

March 21, 2000

Mr. Harold W. Keiser
President and Chief Nuclear Officer
PSEG Nuclear LLC
Post Office Box 236
Hancocks Bridge, NJ 08038

SUBJECT: NRC INSPECTION REPORT 05000272/2000001, 05000311/2000001

Dear Mr. Keiser:

On February 27, 2000, the NRC completed an inspection of your Salem 1 & 2 reactor facilities. The enclosed report presents the results of that inspection. The preliminary findings were presented to PSEG Nuclear management led by Messrs. M. Bezilla and D. Garchow in an exit meeting on March 9, 2000.

NRC inspectors examined numerous activities as they related to reactor safety and compliance with the Commission's rules and regulations, and with the conditions of your operating license. The inspection consisted of a selected examination of procedures and representative records, observations of activities, and interviews with personnel. Specifically, it involved seven-weeks of resident inspection and one region-based inspection of occupational radiation exposure controls. Each inspection finding was assessed using the applicable significance determination process. All findings were determined to be within the licensee response band (i.e. Green).

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosures will be placed in the NRC Public Document Room.

Sincerely,

/RA/

Glenn W. Meyer, Chief,
Projects Branch 3
Division of Reactor Projects

Docket Nos.: 05000272, 05000311
License Nos.: DPR-70, DPR-75

Enclosure: Inspection Report 05000272/2000001, 05000311/2000001

Mr. Harold W. Keiser

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U.S. NUCLEAR REGULATORY COMMISSION

REGION I

Docket Nos: 05000272, 05000311
License Nos: DPR-70, DPR-75

Report No: 05000272/2000001, 05000311/2000001

Licensee: PSEG Nuclear LLC

Facility: Salem Nuclear Generating Station, Units 1 & 2

Location: P.O. Box 236
Hancocks Bridge, NJ 08038

Dates: January 10 - February 27, 2000

Inspectors: Scott A. Morris, Senior Resident Inspector
F. Jeff Laughlin, Resident Inspector
Joseph T. Furia, Senior Health Physicist

Approved By: Glenn W. Meyer, Chief,
Projects Branch 3
Division of Reactor Projects

SUMMARY OF FINDINGS

Salem Generating Station, Units 1 & 2
NRC Inspection Report 05000272/2000001, 05000311/2000001

The report covers a seven-week period of resident inspection and a radiation safety inspection by a regional specialist inspector using the guidance contained in NRC Inspection Manual Chapter 2515*. The significance of issues is indicated by their color (green, white, yellow, red) and was determined by the Significance Determination Process in draft Inspection Manual Chapter 0609 (see Attachment 1).

Cornerstone: Barrier Integrity

- Green. A small unidentified leak from the chemical and volume control system at Unit 2 persisted for approximately 3 ½ hours before operators recognized and terminated the condition. PSEG attributed the delays in recognizing the condition in part to the fact that two other concurrent evolutions were in progress or had just been completed which effectively masked the indications of a leak, namely volume control tank level and plant ventilation radiation levels. In spite of the fact that the technical specification limit on unidentified leakage was slightly exceeded, the safety and risk significance of this incident was very low, because adequate reactor coolant inventory sources remained available throughout the event and that offsite release rates remained well below regulatory limits. (Section 1R14)

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Report Details

SUMMARY OF PLANT STATUS

Unit 1 began the period shutdown in operational Mode 4 due to an unplanned manual reactor trip on January 6, 2000, resulting from a loss of normal feedwater flow. Operators restarted the unit and placed it back on-line on January 15, 2000. The unit operated at or near full power for the remainder of the report period.

Unit 2 began the period at full power and, with the exception of a 50% load reduction to support main turbine valve testing on February 5, 2000, operated at or near 100% power for the entire report period.

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R04 Equipment Alignment

a. Inspection Scope

The inspectors performed a detailed walkdown of the Unit 1 vital 460/230 VAC electrical system to verify that PSEG maintained it in the proper configuration for normal and emergency operation, and to ensure that system material condition was adequate. (This system provides power to numerous safety-related components and valves necessary for accident mitigation and safe shutdown.) The inspectors completed a partial walkdown of the Unit 1 component cooling water (CCW) system during an 11 CCW pump outage to verify that the redundant pumps and the remainder of the CCW system were properly aligned to support normal and emergency operation. A similar effort was conducted of the 1A and 1B emergency diesel generators (EDG) and offsite electrical power system during a planned outage of the 1C EDG. The inspectors also verified that any identified discrepancies were captured in PSEG's corrective action program.

b. Observations and Findings

There were no findings identified.

1R05 Fire Protection

a. Inspection Scope

The inspectors routinely toured high fire risk areas at both Salem units, including the 4160/460/230 VAC switchgear rooms and safety-related relay rooms, to assess PSEG's control of transient combustible material and ignition sources, fire detection and suppression capabilities, fire barriers, and any related compensatory measures.

b. Observations and Findings

There were no findings identified.

The inspectors noted that the fire door connecting the Unit 1 100' elevation relay room to the adjacent chiller unit room had a broken latch preventing the barrier from shutting securely. Several maintenance personnel were working in the chiller room at the time of this discovery, but there was no impairment tag on the door nor was any compensatory measure in place to ameliorate the deficiency. The inspectors informed the site fire protection personnel of the problem; technicians were immediately dispatched to correct the defective door latch.

1R11 Licensed Operator Requalification

a. Inspection Scope

On February 15, 2000, the inspectors witnessed a simulator training session for one operating crew to assess operator performance and training effectiveness, and to identify any deficiencies or discrepancies in training.

b. Observations and Findings

There were no findings identified.

1R12 Maintenance Rule Implementation

.1 Availability of 25 Service Water Pump

a. Inspection Scope

The inspectors followed up on the extended unplanned inoperability (and unavailability) of the 25 service water (SW) pump due to high vibration levels on the pump bearing. The inspectors focused on this particular activity because of the heightened plant risk associated with an inoperable SW pump during a period of increased Delaware River debris loading. This phenomenon occurs from February through April each year and has historically resulted in reduced reliability of SW system components.

b. Observations and Findings

There were no findings identified.

The inspectors identified that plant operators incorrectly considered the 25 SW pump available for operation even though the 125 VDC control power breaker was danger tagged in the open position, preventing automatic pump operation. Internal PSEG guidance as well as the NUMARC 93-01 industry implementing document states that a component can be considered available for maintenance rule tracking purposes provided that it can be restored with a single action that is controlled by procedure and performed by a dedicated operator. Tagging the control power for the SW pump motor supply breaker did not meet this definition. Operators appropriately revised the status of

the pump once informed of the availability definition by both the NRC inspectors and PSEG maintenance rule program staff. The inspectors also noted that the 25 SW pump accumulated numerous hours of unavailability time due to the lack of replacement parts to repair the deficient pump condition.

.2 Unit 2 Emergency Diesel Generators

a. Inspection Scope

The inspectors assessed the effectiveness of maintenance efforts on the Unit 2 EDGs to correct past performance problems primarily associated with the 2A machine. The EDGs provide emergency electrical power to numerous safety-related plant systems.

b. Observations and Findings

There were no findings identified.

1R13 Maintenance Risk Assessments and Emergent Work Evaluation

a. Inspection Scope

The inspectors reviewed numerous evolution plans for on-line maintenance activities to verify that appropriate risk evaluations were performed and to assess PSEG's management of overall on-line plant risk. The inspectors also performed a field walkdown of the SW intake structure during a planned outage of the 26 SW pump train (for a silt inspection) on February 25, 2000. This maintenance activity, in conjunction with the concurrent unavailability of the 25 SW pump, placed Unit 2 in a 72-hour technical specification action statement (TSAS).

b. Observations and Findings

There were no findings identified.

The inspectors observed that the 26 SW pump was danger tagged out of service at 4:59 a.m., but as of 10:00 a.m., work had not commenced. The inspectors raised this issue with control room operators, who subsequently learned that timely maintenance support was not available and restored the 26 SW pump to service rather than extend the unavailability of the inoperable SW loop. As a result, PSEG accumulated approximately eight hours of pump unavailability without the benefit of conducting preventive maintenance to increase train reliability.

1R14 Personnel Performance During Nonroutine Plant Evolutions

a. Inspection Scope

On February 15, 2000, Salem Unit 2 control room operators recognized a small (1.1 gallon/minute) leak via the reactor coolant (RC) filter vessel drain line as indicated by a slowly lowering volume control tank level (VCT) and an elevated plant ventilation radiation monitor reading. The RC filter and VCT are part of the chemical and volume control system (CVCS), which is connected to the reactor coolant system. Once identified, the leak was terminated by isolating the RC filter from the CVCS. Operators formally reported this event to the NRC Operations Center in a 10 CFR 50.72 non-emergency event notification, because they concluded that the leak placed the plant in an unanalyzed condition with respect to reactor coolant leakage outside containment. The inspectors reviewed operator performance prior to, during, and after the event, and verified that the adverse conditions leading up to this occurrence were captured in PSEG's corrective action program.

b. Observations and Findings

The reactor coolant leak was the result of incomplete closure of the RC filter vessel drain valve prior to returning the filter to service following filter media replacement. By design, operators had to close the valve by means of a reach rod through a concrete shield wall, so actual valve position could not be visually verified as shut following the work. The inspectors noted that PSEG's root cause evaluation of this event determined that there were some generic concerns involving the operation and maintenance of reach rod-operated valves at Salem for which corrective actions were still being developed.

The inspectors noted that the leak persisted for approximately three hours before it was first detected by a radiation protection department individual. Specifically, the technician noticed that plant ventilation stack radiation levels had not returned to normal levels following an earlier containment building pressure relief evolution. Once confirmed by observations of a slowly lowering VCT level, operators implemented prompt and appropriate actions to isolate the source of the leakage. The post-event leak rate was quantified at 0.05 gallons/minute, well below the technical specification limit for unidentified leakage.

The inspectors noted that more timely detection of the leakage was deterred by concurrent containment building pressure relief activity and an earlier high head safety injection pump test that disturbed steady-state VCT levels. Another recent (September 8, 1999) event at Salem Unit 1 involved an 80 gallons/minute leak induced by a malfunction of a CVCS reach rod operated valve (see NRC Inspection Report 05000272&311/1999008 for details on this event).

The inspectors evaluated the significance of this event and concluded that it was Green (i.e., very low safety impact) in both the *Barrier Integrity* and *Public Radiation Safety* cornerstones. With regard to barrier integrity, the Green determination was based upon consultation with an NRC senior reactor analyst who judged that even if the leak were to continue, adequate reactor coolant inventory makeup sources were available and that letdown isolation remained operable and could have terminated the leak. Regarding public radiation safety, the issue was evaluated as Green since the elevated radioactive release rate still remained well below 10 CFR 50 Appendix I limits. The inspectors concluded that the barrier integrity cornerstone was the most appropriate location for this finding.

1R15 Operability Evaluations

a. Inspection Scope

The inspectors routinely reviewed degraded and non-conforming conditions associated with risk significant plant systems and components to assess the adequacy of PSEG's operability evaluation (OE) process. When compensatory measures were prescribed, the inspectors verified that these actions were appropriate and completed at the specified frequency. During this report period, the inspectors evaluated two conditions warranting formal OEs, as listed below:

- Following the January 6, 2000 Unit 1 reactor trip, the 12 auxiliary feedwater (AFW) pump discharge valves did not open automatically as designed due to a degraded condition associated with a component in pump runout control circuit.
- On February 23, 2000, a PSEG design engineer initiated notification 20021371, which described a nonconforming condition associated with the CCW system. Specifically, the notification described that under certain worst-case conditions following a loss of offsite power event, the CCW temperature at the outlet of the residual heat removal (RHR) heat exchanger would exceed the piping design basis temperature by 17 degrees F.

b. Observations and Findings

There were no findings identified.

Regarding the CCW system non-conforming condition, the inspectors noted that control room senior reactor operators had reviewed and approved this notification as a level 3 issue (the lowest significance level in the CAP) without identifying the need for performing an OE, in violation of PSEG procedure NC.WM-AP.ZZ-0000, "*Notification Process.*" The inspectors subsequently learned that a PSEG system engineering supervisor independently reached these same conclusions earlier that day, and had appropriately notified the control room staff. A formal OE was written and later approved by the station operations review committee. The operators' failure to properly perform an OE is considered a minor violation not subject to formal enforcement action.

1R17 Permanent Plant Modifications

a. Inspection Scope

The inspectors reviewed a 10 CFR 50.59 safety evaluation prepared to support the removal of 20 channels of process radiation monitoring located in both Salem units. The inspectors independently examined all associated design and licensing basis requirements, and attended the February 22, 2000 station operations review committee meeting that met to approve the proposal. Interviews were also held with the engineering and management staff principally involved with developing the safety evaluation.

b. Observations and Findings

There were no findings identified.

1R19 Post Maintenance Testinga. Inspection Scope

The inspectors observed several post-maintenance tests (PMTs) and reviewed PMT data following the system outages, including:

- 11 component cooling water pump
- 13 chiller unit
- 1C emergency diesel generator
- 21 auxiliary feedwater pump
- 22 service water subsystem

b. Observations and Findings

There were no findings identified.

1R20 Refueling and Outage Activitiesa. Inspection Scope

During the Unit 1 forced outage from January 6 -15, 2000, the inspectors performed numerous verifications of the shutdown core cooling flow path, offsite and emergency power source availability and containment integrity. The availability of reactor coolant emergency makeup sources was inspected as were shutdown reactivity management practices. Since the unit remained in Mode 4 (reactor coolant temperatures between 200 and 340 degrees F) for a large portion of the outage, the inspectors verified that PSEG satisfied all applicable technical specification requirements for that infrequent mode of operation.

The inspectors closely monitored PSEG's controls over the status of the RHR system. In Mode 4, one of the two available trains of RHR is required to be in service for shutdown cooling while the other is to remain available for emergency core cooling in the event of a loss of reactor coolant. This system alignment resulted in a small but

non-trivial increase in shutdown risk since a single check valve (2SJ70) was relied upon to prevent reactor coolant system back-leakage into the refueling water storage tank.

Prior to and during the subsequent plant startup, the inspectors conducted frequent tours of the facility to verify the absence of equipment problems that could compromise the safety of the unit. The inspectors also observed portions of the startup from the control room.

b. Observations and Findings

There were no findings identified.

1R22 Surveillance Testing

a. Inspection Scope

The inspectors observed or reviewed the results of several scheduled equipment surveillance tests, including:

- 1SJ12 and 13 safety injection valves
- 12 auxiliary feedwater pump
- 1A emergency diesel generator
- 11 residual heat removal pump
- 21 residual heat removal pump
- 21 containment spray pump

The inspectors compared actual test data with established acceptance criteria to ensure that the various systems and components met licensing basis requirements.

b. Observations and Findings

There were no findings identified.

1R23 Temporary Plant Modifications

a. Inspection Scope

The inspectors reviewed Unit 1 temporary modification (T-Mod) 00-003 concerning the installation of monitoring and test instrumentation on the main turbine voltage regulator circuitry. PSEG engineers prepared this T-Mod to support troubleshooting activities by monitoring any abnormalities in regulator circuit operation. The inspectors determined that the T-Mod had risk consequences based on the potential for it causing a plant initiating event.

b. Observations and Findings

There were no findings identified.

2. RADIATION SAFETY

Cornerstone: Occupation Radiation Safety [OS]

2OS1 Access Control

a. Inspection Scope

The inspectors reviewed PSEG's access control program by examining the controls established for exposure significant areas including postings, markings, dosimetry, surveys and alarm set points. Areas in both Salem units were examined.

b. Observations and Findings

There were no findings identified.

2OS2 ALARA Planning and Controls

a. Inspection Scope

The inspectors reviewed work performance during the Unit 1 refueling outage (1R13) completed during the fall of 1999. Selected jobs which exceeded their exposure estimates were examined relative to work integration; coordination between working groups; shielding and other engineering controls to minimize exposures; accuracy of person-hour and effective dose rate estimates; post-job reviews; and, ALARA reports. Special emphasis was placed on reviewing PSEG's actions in response to the unplanned elevated reactor cavity dose rates, especially actions planned or implemented to prevent recurrence during future refueling outages. The inspectors also reviewed work controls implemented during a Unit 1 forced outage from January 6-15, 2000, and during Unit 2 containment entries to repair a control rod drive mechanism cooling fan motor.

b. Observations and Findings

There were no findings identified.

2OS3 Radiation Monitoring Instrumentation

a. Inspection Scope

The inspectors reviewed process radiation monitoring instrumentation, based on a listing of these devices found in the Salem Updated Final Safety Analysis Report (UFSAR), Section 11.4.2.2. Radiation monitors included in this review were: control room air intake; control room air particulate, containment fixed filter iodine; condenser air removal; component cooling liquid; reactor coolant system letdown line; non-radioactive waste basin discharge; and main steam high range. Records reviewed included the most recent calibration and channel functional tests performed.

b. Observations and Findings

There were no findings identified.

4. OTHER ACTIVITIES [OA]

4OA1 Identification and Resolution of Problems

.1 (Offsite) Nuclear Review Board Meeting

a. Inspection Scope

The inspectors attended portions of the subject meeting held on February 2-3, 2000, and read through all the recorded minutes subsequent to the meeting. The inspectors witnessed presentations on service water system biological fouling and mitigation strategies, an assessment of quality assurance department audits and surveillances, self-assessment program results, and on-line work management concerns.

b. Observations and Findings

There were no findings identified.

.2 Problem Identification and Resolution Issues

The following sections of this report describe deficiencies or potential issues with regard to PSEG's problem identification and corrective action process:

- 1R05 - identification of degraded fire barrier (door)
- 1R12 - identification of inadequate interpretation of maintenance rule availability
- 1R13 - identification of 26 service water pump work management deficiencies
- 1R14 - delayed operations department identification of a small reactor coolant leak
- 1R15 - delayed identification of the need for an operability evaluation

4OA2 Performance Indicator Verification

.1 Occupational Radiation Safety

a. Inspection Scope

The inspectors reviewed performance indicator data submitted by PSEG in the area of occupational radiation safety. The data reviewed represented a sampling of records from July 15, 1999 through January 11, 2000, for occurrences of non-conformance with high radiation areas greater than 1 Rad per hour and unplanned personnel exposures greater than 100 millirem total effective dose equivalent, 5 rem shallow dose equivalent, 1.5 rem lens dose equivalent or 100 millirem to the unborn child.

b. Observations and Findings

There were no findings identified.

.2 (Closed) URI 05000272/1999011-01: Inaccurate submittal of *Containment Leakage* performance indicator data. The inspectors verified that PSEG corrected the errors identified in NRC Inspection Report 05000272&311/1999011 in the January 2000 submittal.

4OA3 Event Follow-up

.1 (Closed) LER 05000272/2000-01-00: Salem Unit 1 reactor trip due to loss of normal (steam generator) feedwater.

a. Inspection Scope

This circumstances involved in this event were first described in NRC Inspection Report 05000272&311/1999011. During this report period, the inspectors reviewed PSEG's root cause analysis and corrective actions. PSEG concluded that the loss of feedwater flow resulted from radio frequency interference with associated feedwater heater level control circuits from hand-held radios used by roving plant equipment operators. This caused inadvertent closures of the heater inlet valves. To address this issue, barriers and signs were posted to restrict the use of radios in the vulnerable areas of the plant. The inspectors verified that these actions were completed prior to the Unit 1 restart.

Following the reactor trip, the 12 auxiliary feedwater (AFW) pump discharge valves failed to open automatically as designed. This issue described in section 1R15 of this report.

b. Observations and Findings

There were no findings identified.

4OA5 Management Meetings

.1 Exit Meeting Summary

On March 9, 2000, the inspectors presented their overall findings to members of PSEG Nuclear management led by Mark Bezilla and Dave Garchow. PSEG Nuclear management acknowledged the findings presented and did not contest any of the inspectors' conclusions. Additionally, they stated that none of the information reviewed by the inspectors was considered proprietary.

.2 Public Meetings

- a. On February 2, 2000, the resident inspectors and selected members of NRC management held a meeting in Pennsville, NJ to provide basic information to interested public individuals regarding the NRC's revised reactor oversight program and to elicit feedback on the NRC's pilot program implementation at PSEG's Salem and Hope Creek facilities.
- b. On February 4, 2000, PSEG Nuclear management met with NRC staff in the NRC Region I office for a publicly-observed regulatory information conference. The purpose of the conference was to discuss the facts and significance of issues associated with a preliminary White finding associated with PSEG's Emergency Classification Guide implementation. The circumstances associated with the technical aspects of this issue are described in NRC Inspection Report 05000272&311/1999009, dated December 28, 1999, and will be addressed in a separate letter providing NRC's final determination.

.3 Congressman Frank LoBiondo Site Visit

On February 22, 2000, the resident inspectors participated in a Salem site visit by U.S. Representative Frank LoBiondo. The focus of the congressman's visit was to discuss PSEG's actions with respect to resolution of longstanding electrical raceway fire barrier issues.

ITEMS OPENED AND CLOSED**Closed**

05000272/1999011-01	URI	Inaccurate <i>Containment Leakage</i> performance indicator data submittal. (Section 4OA2.2)
05000272/2000001-00	LER	Salem Unit 1 reactor trip due to loss of normal (steam generator) feedwater.

LIST OF ACRONYMS USED

1R13	Salem Unit 1 Refueling Outage 13
AFW	Auxiliary Feedwater
ALARA	As Low As Is Reasonably Achievable
CAP	Corrective Action Program
CCW	Component Cooling Water
CFR	Code of Federal Regulations
CVCS	Chemical and Volume Control System
EDG	Emergency Diesel Generator
LER	Licensee Event Report
NRC	Nuclear Regulatory Commission
OE	Operability Evaluation
PI	Performance Indicator
PMT	Post Maintenance Test
PSEG	Public Service Enterprise Group - Nuclear LLC
RC	Reactor Coolant
RHR	Residual Heat Removal
SW	Service Water
T-Mod	Temporary Modification
TSAS	Technical Specification Action Statement
UFSAR	Updated Final Safety Analysis Report
URI	Unresolved Item
VAC	Volts Alternating Current
VCT	Volume Control Tank
VDC	Volts Direct Current

ATTACHMENT 1

NRC's REVISED REACTOR OVERSIGHT PROCESS

The federal Nuclear Regulatory Commission (NRC) recently revamped its inspection, assessment, and enforcement programs for commercial nuclear power plants. The new process takes into account improvements in the performance of the nuclear industry over the past 25 years and improved approaches of inspecting and assessing safety performance at NRC licensed plants.

The new process monitors licensee performance in three broad areas (called strategic performance areas): reactor safety (avoiding accidents and reducing the consequences of accidents if they occur), radiation safety (protecting plant employees and the public during routine operations), and safeguards (protecting the plant against sabotage or other security threats). The process focuses on licensee performance within each of seven cornerstones of safety in the three areas:

Reactor Safety

- Initiating Events
- Mitigating Systems
- Barrier Integrity
- Emergency Preparedness

Radiation Safety

- Occupational
- Public

Safeguards

- Physical Protection

To monitor these seven cornerstones of safety, the NRC uses two processes that generate information about the safety significance of plant operations: inspections and performance indicators. Inspection findings will be evaluated according to their potential significance for safety, using the Significance Determination Process, and assigned colors of GREEN, WHITE, YELLOW or RED. GREEN findings are indicative of issues that, while they may not be desirable, represent very low safety significance. WHITE findings indicate issues that are of low to moderate safety significance. YELLOW findings are issues that are of substantial safety significance. RED findings represent issues that are of high safety significance with a significant reduction in safety margin.

Performance indicator data will be compared to established criteria for measuring licensee performance in terms of potential safety. Based on prescribed thresholds, the indicators will be classified by color representing varying levels of performance and incremental degradation in safety: GREEN, WHITE, YELLOW, and RED. GREEN indicators represent performance at a level requiring no additional NRC oversight beyond the baseline inspections. WHITE corresponds to performance that may result in increased NRC oversight. YELLOW represents performance that minimally reduces safety margin and requires even more NRC oversight. And RED indicates performance that represents a significant reduction in safety margin but still provides adequate protection to public health and safety.

The assessment process integrates performance indicators and inspection so the agency can reach objective conclusions regarding overall plant performance. The agency will use an Action Matrix to determine in a systematic, predictable manner which regulatory actions should be taken based on a licensee's performance. The NRC's actions in response to the significance (as represented by the color) of issues will be the same for performance indicators as for inspection findings. As a licensee's safety performance degrades, the NRC will take more and increasingly significant action, which can include shutting down a plant, as described in the Action Matrix.