U.S. NUCLEAR REGULATORY COMMISSION

Docket No.	70-1113
License No	SNM-1097
Inspection Report No.	70-1113/98-202
Licensee:	General Electric Company
Facility:	General Electric Nuclear Energy Production
Location:	Wilmington, NC
Inspection Conducted:	April 20-24, 1998
Inspectors:	Yen-Ju Chen, FCOB Peter Lee, FCOB
Approved By:	Philip Ting, Chief Operations Branch Division of Fuel Cycle Safety and Safequards, NMSS

Enclosure

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EXECUTIVE SUMMARY

GENERAL ELECTRIC NUCLEAR ENERGY NRC INSPECTION REPORT 70-1113/98-202

The Nuclear Regulatory Commission (NRC) performed a routine announced fire safety inspection at the General Electric Nuclear Energy (GE) facility in Wilmington, North Carolina, on April 20-24, 1998. The inspection focused on the implementation of GE fire protection program commitments concerning safe plant operations. Major fire safety performance elements reviewed included: fire protection systems, cutting and welding permit program, fire protection system inspections and testing, emergency response, and event investigation (fire).

Fire Protection Systems

- The water supply for fire protection systems was considered adequate to meet the design demand of the existing sprinkler systems in the Fuel Manufacturing Operation (FMO) and Fuel Manufacturing Operation Expansion (FMOX) facility and the design demand required for manual fire suppression in the event of a major fire. Two sources of water supply had been established to assure availability and reliability of water supply necessary for fire protection.
- Adequate automatic sprinkler systems or fire detection systems had been provided throughout the majority of the process areas.
- The upgrade of the site emergency alarm system had provided assurance and reliability of fire alarm initiation and indication and the supervision of fire suppression systems control valves and components. This was considered adequate.

Cutting and Welding Permit Program

 The licensee had developed a safety procedure for the cutting and welding activities, but had not appropriately implemented it in every case. The failure to implement the safety procedure and other program weaknesses constituted a violation of minor significance and were identified as a non-cited violation (NCV). The licensee had promptly and appropriately addressed these safety concerns by the end of the inspection.

Fire Protection Systems Inspection, Testing, and Maintenance

 The licensee's inspection, testing, and maintenance of the site emergency system (i.e., fire alarm) was consistent with industry practice to assure reliability and operability. Weaknesses were identified in licensee's testing of water-based fire suppression systems (i.e., 2-inch main drain, gauges, and annual fire pump test), which were inconsistent with industry standards. Adequate inspection and testing would assure the availability and reliability of the systems. The licensee had committed to review its program and revise the procedures and/or update testing requirements.

Emergency Response

- The licensee had established an effective and adequate program for assuring training of the site Emergency Response Team members. The members' training was commensurate with expected duties and functions for the incipient fire fighting.
- Offsite fire fighting support had been adequately established with surrounding municipal fire departments.

Event Investigation (Fire)

The licensee's response to the March 16, 1998, fire event was appropriate.

REPORT DETAILS

1. Fire Protection Systems

a. Scope

The inspectors reviewed the design drawings and hydraulic data for the capability of the existing automatic sprinkler systems. The inspectors toured the FMO, FMOX, Dry Conversion Process (DCP), and the warehouse portion of the GE facility to evaluate its fire protection systems and assure the plant conditions were within the system design capability. Other fire protection features (e.g., site emergency alarm system, fire alarm initiating and indicating devices, fire doors, fire barriers, etc.) were reviewed to evaluate the overall level of fire safety protection. The inspectors also reviewed the site fire water supply for its reliability and availability.

b. Observations and Findings

Automatic Sprinkler Systems

The inspectors noted that automatic sprinkler protection had been provided in the majority of the process areas (e.g., FMO, FMOX, Warehouse, etc.). The automatic sprinkler systems for the FMO and FMOX had been designed to meet pipe schedule for ordinary hazard group classification. The minimum water supply required for acceptable flow at the base of the sprinkler riser, in accordance with industry standard (i.e., National Fire Protection Association (NFPA) Code 13), is 850-1,500 gpm at 20 psi residue pressure, for a duration of 60-90 minutes. Other automatic sprinkler systems, installed in the warehouse, were based on hydraulic calculations meeting hazard classification of Ordinary Hazard Group II, as defined in NFPA 13. The design densities of the systems were 0.289 gpm/sq. ft. and 0.258 gpm/sq. ft. over a design area of 2,000 sq. ft. The inspectors noted that a higher sprinkler system density was provided for the protection of the solvent extraction area to address the potential rapid heat release associated with the tri-n-butyl phosphate and normal dodecane used in the process.

The inspectors did not identify any fire hazards or storage configuration that would challenge or exceed the design capacity of the existing automatic sprinkler systems. The inspectors noted that transportation wooden crates in the warehouse were stacked approximately 13 ft. high, which exceeded the 12 ft. storage height criteria for Ordinary Hazard Group II occupancy. However, the inspectors also noted that the actual design density of the existing automatic sprinkler systems exceeded that established for Ordinary Hazard Group II. The inspectors concluded that the sprinkler system's performance would limit fire spread or suppress a fire involving the storage containers. The licensee indicated that the stacking of five crates was based on criticality safety evaluations. The implementation of criticality safety limits would provide the administrative controls for limiting the storage pile height beyond the design capability of the existing sprinkler systems.

Fire Detection Systems

The inspectors noted from the facility tour that the majority of the areas, where the sprinklers were not provided due to criticality safety concerns, were protected by fire detection devices (heat and/or smoke detectors) for automatic detection and initiation of alarm and emergency response. In the DCP facility, smoke detectors and/or heat detectors were installed throughout the facility. The new site emergency alarm system, which was completed in May 1997, was listed and approved by independent testing laboratories for fire protection use. The licensee indicated that the installation had been acceptance tested and met established industry standard (i.e., NFPA 72). During the facility tour and the review of fire alarm systems, the inspectors did not identify any apparent deficiencies in the fire alarm systems or the associated components. The manufacturer supplied system batteries provided secondary power for the site emergency alarm systems. Additional backup power was also provided from an established uninterruptible power system for the facility's security system and from the facility's emergency generators. The emergency backup power capabilities met the established industry standards for fire alarm systems. The upgraded system provided adequate assurance for reliability and availability of fire alarm initiation and indication capabilities and supervision of fire suppression systems control valves and components.

Fire Barrier

The licensee had provided fire proofing and fire barrier for the solvent extraction process area and the adjacent process areas. The NRC Branch Technical Position was considered, as applicable, for the expansion of the add-on DCP facility regarding Type I construction for fire resistance. Fire barriers had been provided for the separation of the DCP facility from the existing process facility. Fire barriers were also provided within the DCP areas to limit potential of fire propagation and confinement. This was considered adequate.

Water Supplies

The fire water supply for the GE-facility has been provided by wells located throughout the site. Two independent water storage sources were available for fire protection water supply: an elevated storage tank with a 300,000 gallon maximum capacity with a minimum of 100,000 gallons dedicated for fire protection, and an in-ground open reservoir with approximate capacity of 675,000 gallons. The combined available reserved water supply was a minimum of 775,000 gallons. The capacity was sufficient for a duration of 90 minutes at a flow of 1,500 gpm required for the automatic sprinkler systems based on pipe schedule. With an estimate of 2,000-2,750 gpm for fire water flow during manual fire suppression, the available water supply could last for more than four hours. The elevated water tower (approximate 83 ft. above the highest line of sprinklers) provided a static head pressure of approximately 55-65 psi for the fire distribution loop. The elevated tank was located approximately 200 yards from the water distribution loop surrounding the NRC licensed facility. Two fire pumps were provided for the site fire protection water distribution to meet the pressure requirements of the automatic sprinkler systems and flows from fire hydrants. The rate capacities of the two fire pumps were 1,500 gpm (rated at 65 psi) for the electric fire pump located at the base of the elevated water storage tank and 1,500 gpm (rated at 100 psi) for the diesel fire pump at the in-ground open

reservoir. The inspectors considered the available fire water supply adequate and reliable to meet the need for fire protection systems and manual fire suppression operations.

c. Conclusions

The licensee had provided engineered fire protection systems (e.g., automatic sprinkler systems, fire alarm systems, fire barriers, etc.) for fire protection throughout the facility. The design basis for automatic sprinkler systems was not challenged or exceeded by the plant conditions observed during the inspection. Adequate fire detection capability had been provided in the majority of the process areas where automatic sprinkler protection was absent due to criticality safety concerns. The available fire water supply was considered adequate and reliable to meet the quantity and pressure necessary for fire protection systems and manual fire suppression operations.

2. Cutting and Welding Permit Program

a. Scope

The inspectors reviewed the licensee's cutting and welding permit program, including the applicable procedure and its implementation, to determine the adequacy of the program.

b. Observations and Findings

The inspectors reviewed Safety, Health & Fire Protection Manual Procedure Number 503, "Cutting and Welding Permits," and its implementation. The inspectors determined that the procedure was consistent with the industry practice described in NFPA 51B, Fire Prevention in Use of Cutting and Welding Processes.

Based on discussions with GE staff, normally the Maintenance Leader or the Project Engineer/Leader would issue the cutting and welding permits. These people were familiar with the area of cutting and welding work; however, the inspectors questioned whether they had adequate training to appropriately evaluate the work place for issuing the permit. According to the Fire Chief, training was provided to the permit issuers by going through the procedure step by step and going through a check list for issuing the permit. However, such training was not documented.

Procedure No. 503 required fire watch for all hot work onsite. When the hot work was performed by GE employees, the fire watch was provided by GE; however, most hot work was performed by contractors, and the fire watch was provided by the contractor. After discussing with the contractor's supervisor and GE staff, the inspectors determined that adequate fire watch training was provided to the contractors and the licenses's employees annually, as required by OSHA.

During the walk-through, the inspectors noted that a cutting and welding permit was issued on April 21, 1998, and expired on April 25, 1998, while the established procedure allowed the validation period for only one working shift. Based on the discussion with a maintenance shift coordinator, sometimes he may issue a permit for one day up to the end of the calendar week.

When the permit was issued for more than one working shift, re-examination of the work area was not performed to ensure the safe condition still existed.

After these concerns were raised, the licensee stopped all cutting and welding work and permit issuing until the permit issuers reviewed and understood the applicable procedure. The training for hot work permit issuers has been formalized and will be tracked by the facility's training system. The training will include area evaluation and fire watch training. Nuclear Safety Instruction No. O-9.0 has been modified to require radiation protection workers to monitor cutting and welding permits while monitoring radiation work permits during their walk-throughs, which provides an independent oversight of the program. All these corrective actions were completed by the end of this inspection. These corrective actions will strengthen the cutting and welding permit program.

This failure, in aggregate, constitutes a violation of minor significance and is being treated as a non-cited violation, consistent with Section IV of the NRC Enforcement Policy. Due to the immediate and adequate licensee corrective actions, the failure to follow established safety procedure was identified as NCV No. 70-1113/98-202-01.

c. Conclusions

The licensee had developed a safety procedure for the cutting and welding permit program, but had not appropriately implemented it in every case. The failure to implement the safety procedure and other weaknesses of the program was identified as an NCV. The licensee had promptly and appropriately addressed these safety concerns by the end of the inspection.

3. Fire Protection Systems Inspection. Testing, and Maintenance

a. Scope

The inspectors conducted interviews with licensee's staff and reviewed the records of inspection and testing performed for the automatic sprinkler systems, fire pumps, fire hydrants, and the fire alarm system. The inspectors also reviewed the licensee's two-inch main drain test results. The inspectors walked through the licensed facility to verify the operability conditions of various automatic sprinkler systems and the associated components.

b. Observations and Findings

The inspectors reviewed the inspection, testing, and maintenance (ITM) performed for the site emergency alarm system (fire alarm system related components) and concluded that they were consistent with industry standards established in NFPA 72. The ITM performed for the fire alarm system components of the site emergency alarm system provided an adequate assurance for the availability and reliability to perform its intended functions.

The portable fire extinguishers provided at the facility were inspected monthly, which was consistent with the industry standards and practices. The inspectors randomly checked portable extinguishers during the walk-through of the facilities. No apparent deficiency associated with the inspection, testing, and maintenance of portable extinguishers was

identified. The inspectors identified several weaknesses in the ITM of the facility automatic sprinkler systems and fire pumps as described below.

Main Drain Test

From the review of the inspection and testing of automatic sprinkler systems, the inspectors identified that the automatic sprinkler system 2-inch main drain tests had not been performed as a part of routine testing. The performance of the 2-inch main drain tests at a quarterly frequency is a requirement of NFPA 25 to ensure water supply to the sprinkler riser. The test identifies partially closed or blocked post inspection valves, detects blockages in underground piping leading into the buildings, qualifies water discharged for the internal conditions of piping, activates water motor alarm, transmits flow alarm, and flushes piping. The inspectors noted that the lack of the 2-inch main drain test was based on recommended testing guidance from the licensee's insurer; however, the insurer's guidance did not provide sufficient technical basis.

The licensee staff acknowledged the importance of performing the main drain test to assure the availability of water at the base of the sprinkler system risers. The 2-inch main drain tests of all automatic sprinkler systems in the NRC licenced facility were performed by the licensee during this inspection. No apparent concern was identified. The main drain tests indicated that fire protection water supply was available at the base of the sprinkler risers.

System Gauges

The industry standard (i.e., NFPA 25) requires sprinkler system gauges to be checked with an inspector gauge (e.g., a calibrated gauge) or to be replaced with a calibrated gauge at a five-year frequency. Gauges that are not accurate to within 3 percent are required to be recalibrated or replaced. These gauges were relied on for the monitoring of sprinkler system pressures and for the indication of differential pressures during testing. The performance of the gauges appeared adequate at the time of the inspection. However, the licensee indicated that the verification and assurance of calibrated gauges at the appropriate frequency would be included in the licensee's review of procedures to assure consistency with established industry standards (i.e., NFPA 25).

Fire Pumps Annual Test

The inspectors noted that the annual pump operation tests for the electrical and diesel fire pumps had not been performed by the licensee and were not included in the established preventive maintenance management and tracking system. The fire pump test under minimum, rated, and peak flows is an established NFPA 25 requirement. The annual tests provide assurance of the performance of the fire pump assembly and provide an indication of its capability to meet the original intended design performance. The licensee indicated that the diesel fire pump was last tested in 1996. The electric fire pump was last tested on April 29, 1994. The licensee acknowledged the need to perform the annual test on the existing fire pumps to assure reliability of pump performance. The licensee had initiated actions to perform the annual fire pump tests to be completed within the next 30 days. In the interim, the licensee's performance of the 2-inch main drain test provided the indication that the electric fire pump could maintain system pressures necessary for the automatic sprinkler systems at the

licensed facility. The inspectors also noted that the proximity of the elevated water storage tank could provide sufficient static head pressure to meet initial operations of a number of sprinkler heads and could activate flow alarm upon notification of a fire. Based on the proximity of the elevated water storage tower, looped water distribution configurations, emergency response capability and good housekeeping and control of combustibles, an interim assurance exists for meeting initial demand of the automatic sprinkler systems to perform their intended functions.

c. Conclusions

Weaknesses of the licensee's performance of inspection and testing of water-based fire suppression systems (e.g., automatic sprinkler systems, fire pump) were identified in that the current procedures were not consistent with the minimum requirements established by industry standard (i.e., NFPA 25) and omitted several important required tests. Adequately implemented inspection and testing for fire suppression systems would provide assurance of availability and reliability of the systems. The licensee had committed to improve the testing of fire suppression systems (i.e., 2-inch main drain test, annual fire pump test, gauges) to be consistent with industry standard. This will be tracked as **Inspector Followup Item (IFi) No. 70-1113/ 98-202-02**. The licensee had performed adequate inspection and testing necessary to assure the availability and reliability of operations for fire alarm system components of the site emergency alarm system. In addition, the facility's portable fire extinguishers were adequately inspected, tested, and maintained.

4. Emergency Response

a. Scope

The inspectors reviewed the training of the Emergency Response Team (ERT) members to determine the adequacy for performing fire fighting response. The inspectors also reviewed the facility's mutual aid agreement information to ensure that offsite fire fighting support would be provided during a major fire.

b. Observations and Findings

Emergency Response Team Training

The licensee had established the ERT to respond to incipient (i.e., small) fires. The ERT includes volunteer employees from the nuclear and non-nuclear operations of the GE site. The 40-hour initial training of ERT members consisted of 16 hours of fire fighting and 24 hours of hazardous material response. Monthly 4-hour training sessions provided refresher training to assure ERT members' capability to perform the assigned fire response duties. The monthly training met the OSHA minimum quarterly training requirement. The inspectors did not identify any deficiencies associated with the training of ERT members in the area for fire suppression response. The training provided would assure capability of ERT members to respond to fires beyond an incipient stage of fire development.

Off Site Fire Fighting Support

As stated in the Emergency Plan, fire fighting support has been established between GE-Wilmington and offsite fire departments. The licensee indicated that an initial response to a request for offsite assistance would automatically result in the response by four offsite fire departments (e.g., Castlehayne, Wrightburough, Ogden, and Winterpark). The licensee indicated that the ap oximate response time for an offsite fire department response was 10 minutes. Offsite fire department response was effectively exercised during an actual fire event on March 16, 1998.

c. Conclusions

The licensee had established an effective program for assuring training of the site ERT members. The ERT member training was commensurate with expected duties and functions for incipient fire fighting. Offsite fire fighting support had been adequately established with surrounding municipal fire departments.

5. Event Investigation (Fire)

a. Scope

The inspectors reviewed the licensee's response to the March 16, 1998, fire event, to ensure adequate actions had been taken.

b. Observations and Findings

On March 16, 1998, a fire occurred at the GE facility in a dumpster located at the north wall of FMOX at the Uranium Recovery Unit. Roofing work had been on-going since the beginning of 1998, and the dumpster was being used by the roofing work contractor for the disposal of removed roofing material. On the date of the fire event, the roofing work was completed at approximately 4:30 p.m., and the fire was first identified at approximately 7:30 p.m.

The inspectors reviewed the licensee's response to this fire event, including the pre-plan of the roofing work, response to the event, and post-event investigation. Procedure and Practice (P&P) 40-12, "Incident Classification and Investigation," was also reviewed.

Based on a discussion with the facility engineer, it appeared that safety issues associated with the roofing work were considered prior to the work, such as access to the roof, locations of the chute, etc. However, there was no documentation of these discussions and safety decisions. The inspectors noted a lot of non-routine work, such as construction and roofing, onsite. A formal safety evaluation for such work would minimize potential safety issues.

The inspectors reviewed the event time line and determined that the licensee's response appeared appropriate. The offsite fire departments were requested because a special fire suppression agent (foam) was needed to fight the dumpster fire. Before the offsite fire departments arrived, a stream of water had been applied between the fire and the building to protect the structure. The licensee's conservative classification of this event as an "alert" was considered appropriate in accordance with its implementing procedure. Weaknesses identified from post-event critique had been appropriately addressed, and corrective actions had been planned.

The Fire Chief and the facility engineer conducted the post-event investigation and prepared the Unusual Incident Report in accordance with P&P 40-12. Mopheads and cigarettes were considered as two potential ignition sources. The asphalt was heated to approximately 500°F in a boiler on the ground, and it was pumped to a portable constrainer on the roof. The hot asphalt was then spread on the roof using mops for the removal of roofing materials. Prior to the event, the practice was to cool the mopheads in metal buckets until they could be handled and then put them into the dumpster. The concern was that the inside of the heads may have still been hot, even when the outside was cool enough to be handled. The licensee's investigation showed that the source of the fire was far away from these mopheads and concluded that the mopheads were not the cause of the fire. The other possible ignition source was cigarettes; however, no cigarette butt was found in the dumpster to make a conclusive determination.

Although no conclusive cause for the fire was determined, corrective and preventive actions were identified to minimize any future fires from these two potential causes. All corrective actions had been completed at the time of the inspection. The inspectors determined these corrective actions were adequate and the implementation was appropriate.

c. Conclusions

The inspectors reviewed the licensee's response to the March 16, 1998, fire event and determined the responses appropriate.

6. Exit Meeting Summary

The inspectors met with GE management representatives throughout the inspection. The inspectors presented the inspection findings to members of the licensee staff during the exit meeting on April 24, 1998. No classified or proprietary information was discussed. At the exit meeting, GE management and staff acknowledged the findings identified, and committed to take appropriate actions as discussed above.

PARTIAL LIST OF DOCUMENTS REVIEWED

ERT Training Schedule, 4/98

ERT Monthly Training Attendance Record, 1997

E-Mail from Smith to Godwin, dated 3/19/98, Subject: ERT Training Attendance Attachment: ERT Monthly Training Attendance Record, 1998

- Training Outline - 2/98 (Site Bulk Chemical Storage)

- Training Outline - 1/98 (HAZMAT PPE and Decon)

- Training Outline - 12/97 (Automatic Sprinkler Protection)

- Training Outline - 11/97 (SCBA/Search and Rescue)

- Training Outline - 10/97 (Fire Attack)

- Training Outline - 9/97 (Portable Extinguishers)

- Training Outline - 8/97 (Pump Operations)

- Training Outline - 7/97 (Hose Streams)

GE-Wilmington Fire System Checks - weekly/monthly

Safety, Health and Fire Protection Manual (No.111, Rev.5), Issue Date 7/94

Safety, Health and Fire Protection Manual (No. 112, Rev. 4), Issue Date 7/94

Safety, Health and Fire Protection Manual (No. 503, Rev. 8), Issue Date 7/94

American Nuclear Insurers Reports, dated 11/6/97, 9/4/97, and 3/21/97

Factory Mutual Engineering, dated 9/28/95, 2/9/95, 3/29/94, 2/4/93

Factory Mutual 1990 Fire Protection System Flow Test, (9/90)

Main Drain Flow Test Data, 4/23/98

Preventive Maintenance and Tracking Repetitive Work Orders for Emergency Alarm System, Fire Pumps, and Sprinkler System

Safety, Health and Fire Protection Manual Procedure Number 503, "Cutting and Welding Permits," Rev. 8

P&P 40-12, "Incident Classification and Investigation," Rev. 10, dated 10/11/96

Safety, Health and Fire Protection Manual Procedure Number 112, "Plant Safety Rules," Rev. 4, dated 7/94

Unusual Incident Report for 3/16/98 (Fire Event)

INSPECTION PROCEDURE USED

IP 88055 Fire Protection

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

70-1113/98-202-01	NCV	Not adequately following the procedure for performing cutting and welding.
70-1113/98-202-02	IFI	The inspection, testing, and maintenance of water- based fire suppression systems was not consistent with the industry standards.

PARTIAL LIST OF PERSONS CONTACTED

Facility Engineer
Sr. Facility Engineer
Sr. Licensing Specialist
Emergency Response Coordinator/Fire Chief
Fire Safety
Team Leader
Manager, SS&EP
Manager, GENE Manufacturing
Program Manager, RSE
Manager, Facility Licensing
Shift Technical Resource
Facilities
Acting Manager, PPL
Ceramic Team Leader
Maintenance Shift Coordinator
Manager, Fabrication Product Line
EMT Training Captain
Leader, FMO Maintenance
Manager, Site Environment, Health, & Safety
Acting Manager, Facility Licensing
Team Leader
DCP Technical Resources

* Denotes exit meeting attendees.

LIST OF ACRONYMS USED

DCP	Dry Conversion Process	
FMO	Fuel Manufacturing Operation	
FMOX	Fuel Manufacturing Operation Expansion	
ERT	Emergency Response Team	
gpm	Gallons per Minute	
IFI	Inspector Followup Items	
ITM	Inspection, Testing, and Maintenance	
NCV	Non-Cited Violation	
NFPA	National Fire Protection Association	
P&P	Procedure & Practice	
psi	Pounds per Square Inch	
sa. ft.	Square Feet	