circuit may result in a loss of bus voltage condition for a time frame of 10 to 17 seconds. The basis for this acceptability is:

    - The faulted condition is cleared by the existing circuit protection following the time delay.

    - The loss of bus voltage condition does not cause damage to any component associated with the bus.

    - The short duration of the loss of bus voltage condition will not cause significant operator confusion due to erroneous indications during the fault condition.

- Actuation of automatic devices requires loss of at least two vital busses which is not considered credible for the short duration. Because the circuits associated with each bus (channels 1, 2, 3 and 4) have separate raceway systems, a simultaneous fault condition for more than one bus is very unlikely.

2. Common enclosure

   The circuit protection provided for power and control cables precludes fire propagation into an enclosure shared with safe shutdown circuits by interrupting a fault before cable insulation damage due to overheating can occur outside the fire area under consideration. Fire induced fault current in associated instrument cables will not affect safe shutdown circuits in a common enclosure because the cables carry low level current (mA) and the circuit power source can only provide low level short circuit current.

3. Spurious actuation (See Section V)

   Each fire area has been evaluated to determine where spurious valve, pump or electrical breaker actuations can occur which could hinder or preclude the ability to achieve safe shutdown if operator actions are not taken to terminate the undesired event. Spurious actuation concerns are identified on an area by area basis in the Fire Hazards Analysis (FSAR Appendix 9A).

J. Control room fire alternate shutdown evaluation

   1. Transfer of control capability
   2. Isolation of indication signals
   3. Impact of hot shorts, open circuits, shorts to ground prior to transfer of control.

K. Emergency lighting and communications

   1. Emergency lighting:
      a. 8-hour minimum battery power supplies
      b. Access and egress routes to and from all fire areas
      c. Areas that must be manned for safe shutdown

- d. Not considered necessary for stations where operator actions are required to achieve cold shutdown only

2. Emergency communications:

    - a. Fixed system independent of normal plant communication systems
    - b. Portable radio communication system
    - c Not considered necessary for station where operator actions do not involve coordination or activities or where time is not a significant factor.

V. OUTSIDE CONTROL ROOM FIRE SPURIOUS ACTUATION EVALUATION GROUND RULES

A. NRC REQUIREMENTS:

1. No accidents are assumed concurrent with the fire.
2. Cold shutdown must be achieved and maintained with and without offsite power within 72 hours.
3. As the consequence of the fire, hot shorts, open circuits, or shorts to ground must be considered.
4. Where fire induced LOCA is involved (RCS only), any number of spurious actions/inactions must be postulated

B. ASSUMPTIONS AND BASES:

1. The worst case combination of spurious actuation of the device under consideration and fire damage to circuits of other components in the fire area will be evaluated.

    Basis:

    This assumption considers that a fire will damage more than one circuit in the fire area but not necessarily all circuits. No other components with circuits in the same fire area can be used to mitigate the effects of the spurious actuation under consideration; conversely, the action/inaction of these components combined with the spurious actuation may preclude safe shutdown.

2. A spurious control signal action/inaction shall be defined as being caused by a single hot short, open circuit, or short to ground. This single electrical fault can impact a single component or multiple components actuated by a single signal. Multiple hot shorts are considered only where hi/low pressure interface (reactor coolant system connections) is a concern.

   Basis:

   Each electrically operated component has its own unique control circuits, which may be affected by the single hot short, open circuit, or short to ground.

3. Fire induced failures in three phase power cables can only result in a loss of power to, or the inability to supply power to the component.

   Basis:

   Hot shorts in three-phase power circuits resulting in maintained contact are not considered credible.

4. A spurious actuation can be assumed to occur at any time following the onset of the fire event, until action is taken to defeat or preclude the action/inaction from occurring.

   Basis:

   The plant can be in any of its normal operating modes (i.e., Modes 1-6) at the initiation of the fire event.

5. For offsite power available, all equipment not affected by the fire will remain in its prefire condition (i.e., condition during normal plant operation for the assumed mode). For loss of offsite power, all equipment goes to its loss of offsite power design failure position unless affected by the fire.

   Basis:

   The basis for this assumption is simply that the components/systems not affected by a fire will function as designed

6. All plant operating modes except refueling will be evaluated (i.e., Modes 1, 2, 3, 4 and 5).

Basis:

There is sufficient time during the refueling mode (Mode 6) for an operator to assess plant status and respond to conditions without jeopardizing reactivity control or fission product boundary integrity.

7. Only systems and components which can affect (positive or negative impact) safe shutdown are subject to evaluation.

Basis:

Branch Technical Position CMEB 9.5-1 requires being able to achieve and maintain cold shutdown. Any systems/components not impacting safe shutdown are not within the scope of this evaluation.

8. Turbine trip does not necessarily result in a loss of offsite power (LOP) condition.

Basis:

Given a turbine trip, it may be more conservative to assume that a LOP condition does not occur. The turbine trip circuitry is subject to the single hot short, open circuit, or short to ground.

9. No single failures (including common mode) in addition to the spurious action/inaction will be evaluated.

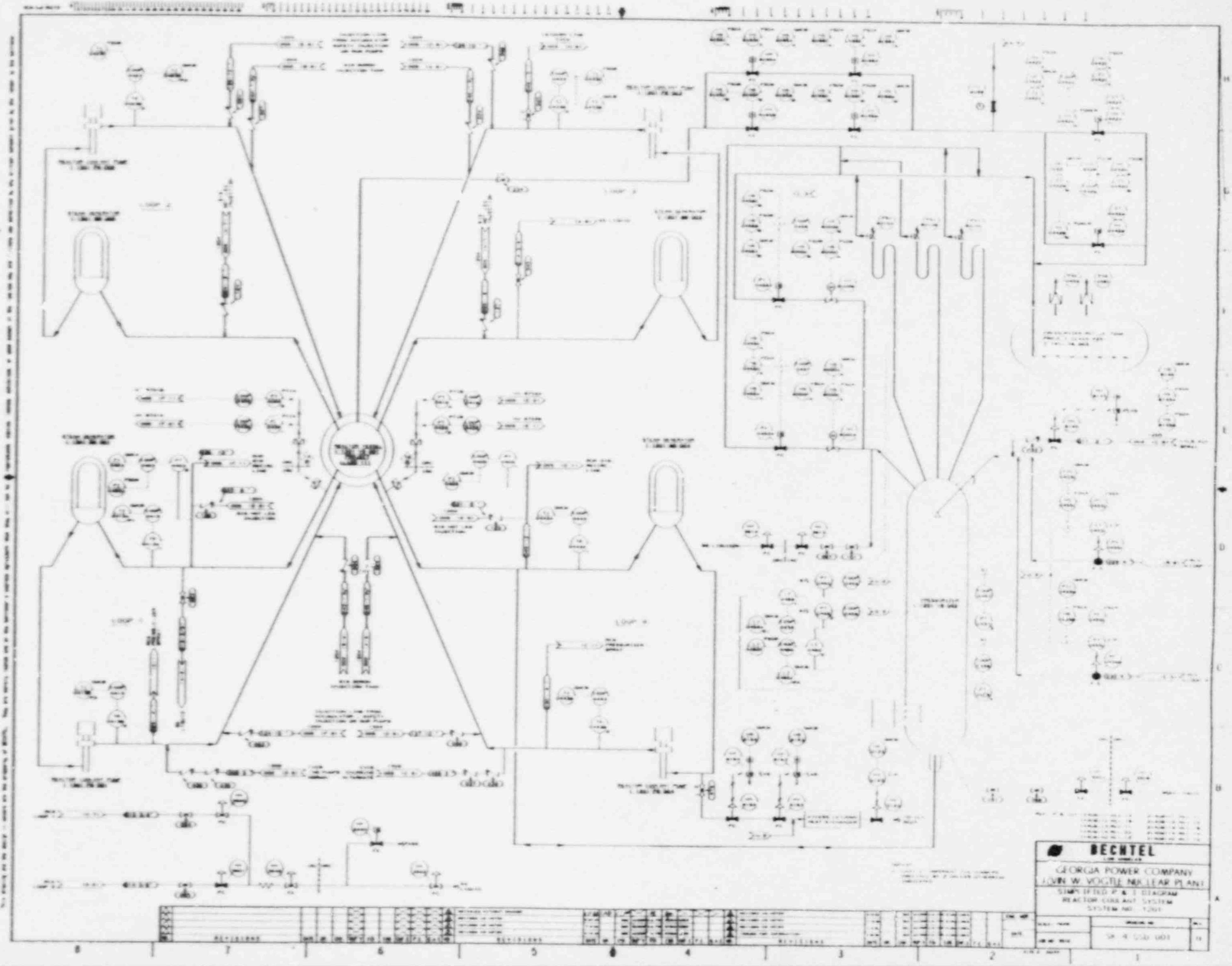
Basis:

The scope of BTP CMEB 9.5-1 does not consider any failures other than those caused by the fire.

10. Fire induced circuit damage can not result in loss of reactor coolant pump seal cooling due to a spurious actuation.

Basis

Either auxiliary component cooling water system operation or CVCS seal injection is required to maintain the integrity of the reactor coolant pump seals. These systems are physically independent of each other and each system has redundant pumps (powered from the redundant Class 1E electrical distribution system) which share common piping within the respective system. There is no single signal caused by fire damage that can result in loss of both means of cooling (temporary loss of seal cooling during load shedding and load sequencing is acceptable).

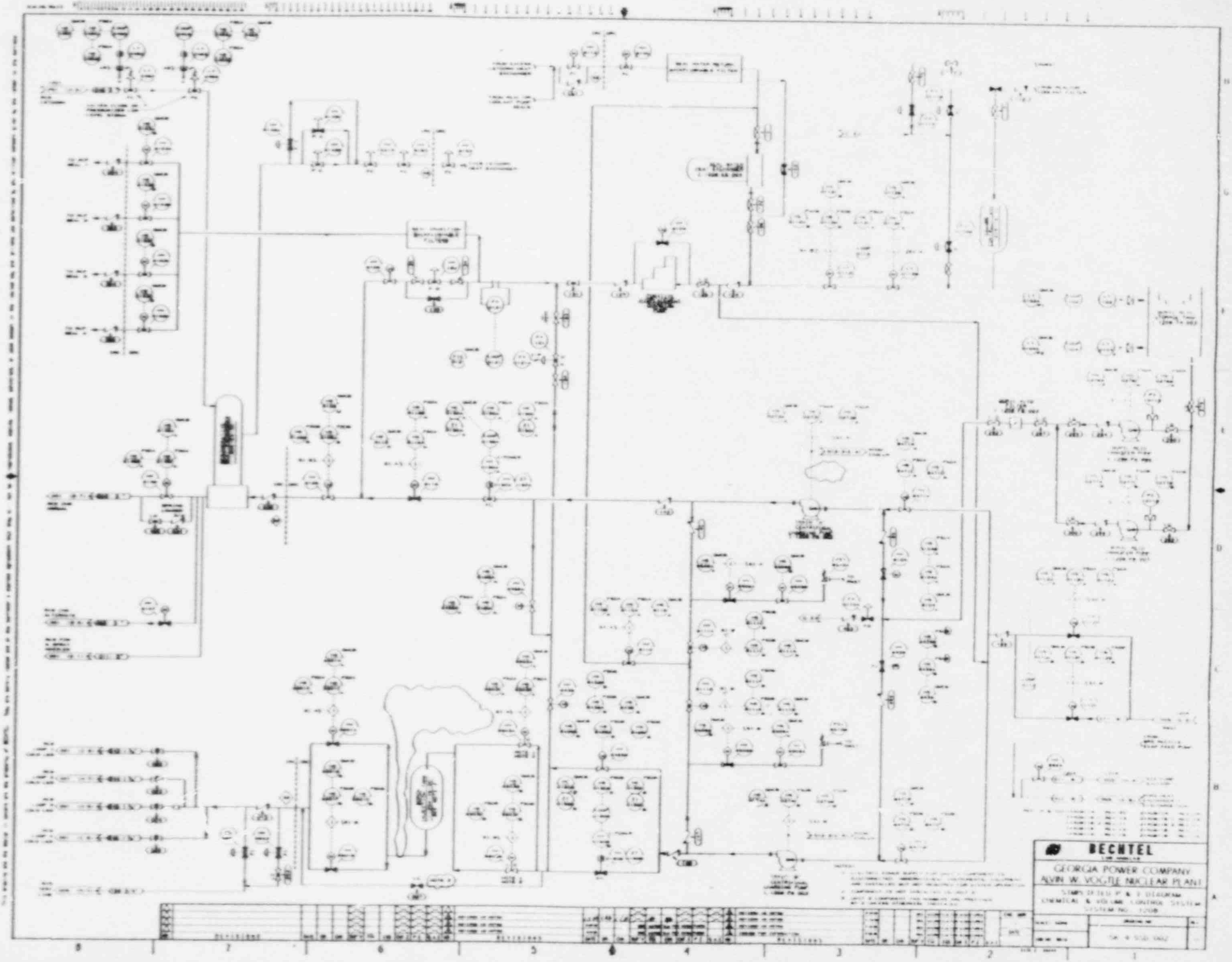


BECHTEL

GEORGIA POWER COMPANY
ALVIN W. VOGTLE NUCLEAR PLANT

SIMPLIFIED P & I DIAGRAM
REACTOR COOLANT SYSTEM
SYSTEM NO. 1201

SK-4-1201-001



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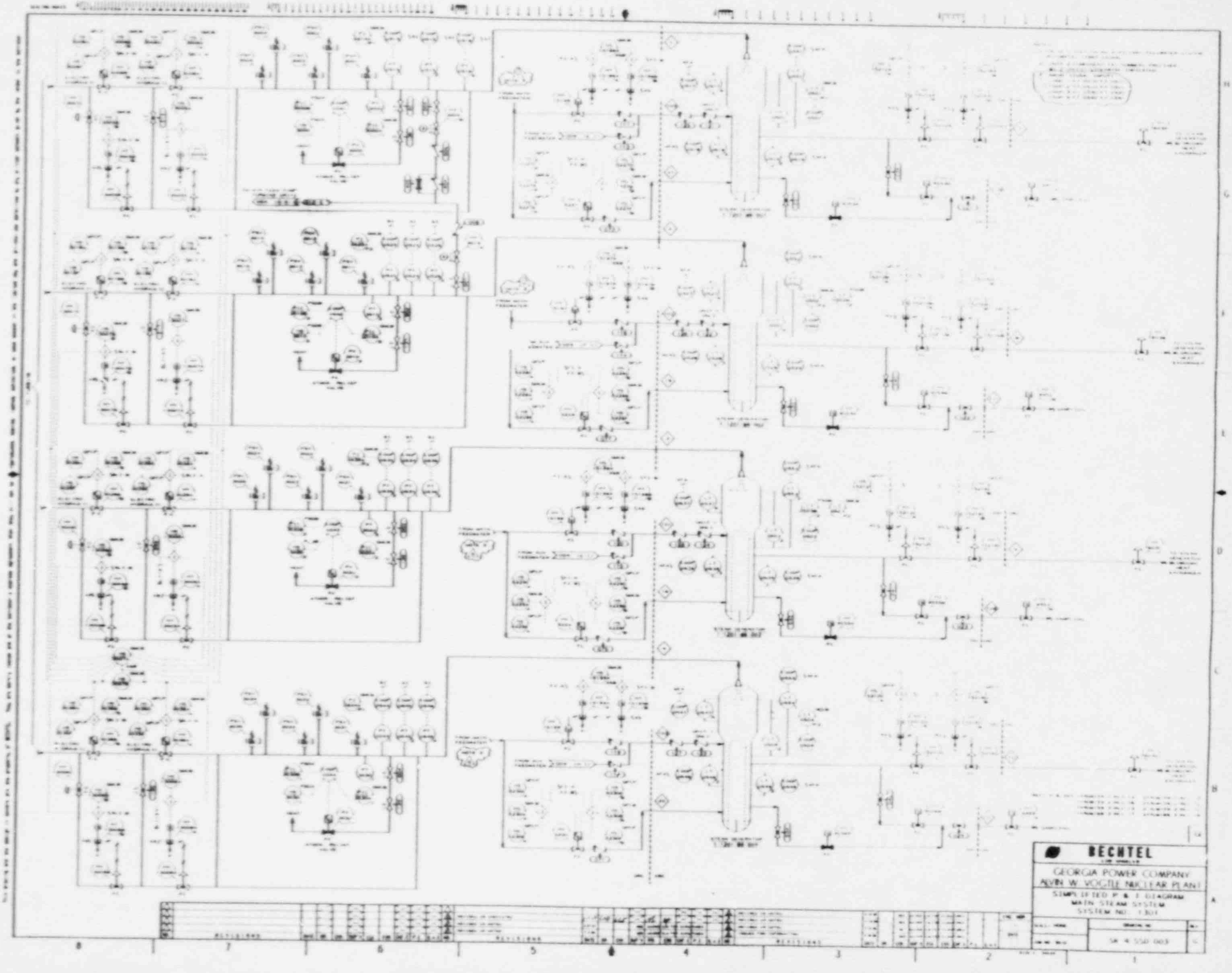
GEORGIA POWER COMPANY
ALVIN W. VOGTLE NUCLEAR PLANT

SIMPLIFIED P & I DIAGRAM
CHEMICAL & VOLUME CONTROL SYSTEM
SYSTEM NO. 1208



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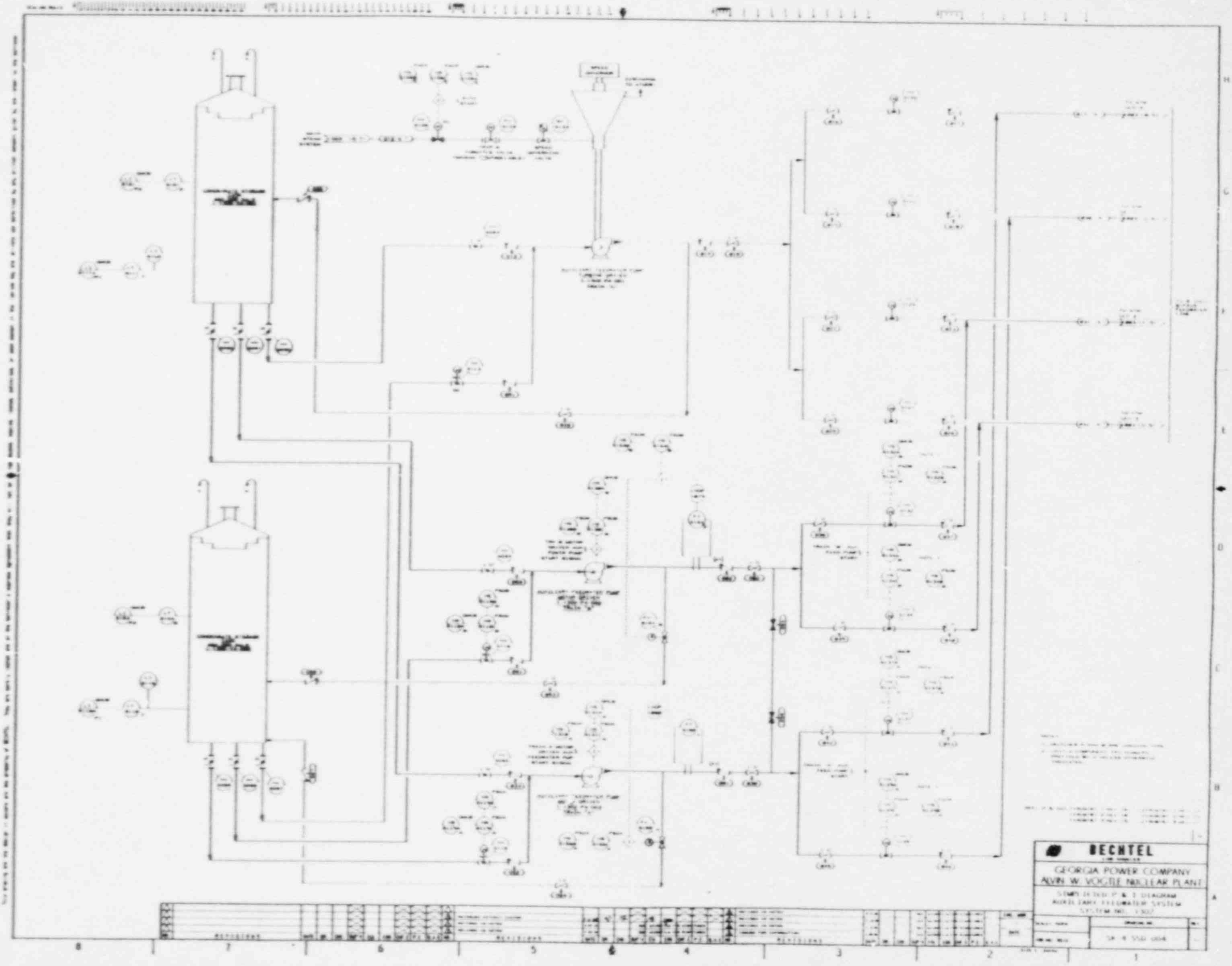
GEORGIA POWER COMPANY
ALVIN W. VOGTLE NUCLEAR PLANT

SIMPLIFIED P & I DIAGRAM
MAIN STEAM SYSTEM
SYSTEM NO. 1301

SCALE: NONE

SK 4 550 003



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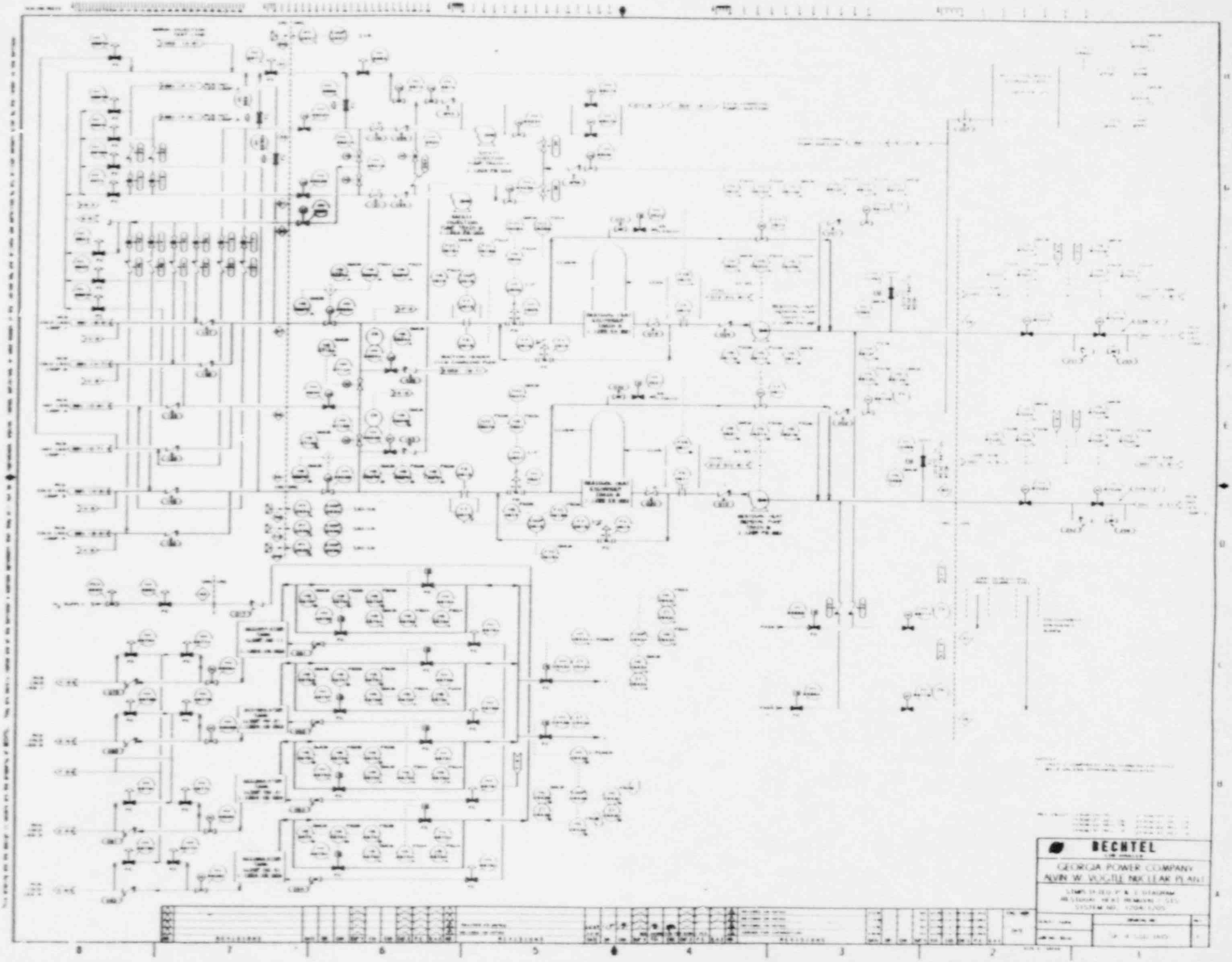
GEORGIA POWER COMPANY
ALVIN W. VOGTLE NUCLEAR PLANT

SIMPLIFIED P & I DIAGRAM
AUXILIARY FEEDWATER SYSTEM
SYSTEM NO. 1302

SK R 550 004



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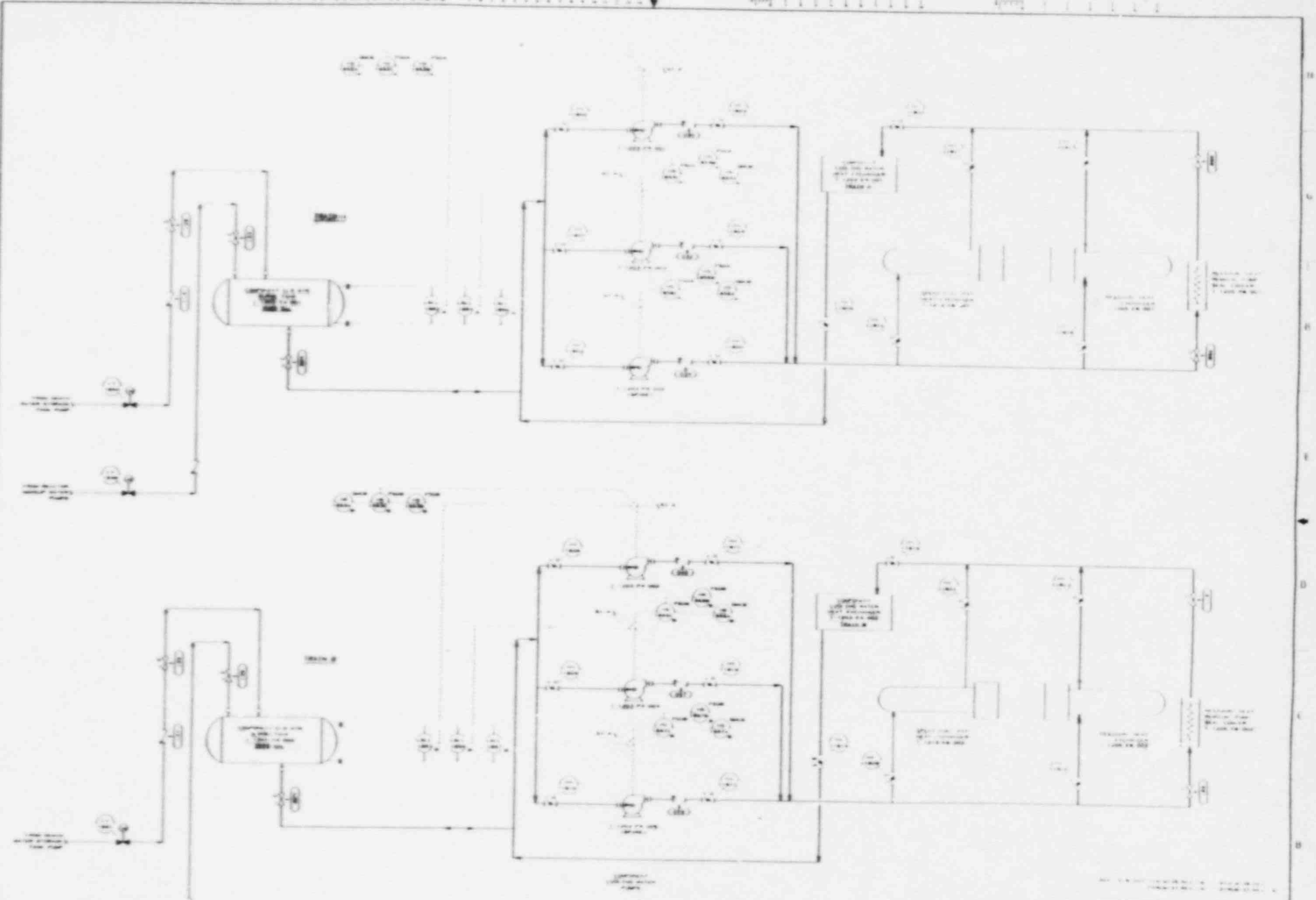
GEORGIA POWER COMPANY
ALVIN W. VOGTLE NUCLEAR PLANT

SIMPLIFIED P & I DIAGRAM
RESIDUAL HEAT REMOVAL SYS.
SYSTEM NO. 1204/1205



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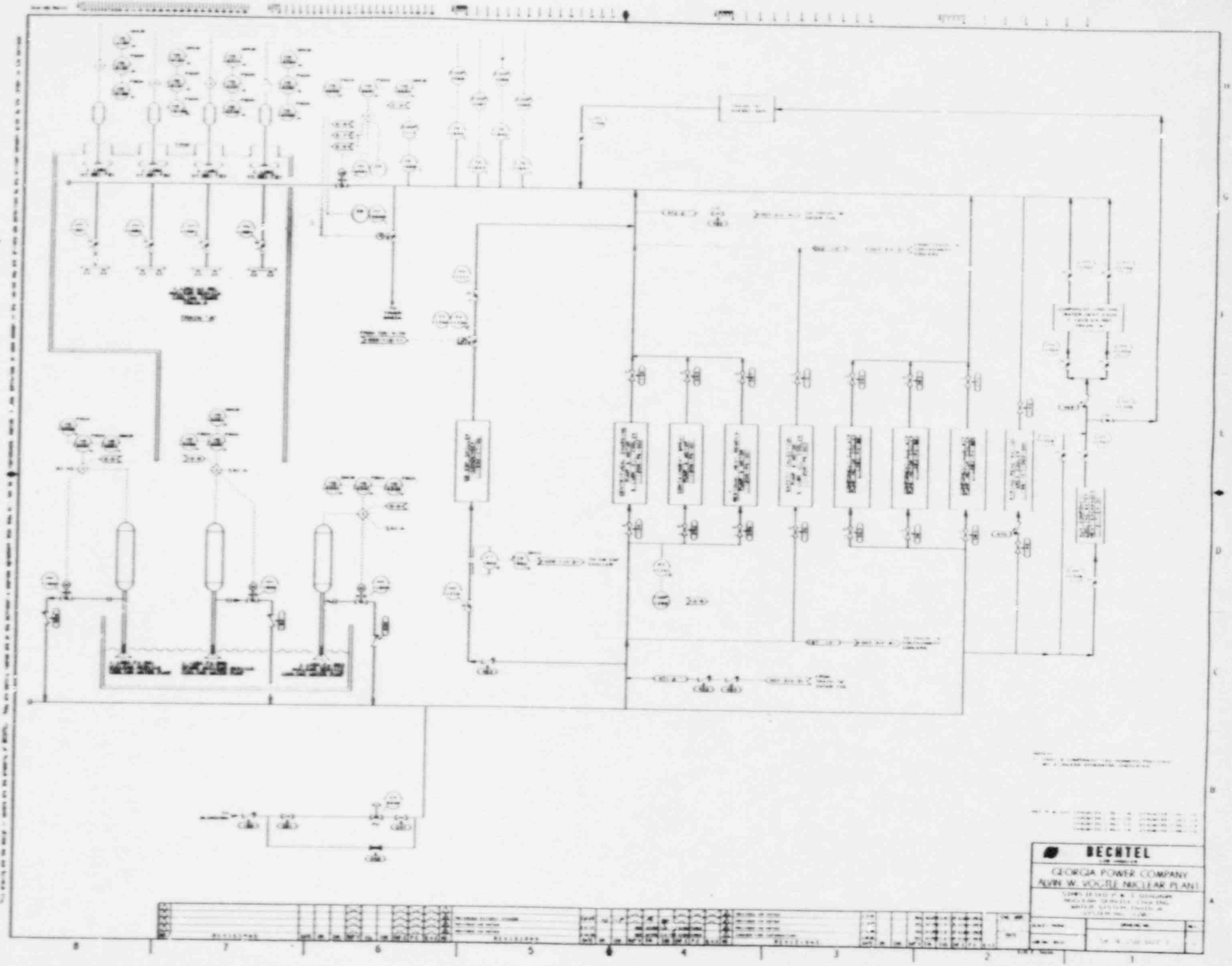
GEORGIA POWER COMPANY
ALVIN W. VOGTLE NUCLEAR PLANT

SIMPLIFIED P & I DIAGRAM
COMPONENT COOLING WATER SYSTEM
SYSTEM NO. 1203



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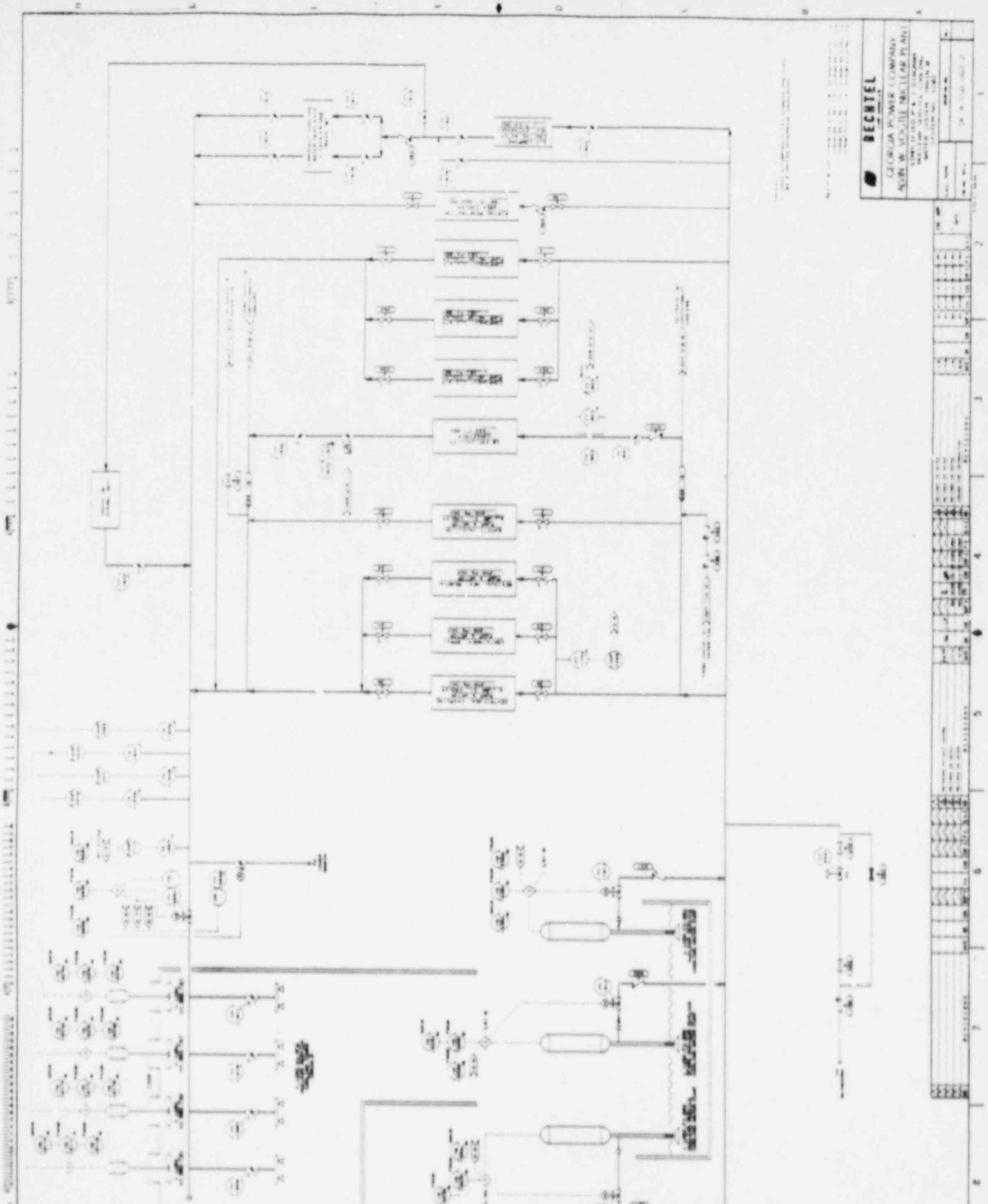
ALVIN W. VOGTLE NUCLEAR PLANT



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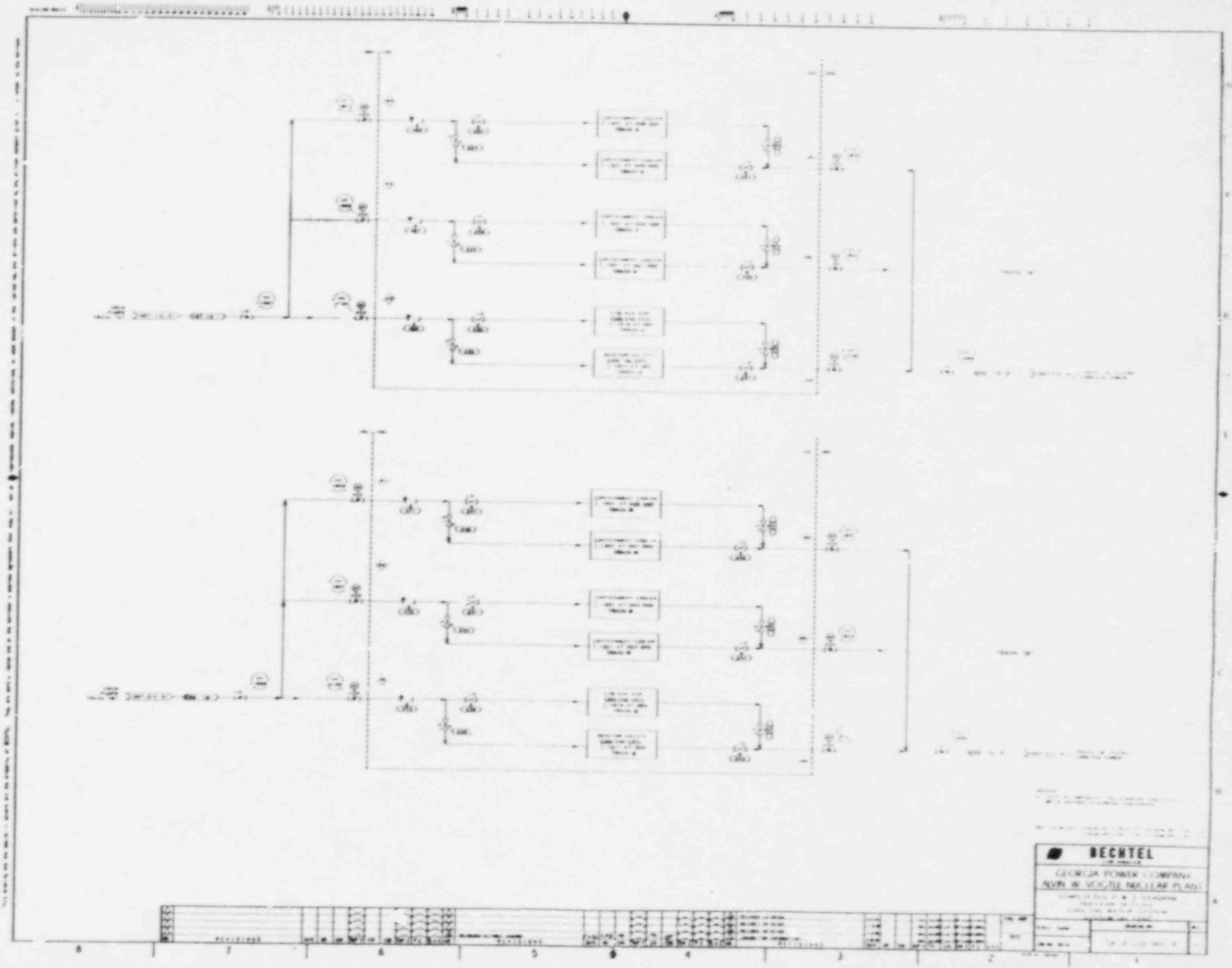

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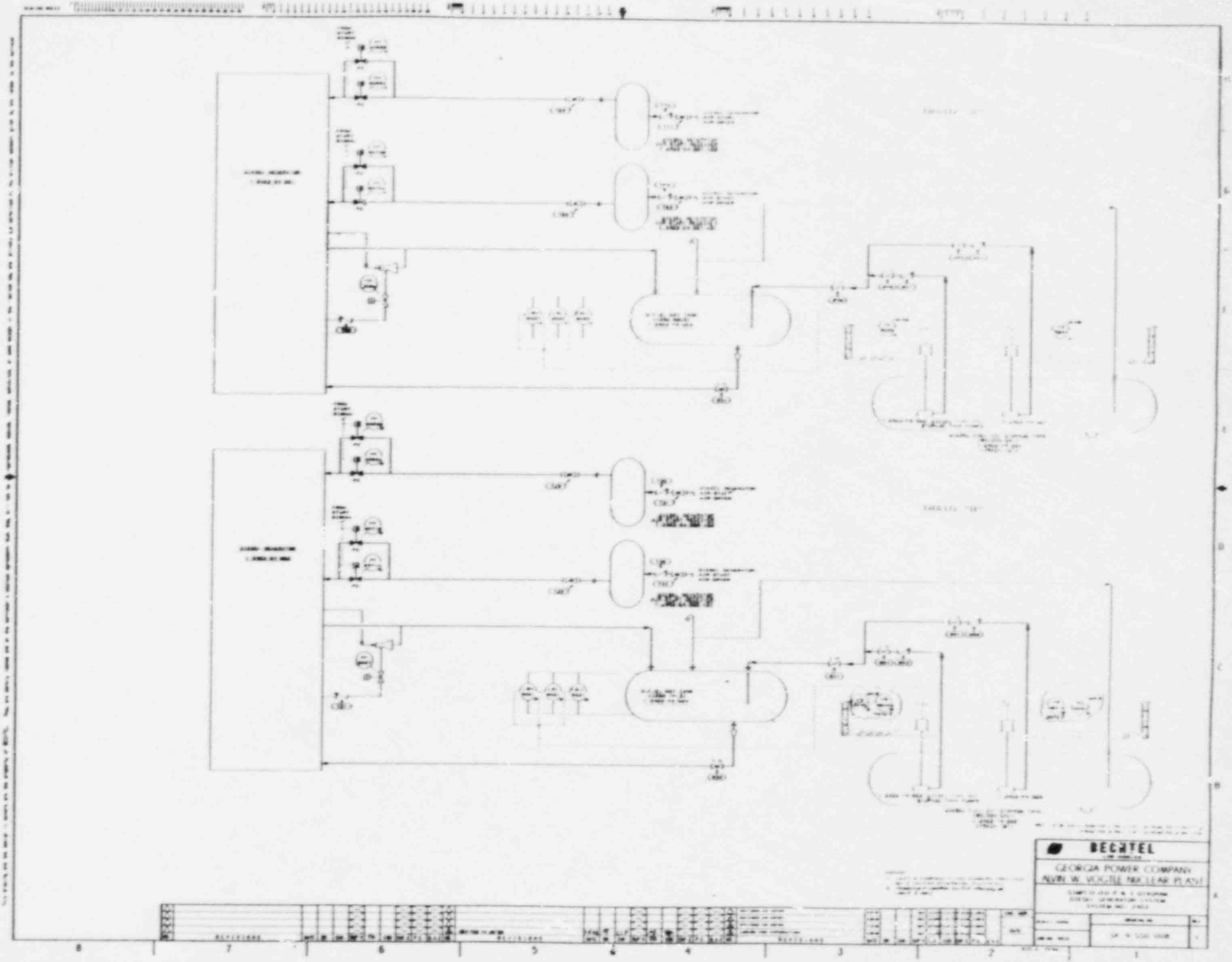
ALVIN W. VOGTLE NUCLEAR PLANT

SIMPLIFIED P & I DIAGRAM


TRAIN "A"
TRAIN "B"
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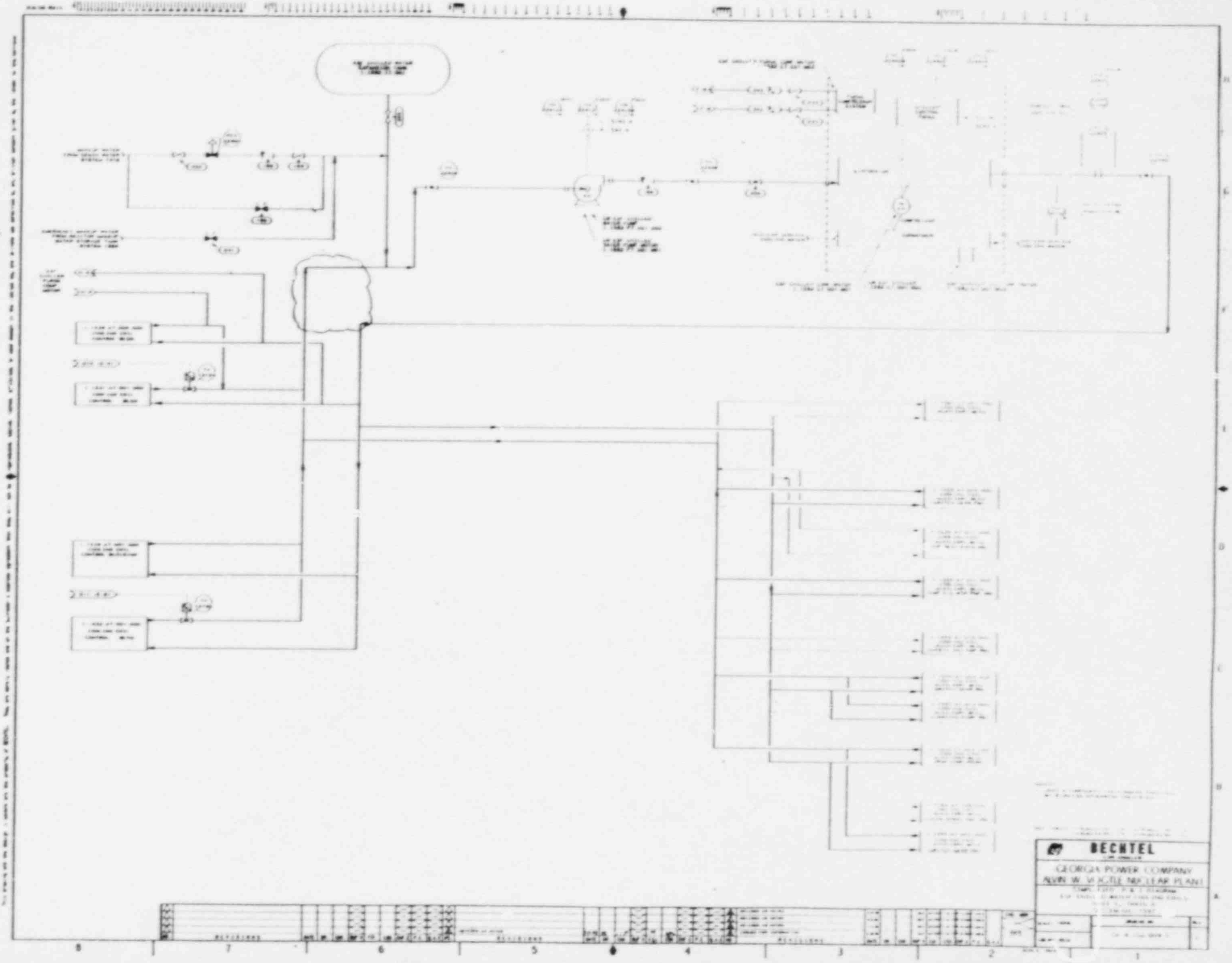
GEORGIA POWER COMPANY
ALVIN W. VOGTLE NUCLEAR PLANT
SIMPLIFIED P & I DIAGRAM
DIESEL GENERATOR SYSTEM
SYSTEM NO. 2403
REVISIONS
DATE



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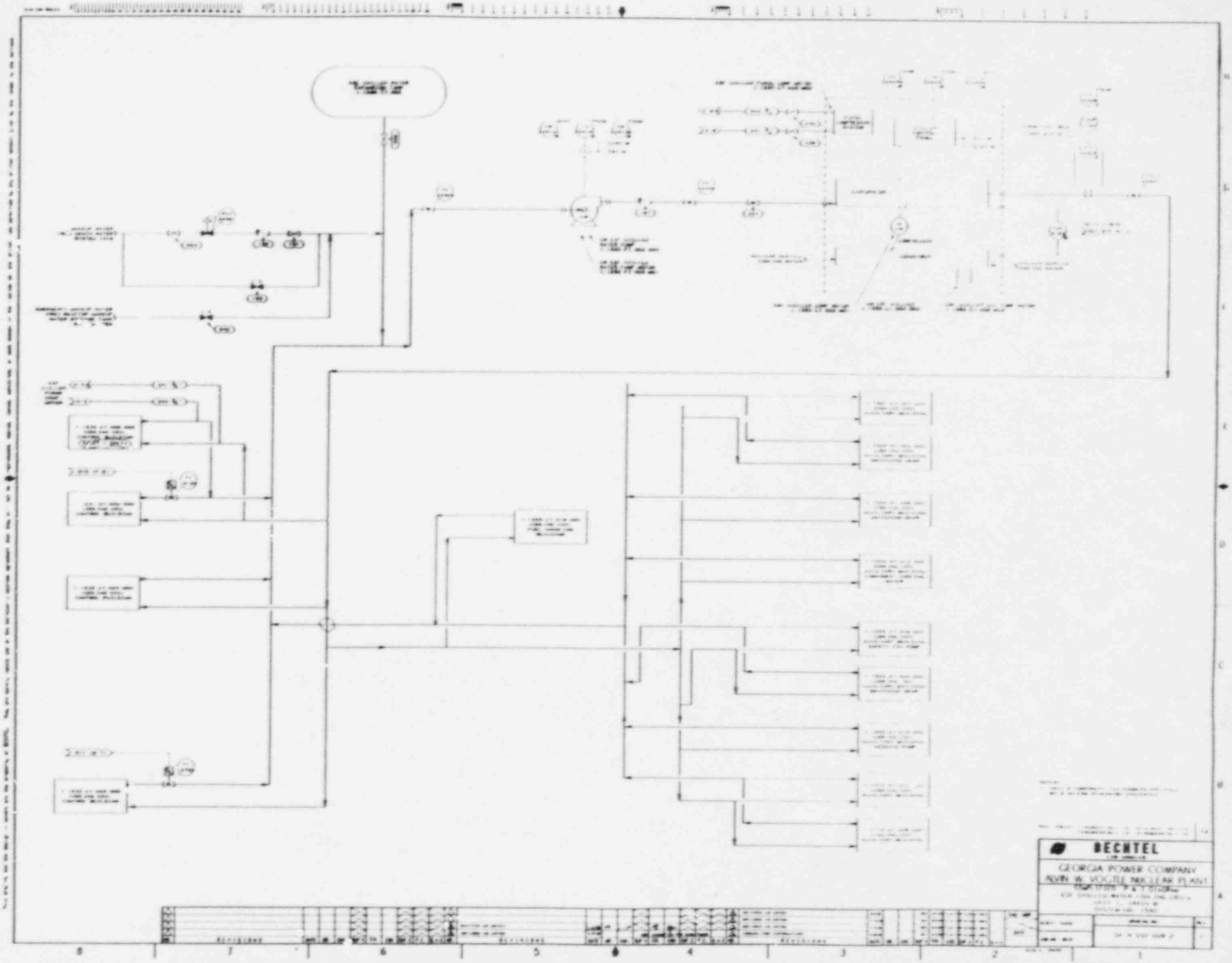
ALVIN W. VOGTLE NUCLEAR PLANT



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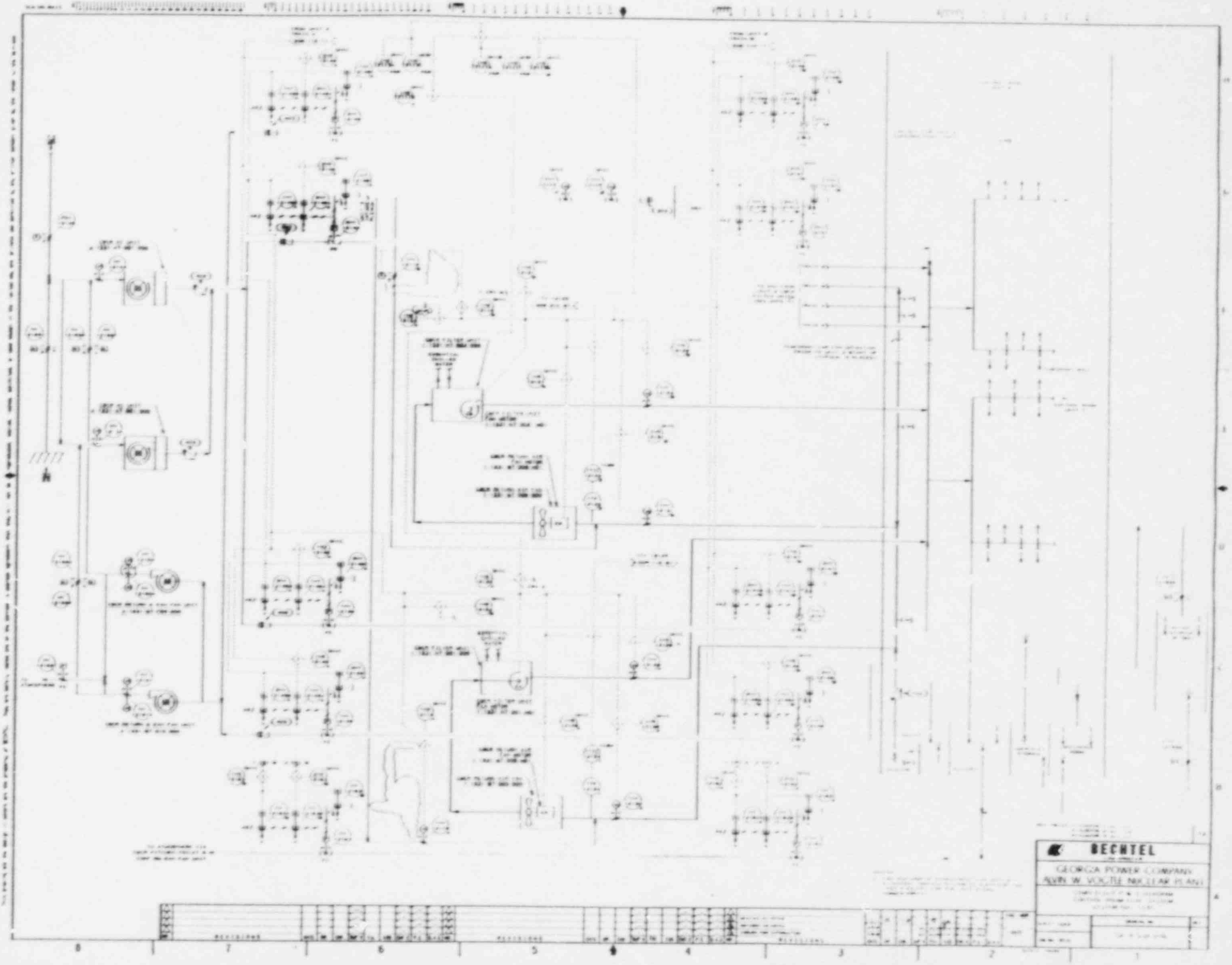
ALVIN W. VOGTLE NUCLEAR PLANT

SIMPLIFIED P & I DIAGRAM
ESF CHILLED WATER COOLING COILS
UNIT 1, TRAIN B
SYSTEM NO. 1592

BECHTEL
GEORGIA POWER COMPANY
ALVIN W. VOGTLE NUCLEAR PLANT
REVISIONS
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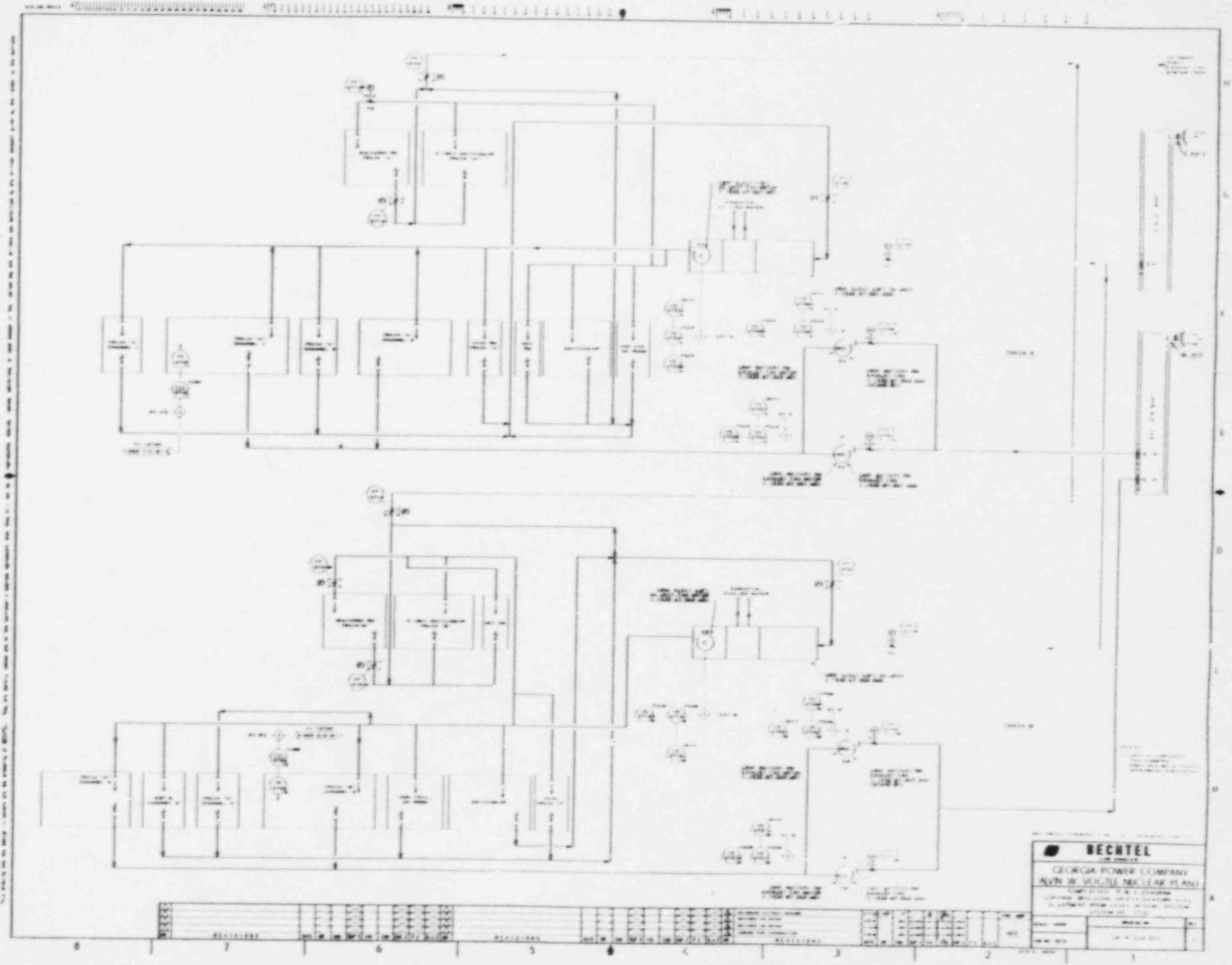

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ALVIN W. VOGTLE NUCLEAR PLANT

SIMPLIFIED P & I DIAGRAM
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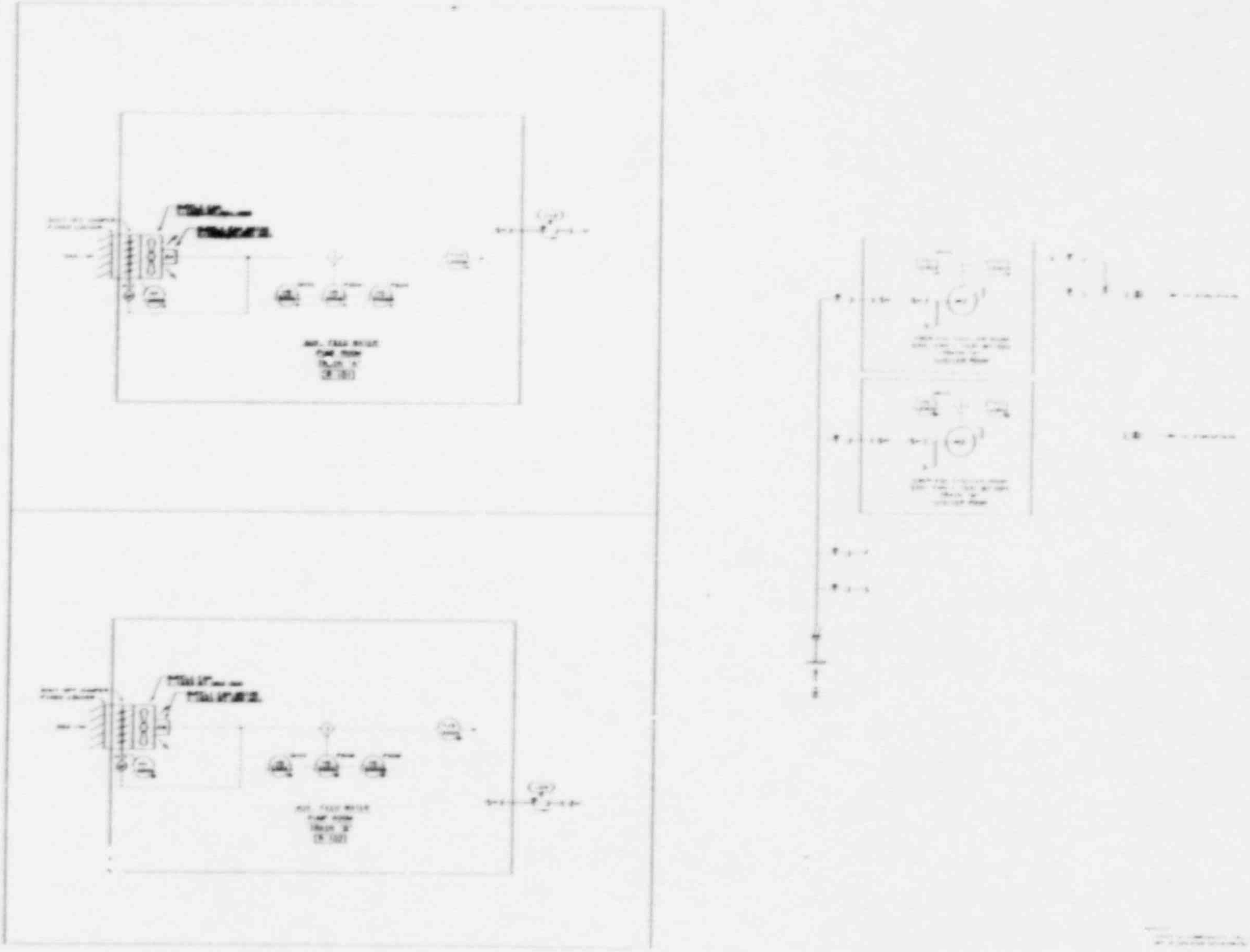

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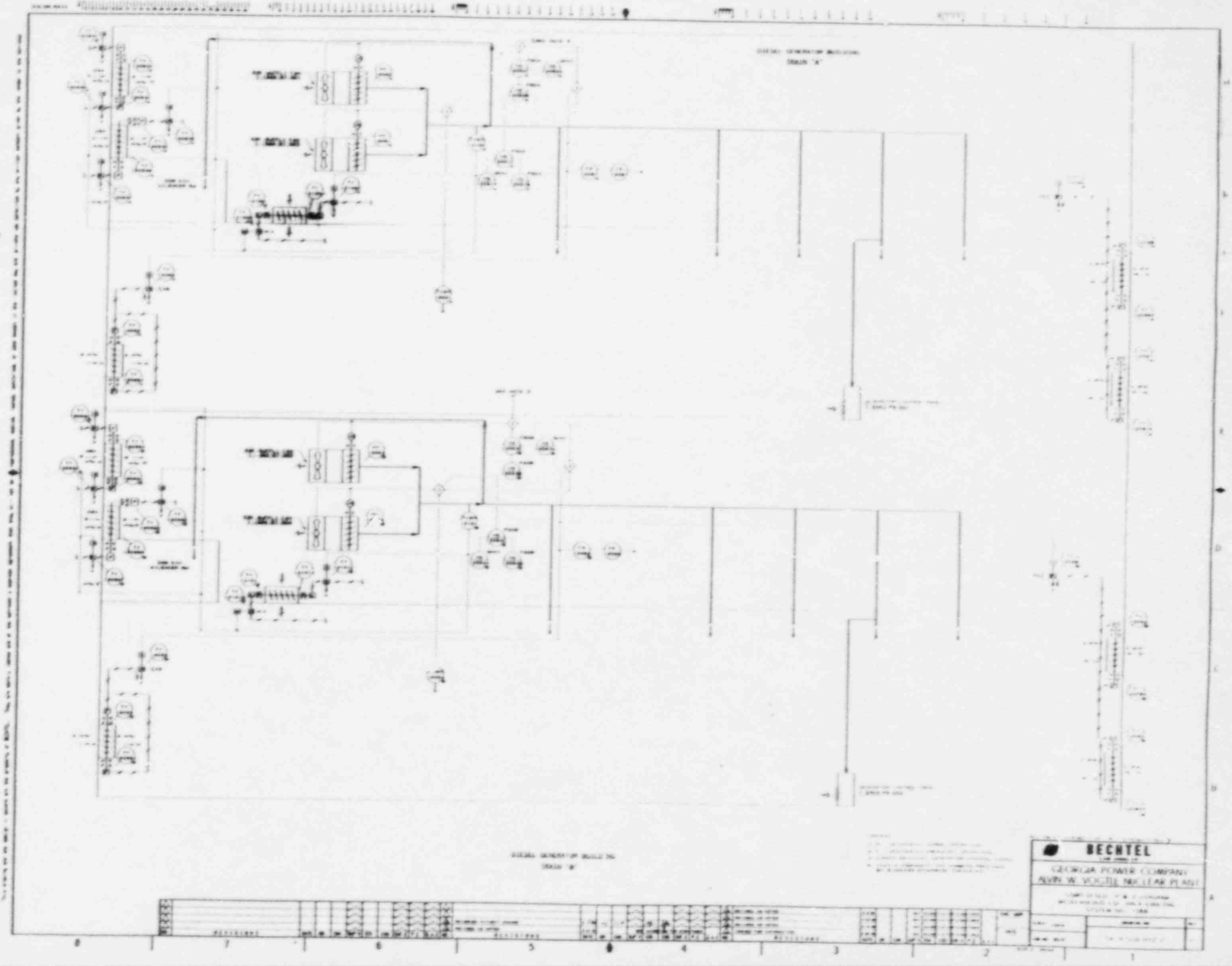
ALVIN W. VOGTLE NUCLEAR PLANT



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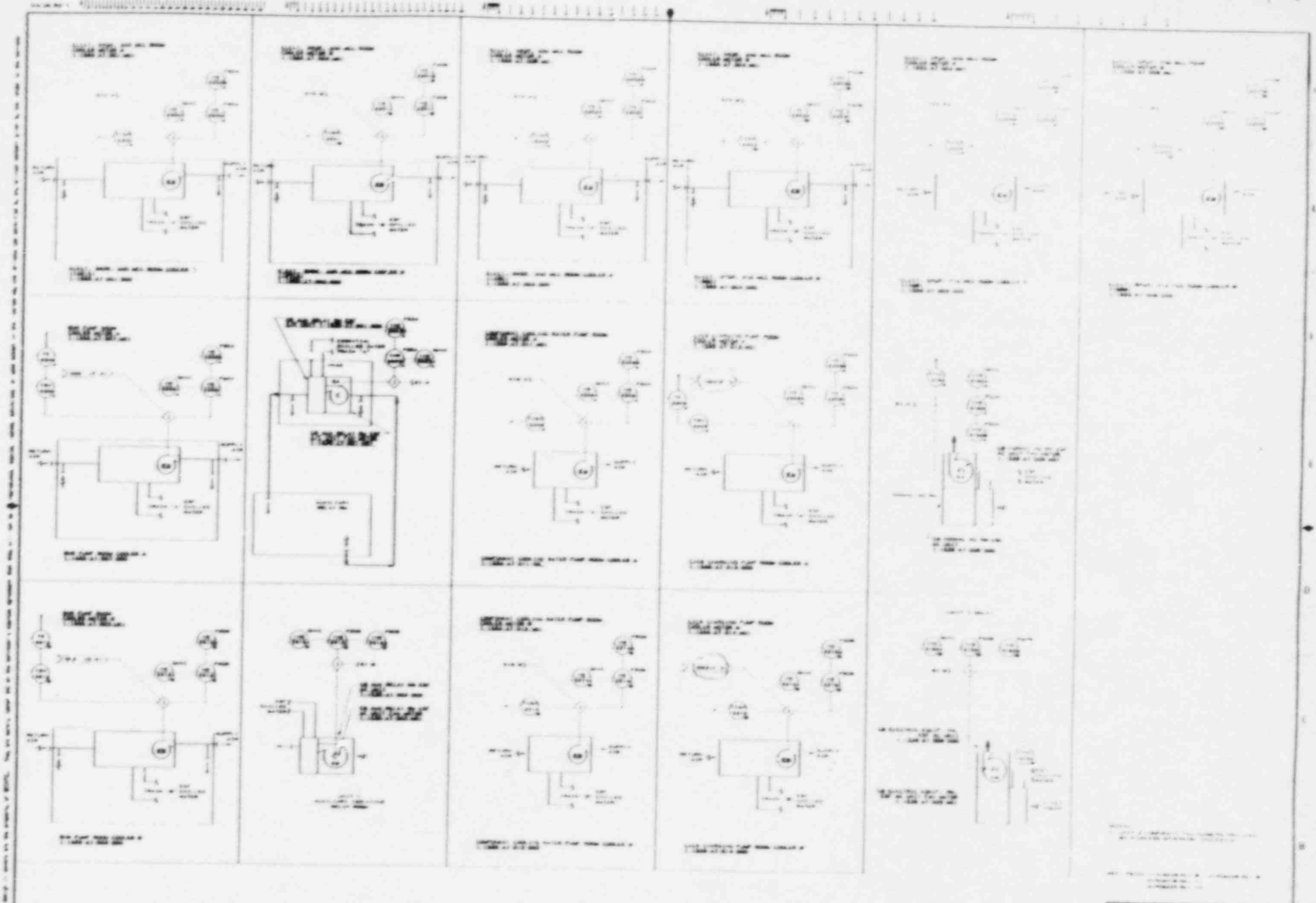
ALVIN W. VOGTLE NUCLEAR PLANT



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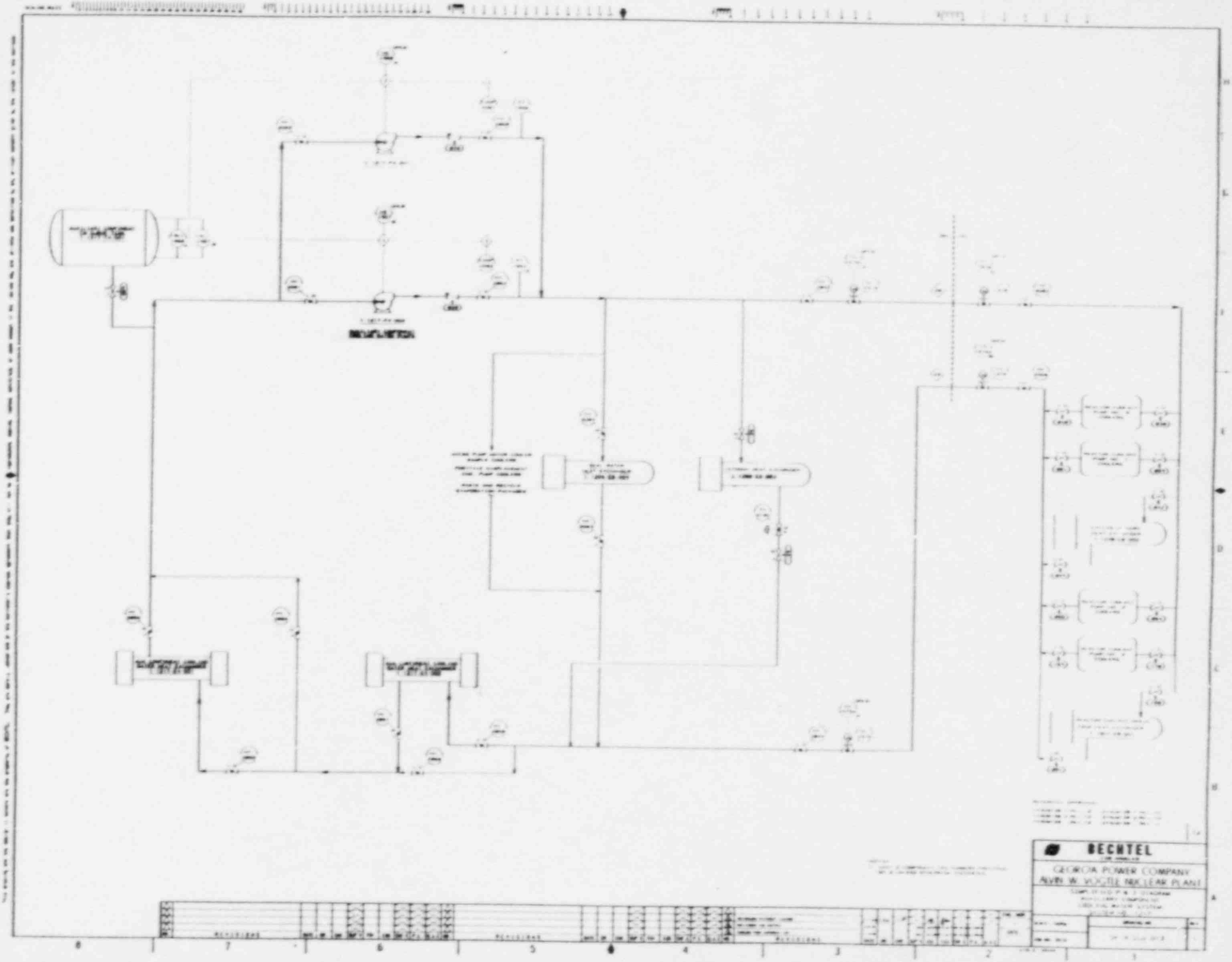
ALVIN W. VOGTLE NUCLEAR PLANT

SIMPLIFIED P & I DIAGRAM



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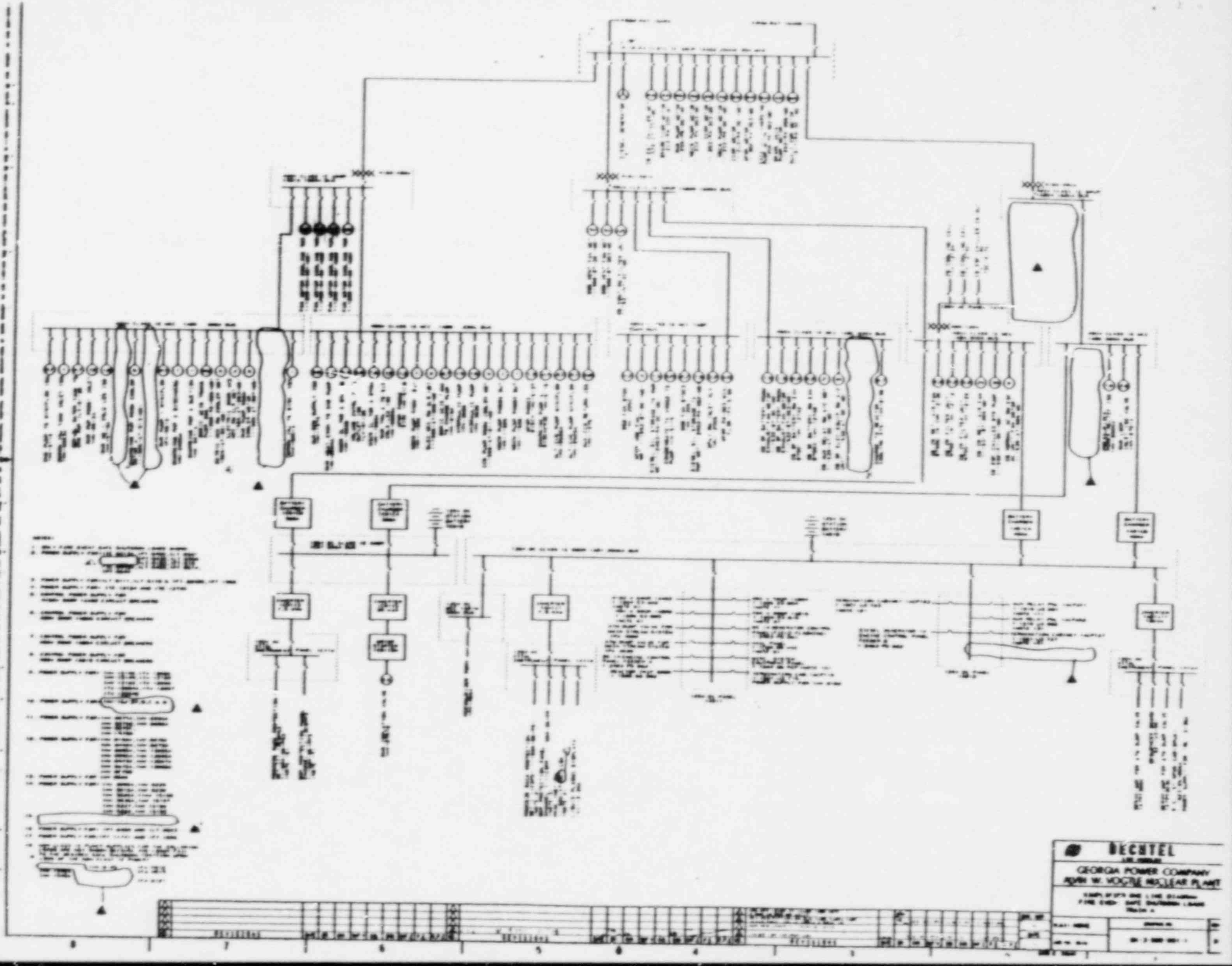
ALVIN W. VOGTLE NUCLEAR PLANT
SIMPLIFIED P & I DIAGRAM
AUXILIARY COMPONENT
COOLING WATER SYSTEM



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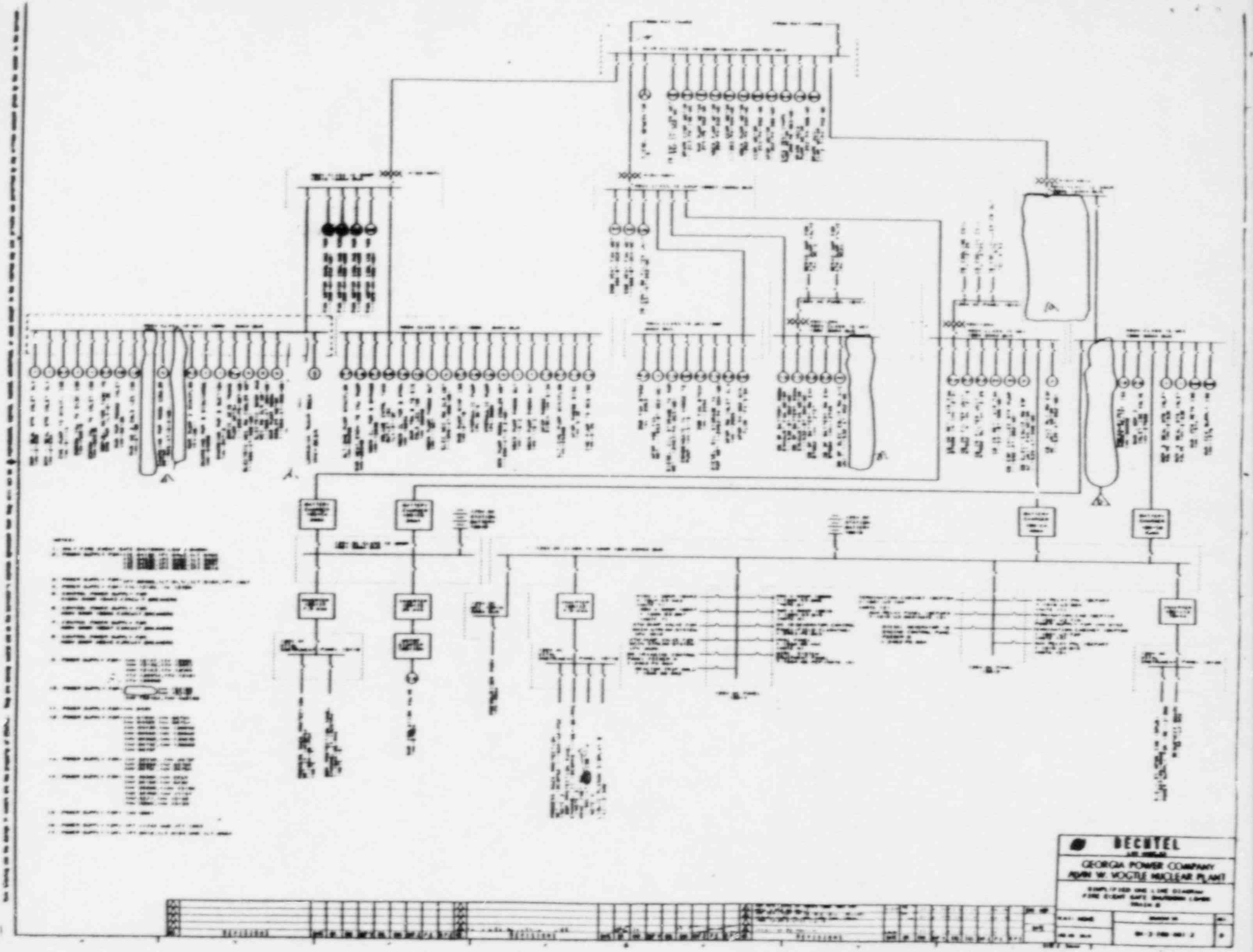
ALVIN W. VOGTLE NUCLEAR PLANT

SIMPLIFIED ONE LINE DIAGRAM
FIRE SAFE SHUTDOWN LOADS
TRAIN A



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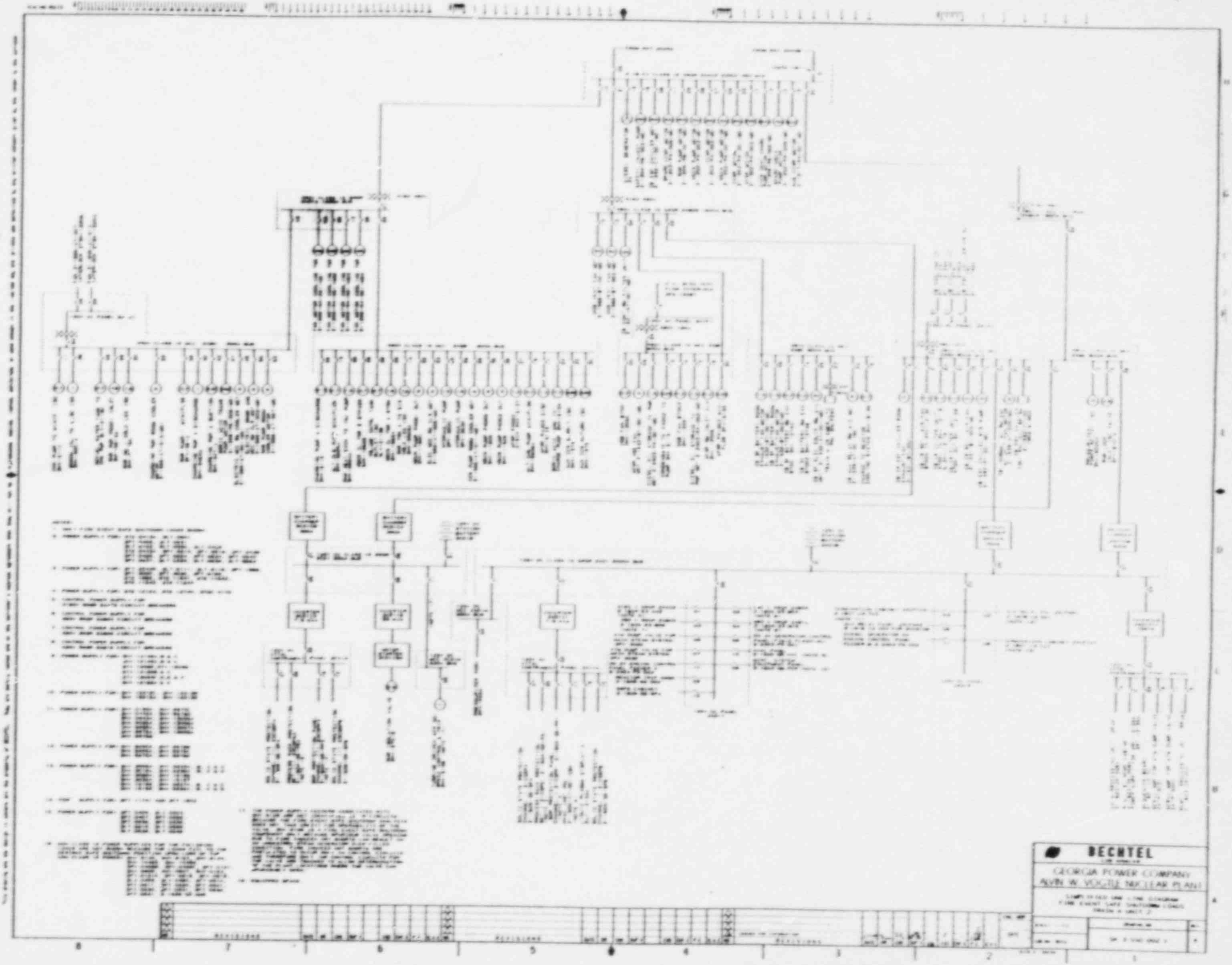
GEORGIA POWER COMPANY
ALVIN W. VOGTLE NUCLEAR PLANT

SIMPLIFIED ONE LINE DIAGRAM
FIRE EVENT SAFE SHUTDOWN LOADS
TRAIN B



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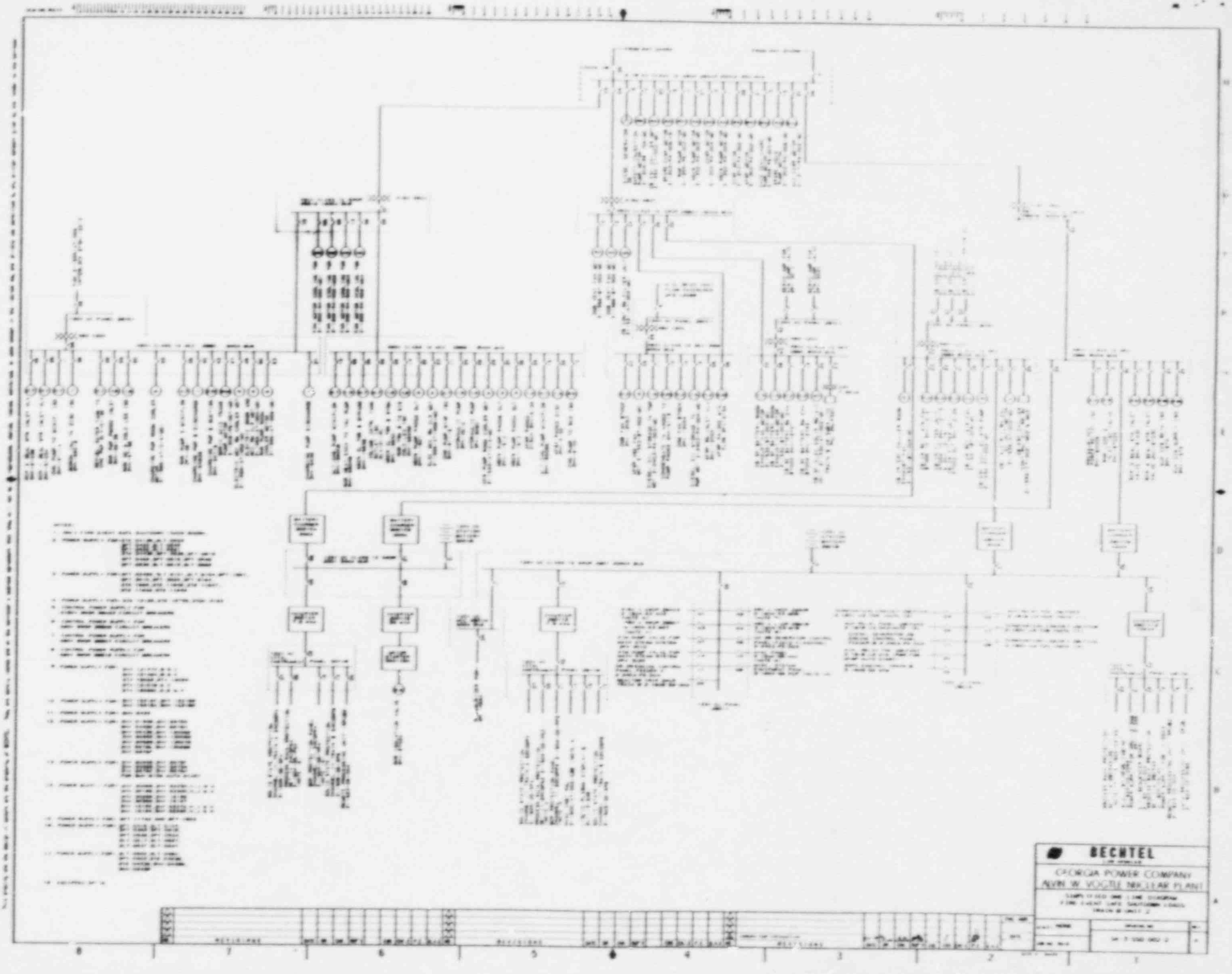
GEORGIA POWER COMPANY
ALVIN W. VOGTLE NUCLEAR PLANT

SIMPLIFIED ONE LINE DIAGRAM
FIRE EVENT SAFE SHUTDOWN LOADS
TRAIN A UNIT 2



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GEORGIA POWER COMPANY
ALVIN W. VOGTLE NUCLEAR PLANT

SIMPLIFIED ONE LINE DIAGRAM
FIRE EVENT SAFE SHUTDOWN LOADS
TRAIN B UNIT 2

SCALE: NONE