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CAROLINA POWER & LIGHT COMPANY  
BRUNSWICK STEAM ELECTRIC PLANT

UNIT 0

INITIAL EMERGENCY ACTIONS

PLANT EMERGENCY PROCEDURE: PEP-02.1

VOLUME XIII

Rev. 006

Recommended By: \_\_\_\_\_

*LG Bayer*  
Assistant to General Manager

Date: 10/14/82

Approved By: \_\_\_\_\_

*Ed. J.*  
General Manager

Date: 10/19/82

dj

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## EXHIBIT 2.1-1

### EMERGENCY ACTION LEVELS

#### UNUSUAL EVENT

##### 1.0 Effluent Releases

##### 1.1 Liquid Releases

- 1.1.1 Any unplanned release from the liquid waste system resulting in activity levels greater than those in 10CFR20, Appendix B, Table II to the discharge canal.
- 1.1.2 A planned release giving activity levels greater than those given in 10CFR20, Appendix B, Table II to the discharge canal as indicated by a failure to isolate or terminate the release upon:
  - a) exceeding the RMS setpoint, or
  - b) exceeding 2 times the permitted release flow rate, and loss of circulating water pump.
- 1.1.3 Any other accidental, unplanned, or uncontrolled off-site liquid release which exceeds or which could have exceeded 10 curies.

- 1.2 A gaseous release which at the release point exceeds any instantaneous limit specified in BSEP Environmental Technical Specification 2.5.2a.

##### 2.0 Plant Occurrences Having Direct Consequences

##### 2.1 In-Plant Releases

- 2.1.1 Failed fuel, as indicated by Reactor Coolant System (RCS) activity:
  - a) RCS activity is greater than 4.0  $\mu\text{Ci/ml}$  (Dose Equivalent I-131),
  - b) RCS activity is greater than 0.2  $\mu\text{Ci/ml}$  (Dose Equivalent I-131), but less than limit in (a) above, for more than 48 hours,
  - c) RCS activity is greater than  $100/\bar{E}$   $\mu\text{Ci/ml}$  for all isotopes.
- 2.1.2 In-plant leak or spill as indicated by:
  - a) Any Building Evacuation based on confirmed radiological conditions (except precautionary).
  - b) Reactor Coolant System leakage in excess of 25 gpm for >8 hours on drywell equipment drain integrator G16FYK601.

## EXHIBIT 2.1-1

### EMERGENCY ACTION LEVELS

- c) Unidentified Reactor Coolant System leakage in excess of 5 gpm for >8 hours on drywell floor drain integrator G16FYK602.
  - d) Any non-isolable RCS pressure boundary leakage.
- 2.2 Failure of a primary system safety/relief valve (including ADS) to open if challenged as indicated on annunciator panel C32LPR-R608 or R609 or failure to close once opened as indicated on annunciator panel A-3, 1-1, 1-10.
- 2.3 Emergency Core Cooling System automatically initiated and discharging to vessel for a period greater than five (5) minutes other than by operator action. Core spray panel A1, 2-6; A3, 2-1, 2-6  
OR RHR panel A1, 1-8; A3, 2-1, 1-7  
OR HPCI initiation signal light and indication of pump discharge flow
- 2.4 Loss of containment integrity requiring shutdown by technical specifications and shutdown is not achieved within required time period.
- 2.5 Loss of engineered safety feature or fire protection system function requiring shutdown by technical specifications and shutdown is not achieved within required time period.
- 2.6 Indications or alarms on process or effluent parameters not functional in control room to an extent requiring plant shutdown or other significant loss of assessment or communication capability for greater than sixty (60) minutes.
- 2.7 Loss of all off-site power or loss of all on-site AC Power capability as indicated by a turbine trip and startup auxiliary transformer not available or loss of all E-buses.
- 2.8 Transportation of contaminated injured individual from site to off-site hospital.
- 2.9 Unplanned fire within the Protected Area not brought under control more than 10 minutes after activation of a Fire Suppression System or 10 minutes after manual fire-fighting efforts have begun.
- 3.0 Occurrences Having Indirect Consequences
- 3.1 Natural Phenomenon or Man-Made Event Having Potential for Degrading Plant Safety.
- a) Any alarm on seismic monitor and confirmation of an earthquake in the region.

## EXHIBIT 2.1-1

### EMERGENCY ACTION LEVELS

- b) Any tornado crossing the site boundary (by observation or evidence).
- c) Any hurricane requiring implementation of EI-37.1, "Operation During Hurricane Warnings and Hurricane Conditions."
- d) Any aircraft crash within the site boundaries.
- e) Any unplanned explosion within the site boundaries.
- f) Any release of toxic or flammable gas that could endanger personnel.

#### 3.2 Exceeding any Technical Specification Safety Limit.

#### 3.3 Plant Situations:

- a) Security threat (bomb threat, attack threat, civil disobedience), attempted sabotage, or attempted entry
- b) Any incident involving licensed nuclear material (i.e., nuclear fuel or licensed sources), which may have caused or threatens to cause:
  - i. A loss of one day or more of the operation of the facility,
  - ii. Property damage in excess of \$2,000.
- c) Strikes of operating employees or security guards, or honoring of picket lines by such employees.

#### 3.4 Any other instance that, in the judgment of the Shift Operating Supervisor/Site Emergency Coordinator warrants declaration of an Unusual Event:

An Unusual Event represents conditions that involve (1) releases to the environment in excess of technical specification limits; or (2) failures of fuel cladding that result in concentrations of radioactivity in the primary coolant requiring hot shutdown; or (3) degradation of the plant safety systems.

## EXHIBIT 2.1-1

### EMERGENCY ACTION LEVELS

#### ALERT

##### 1.0 Effluent Release

- 1.1 Any liquid release giving greater than  $1.0 \times 10^{-4}$   $\mu\text{Ci/ml}$  in the discharge canal as indicated by:
- a) Whenever the Service Water discharge monitor reads greater than 1000 cps (D12-R604).
  - b) Field measurement indicating greater than  $1.0 \times 10^{-4}$   $\mu\text{Ci/ml}$  in the discharge canal.
- 1.2 Any gaseous release giving  $>3 \times 10^{-4}$   $\mu\text{Ci/cc}$  at the site boundary:
- a) Main Stack high range discharge monitor reading  $>0.1$  R/hr.
  - b) Whenever Steam Jet Air Ejector discharge monitor is off-scale high (VA-AQH-3215).
  - c) Whenever the Reactor Building Ventilation monitor is off-scale high (D12-K601A or K601B).
  - d) Whenever the Reactor Building Roof Vent monitor is off-scale-high (CAC-1264).
  - e) Whenever the Turbine Building Vent monitor is off-scale-high.

##### 2.0 Plant Occurrences Having Direct Consequences

###### 2.1 In-Plant Releases

###### 2.1.1 Failed fuel, as indicated by:

- a) RCS activity is greater than 40  $\mu\text{Ci/ml}$  (Dose equivalent I-131)

Note: Whenever main steam isolation is indicated due to high radiation in the line, an RCS grab sample should be taken immediately and analyzed for gross activity.

###### 2.1.2 In-Plant Leak or Spill, which may be indicated by:

- a) Any Area Radiation Monitor or Continuous Air Monitor off-scale-high.
- b) Any Site Evacuation based on confirmed radiological conditions.

## EXHIBIT 2.1-1

### EMERGENCY ACTION LEVELS

- c) Fuel handling accident involving damage to spent fuel, as indicated by:
    - i. Observation/report, AND an alarm on Reactor Building Ventilation monitor D12-RM-K609A-B, Reactor Building roof vent monitor CAC-1264, or the refueling floor area monitor (channel 1-28 or 2-28).
    - ii. Any time EI-22, "Spent Fuel Damage" is implemented.
  - d) Whenever the Reactor Building Closed Cooling Water monitor is off-scale-high (D12-R604).
- 2.2 Loss of Coolant Accident (primary system leakage >50 gpm) as indicated by:
- a) Reactor Vessel water level falling and normal feedwater system unable to restore (N004A, B, C).
  - b) Low or falling RCS pressure, with rising drywell pressure and temperature (C32-LPR-R608, CAC-TR-1258, CAC-PIC-2685).
  - c) Any time EI-1.2 is implemented.
- 2.3 Steam Line Break (i.e., downstream of MSIVs and upstream of feedwater isolation valves), as indicated by:
- a) Reactor trip, with:
    - i. Low RCS pressure, (C32-LPR-R608)  
OR
    - ii. Low steam pressure, (C32-R609)  
OR
    - iii. Low reactor vessel water level, (C33-LPR-R608)  
OR
    - iv. High steam flow (indicated on P603).
  - b) Any time EI-1.3 is implemented.
- AND either:
- c) RCS activity >0.2 uCi/cc Iodine equivalent, OR
  - d) MSIV fails to close as indicated by annunciators on P601 and P603.
- 2.4 Loss of all AC Power
- a) Loss of off-site power (turbine trip and startup auxiliary transformer de-energized),

AND



## EXHIBIT 2.1-1

### EMERGENCY ACTION LEVELS

- b) Failure of on-site emergency AC power source, as indicated by loss of diesel generators.
  - 2.5 Failure of the Reactor Protection System to initiate (indicated on panel A-5) and complete a trip which brings the reactor to a subcritical condition as indicated by full core display panel P601 and neutron monitoring instruments (APRM and IRM).
  - 2.6 Loss of all DC power (more than momentary) as indicated on UA-23, 1-7, 1-8 and 4-7, 4-8.
  - 2.7 Complete loss of ability to maintain plant in cold shutdown. By loss of essential service water loops or loss of RHR loops A and B.
  - 2.8 Any unplanned fire not brought under control within 10 minutes after fire suppression efforts have begun AND which could potentially affect vital, safety-related or ESF equipment.
- 3.0 Occurrences Having Indirect Consequences
- 3.1 All alarms (annunciators) lost for more than 5 minutes.
  - 3.2 Evacuation of Control Room anticipated or required (i.e., implementation of EI-29), with control of shutdown established from local stations.
  - 3.3 Natural Phenomenon or Man-Made Event Having Potential for Degrading Plant Safety.
    - a) Earthquake registering  $>0.08$  g on seismic instrumentation.
    - b) An adverse weather condition that causes a loss of function of 2 or more safety-related trains.
    - c) Any explosion, aircraft crash, or missiles resulting in major damage to structures housing safety-related systems.
    - d) Any unplanned and uncontrolled entry of flammable or toxic gases into vital areas in sufficient quantities to endanger personnel or the operability of safety-related equipment.
  - 3.4 Plant Situations
    - a) Attempted sabotage, with successful entry into a Protected Area.
    - b) A turbine disk failure resulting in penetration of its outer casing.
  - 3.5 Any other instance that, in the judgment of the Site Emergency Coordinator/Shift Operating Supervisor, warrants declaration of an Alert:



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### EMERGENCY ACTION LEVELS

An Alert represents conditions which involve; (1) releases to the environment exceeding 10 times a Technical Specification limit or (2) damage to the core resulting in radioactive levels in the reactor coolant exceeding 40  $\mu\text{Ci/ml}$  dose equivalent I-131, 10,000/E  $\mu\text{Ci/gram}$ , or (3) occurrence of an event (or events) resulting in a substantial reduction in safety. Corrective action is predicted to be successful in preventing a significant release.

Events in this class reflect a significant degradation in the safety of the reactor. However, releases from such events will be small.

## EXHIBIT 2.1-1

### EMERGENCY ACTION LEVELS

#### SITE EMERGENCY

##### 1.0 Effluent Releases

Any release to the environment resulting in an off-site dose in excess of 0.1 rem (whole body) or 0.5 rem (thyroid), as indicated by:

- a) Dose projections using actual effluent data and actual meteorological conditions as calculated in accordance with PEP-03.4.1.
- b) Dose projections using estimated or assumed data (if actual data is unavailable), as calculated in accordance with PEP-03.4.1.
- c) Field measurements at or beyond the site boundary.

##### 2.0 Plant Occurrences Having Direct Consequences

###### 2.1 In-plant Releases

2.1.1 Failed Fuel, as indicated by RCS activity is greater than 400  $\mu\text{Ci/ml}$  (Dose equivalent I-131).

###### 2.1.2 Major In-Plant Leak or Spill, as indicated by:

- a) Major damage to spent fuel, as indicated by:
  - i. observation of substantial damage to multiple fuel assemblies,
  - ii. observation that the water level has dropped below the top of the fuel.

###### 2.2 Loss of Coolant Accident (primary system leakage >50 gpm) as indicated by:

- a) Reactor Vessel water level falling and normal feedwater system unable to restore (N004A, B, C).
- b) Low or falling RCS pressure, with rising drywell pressure and temperature (C32-LPR-R608, CAC-TR-1258, CAC-PIC-2685).
- c) Any time EI-1.2 is implemented.

#### AND

Failure of any 2 (or more) ECCS trains to function on demand (HPCI, core spray A or B, RHR loops A or B as indicated by annunciators on P601).

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### EMERGENCY ACTION LEVELS

2.3 Steam Line Break (i.e., downstream of MSIVs and upstream of feedwater isolation valves), as indicated by:

a) Reactor trip, with:

- i) Low RCS pressure, (C32-LPR-R608)  
OR
- ii) Low steam pressure, (C32-LPR-R609)  
OR
- iii) Low reactor vessel water level, (C33-LPR-R608)  
OR
- iv) High steam flow (indicated on P603).

b) Any time EI-1.3 is implemented.

AND

Inability to close MSIVs within 15 minutes (indicated on P601 and P603).

2.4 Loss of all AC power

- a) Loss of off-site power (turbine trip and startup auxiliary transformer de-energized), AND
- b) Failure of on-site emergency AC power source for greater than 15 minutes, as indicated by loss of diesel generators.

2.5 Loss of all DC power for greater than 15 minutes indicated on UA-23, 1-7, 1-8 and 4-7, 4-8.

2.6 Any fire that:

- a) impairs the operability of any safety-related train or vital equipment;
- b) causes the inability to shutdown the plant.

2.7 Failure of the Reactor Protection System to initiate (indicated on panel A-5) and complete a trip which brings the reactor to a subcritical condition as indicated by full core display panel P601 and neutron monitoring instruments (APRM and IRM)

AND

Failure of standby liquid control to bring the reactor to a subcritical condition.

3.0 Occurrences Having Indirect Consequences

3.1 Loss of all alarms (annunciators) AND occurrence of a plant transient.

## EXHIBIT 2.1-1

### EMERGENCY ACTION LEVELS

- 3.2 Evacuation of Control Room AND local control of shutdown is not established or is lost.
- 3.3 Any Natural Phenomenon or Man-Made Event which Degrades Plant Safety concurrent with or causing the loss of more than 2 safety-related trains, i.e.:
- a) Earthquake that registers  $>0.16$  g ground acceleration.
  - b) Hurricane winds - 0-50 ft. above ground level - 130 mph  
50-150 ft. above ground level - 150 mph  
150-450 ft. above ground level - 180 mph
  - c) Tornado winds - Maximum tangential of 300 mph with forward velocity of 60 mph.
  - d) Any explosion, aircraft crash, or missiles resulting in major damage to structures housing safety-related systems.
  - e) Any unplanned, uncontrolled entry of flammable or toxic gases into vital areas in sufficient quantities to endanger personnel or the operability of safety-related equipment.
- 3.4 Plant Situations
- a) Attempted sabotage with successful attempt(s) at disabling plant equipment or controlling plant operations.
- 3.5 Any other instance that, in the judgment of the Site Emergency Coordinator/Shift Operating Supervisor, warrants declaration of a Site Emergency:

A Site Emergency represents conditions that involve; (1) releases to the environment resulting in projected doses to members of the public in excess of 0.1 rem whole body or 0.5 rem thyroid; or (2) damage to the core resulting in radiation levels in the reactor coolant exceeding 400  $\mu\text{Ci/ml}$  dose equivalent I-131; or (3) occurrence of an event (or events) that involve major failures of plant equipment and that will lead to core damage unless corrective action is taken. Time is available to implement contingency measures.

The Site Emergency class includes Alert conditions where the plant personnel have been initially unsuccessful in restoring the facility to a safe shutdown condition (e.g., the fire has now continued for more than 10 minutes and has now caused loss of function of safety-related equipment). It also includes Alert conditions where subsequent additional malfunctions have occurred (e.g., a transient occurs during the time when plant alarms are inoperable). The Site Emergency class is more severe than the Alert class because significant radiation releases may occur.

## EXHIBIT 2.1-1

### EMERGENCY ACTION LEVELS

#### GENERAL EMERGENCY

##### 1.0 Effluent Releases

Any release to the environment resulting in an off-site dose in excess of 1.0 rem (whole body) or 5.0 rem (thyroid), as indicated by:

- a) Dose projections using actual effluent data and actual meteorological conditions as calculated in accordance with PEP-03.4.1.
- b) Dose projections using estimated or assumed data (if actual data is unavailable) as calculated in accordance with PEP-03.4.1.
- c) Field measurements at or beyond the site boundary.

##### 2.0 Plant Occurrences Having Direct Consequences

###### 2.1 In-Plant Releases

- 2.1.1 Failed Fuel as indicated by RCS activity is greater than 4,000  $\mu\text{Ci/cc}$  (dose equivalent I-131).

###### 2.2 Loss of any two of the three fission product barriers listed below:

- a) Failed fuel causing RCS is greater than 40  $\mu\text{Ci/ml}$ .
- b) Loss of primary coolant boundary including:
  - i. Loss of Coolant Accident (as defined in "Alert", 2.2);
  - ii. Major Steam Line Break (as defined in "Alert", 2.3);
- c) Loss of containment integrity including:
  - i. Failure of Group 1, 2, 3, 6, 7, 8 to initiate when appropriate
  - ii. Rupture of containment vessel indicated by high drywell temperature and pressure, and loss of coolant inventory indicated on level recorders.

EXHIBIT 2.1-1

EMERGENCY ACTION LEVELS

3.0 Event Combinations Likely to Lead to Core Melting

- 3.1 Loss of main condenser decay heat removal capability, (with poor prognosis for recovery) AND either:
- a) Failure of all Low Pressure Coolant Injection trains (with poor prognosis for recovery), indicated on panel P601
- OR
- b) Failure of all Service Water trains necessary for removing decay heat, with poor prognosis for recovery; panel P601 (RHR service water); panel XU2 (nuclear and conventional service water).
- 3.2 Inability to achieve Hot Shutdown for >30 minutes (as defined in Site Emergency, 2.7).
- 3.3 Inability to provide makeup water to the RCS (i.e., simultaneous failure of HPCI, LPCI, RCIC, Condensate and Feedwater), as indicated by falling or low Reactor Vessel level with attempts to inject water not successful within 15 minutes.
- 3.4 Loss of Coolant Accident coincident with failure of both Core Spray System trains AND both Low Pressure Injection System trains.

Shift Operating Supervisor learns of an off normal condition, determined by instrument readings or observation. Shift Operating Supervisor implements PEP-2.1, which flows as shown on this sheet.

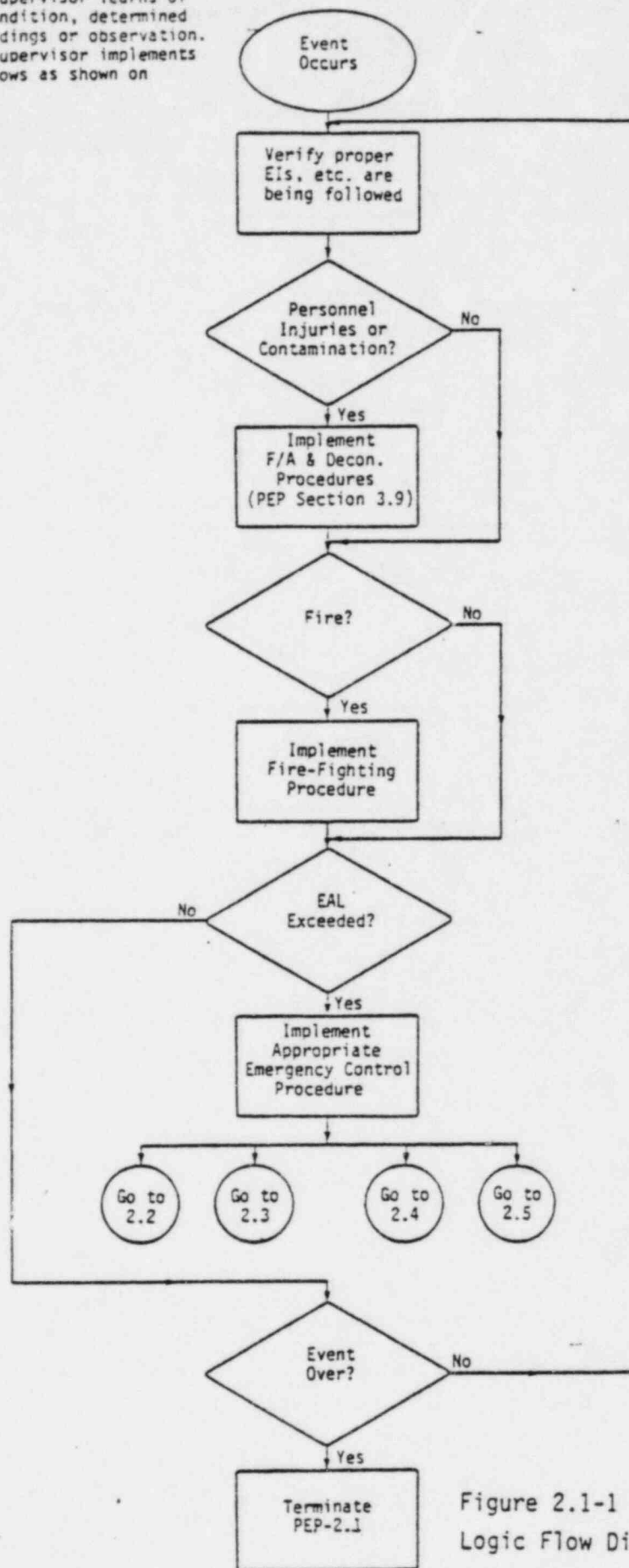


Figure 2.1-1  
Logic Flow Diagram for PEP-2.1