APPENDIX 13A

SAFETY RELATED TEST ABSTRACTS

(Issued with Amendment 20 - May 26, 1971)

Note: The numbers contained in the following tests abstracts are approximations and are subject to change due to engineering and design modifications.

UNIT 1
SAFETY RELATED TEST ABSTRACTS

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(201-5)

ABSTRACT OF

CORE FLOODING SYSTEM FLOW TEST

METROPOLITAN EDISON COMPANY
THREE MILE ISLAND UNIT 1

1. Purpose

   1.1 Demonstrate CF system discharge capability.

2. Prerequisites

   2.1 CF System operational.

   2.2 CF tank filled to approximately 11.5 ft. level with demineralized water.

   2.3 Reactor Coolant System cleaned, reactor vessel head removed.

   2.4 Fuel transfer canal clean, seal plates installed and leak tested.

3. Test Method

   3.1 Pressurize CF tank to approximately 100 psig with nitrogen.

   3.2 Open tank stop valve, allowing tank contents to discharge into reactor vessel.

   3.3 Repeat for the other core flooding tank.

4. Data Required (For Each Tank)

   4.1 CF tank pressure.

   4.2 CF tank level.

5. Acceptance Criteria

   5.1 Unobstructed flow of water and no foreign material from the CF tanks to the reactor vessel.

ABSTRACT OF

REACTOR BUILDING EMERGENCY COOLING WATER SYSTEM
FUNCTIONAL TEST

METROPOLITAN EDISON COMPANY
THREE MILE ISLAND UNIT 1

1. Purpose

1.1 Verify that the Reactor Building Emergency Cooling Water System delivers river water to each cooler at the proper flow and required pressure.

2. Prerequisites

2.1 The Reactor Building Emergency Cooling Water System shall be operable.

3. Test Method

3.1 Operate pumps as required to verify performance.

4. Data Required

4.1 Water discharge pressure and flow from the reactor building.

4.2 Valve operation.

5. Acceptance Criteria

5.1 Water Pressure and Flow meet or exceed the minimum design requirements.

5.2 Valves operate as required.

ABSTRACT OF

REACTOR BUILDING PURGE SYSTEM FUNCTIONAL TEST

METROPOLITAN EDISON COMPANY
THREE MILE ISLAND UNIT I

1. Purpose

   1.1 Verify the isolation capability of the Reactor Building Purge System.

2. Prerequisites

   2.1 Reactor building purge isolation valves operable.

3. Test Method

   3.1 Open valves in purge line.

   3.2 Start purge fan.

   3.3 Simulate signal to isolate purge system.

4. Data Required

   4.1 Valve positions and closure times.

5. Acceptance Criteria

   5.1 Interior and exterior valves must close within predetermined time.

ABSTRACT OF

DECAY HEAT REMOVAL SYSTEM FUNCTIONAL TEST

METROPOLITAN EDISON COMPANY
THREE MILE ISLAND UNIT 1

1. Purpose

 1.1 Functionally check the operation of the decay heat pumps.

 1.2 Validate portions of Decay Heat Removal System operating procedure.

 1.3 Test the operability of the decay heat system in the following modes of operation:

Operating Mode
Initial Pump Operation
DH Removal During RC System Cooldown
DH Removal During RC Component Repair
DH Removal During Refueling

2. Prerequisites

 2.1 Demineralized Water System operable.

 2.2 Cooling water available to DH coolers and motors.

 2.3 RC system clean.

 2.4 Communication between the Control Room and system components available.

 2.5 System erection complete, including recirculation line to BWST.

 2.6 Initial system flush complete, certified clean.

 2.7 System relief valves set.

 2.8 System filled and vented.

3. Test Method

   3.1 The Decay Heat System functional test procedure is broken down into a series of tests. Each of these tests list additional required prerequisites for that test. Each test can be performed when its prerequisites are satisfied and the test sequence need not be as listed. In all tests refer to the operating procedure and valve lineup for this testing.

4. Data Required

   4.1 Verify flow in each mode of operation.

   4.2 Verify pump head/flow curve.

   4.3 Verify system interlocks.

5. Acceptance Criteria

   5.1 Adequate flow is obtained in each of the above modes when system is lined up as per system operating procedure.

   5.2 System interlocks perform properly.

   5.3 Pump performance is in accordance with a point on pump head curve.

ABSTRACT OF

REACTOR BUILDING SPRAY SYSTEM FUNCTIONAL TEST

METROPOLITAN EDISON COMPANY
THREE MILE ISLAND UNIT 1

1. Purpose

    1.1 Check the delivery capability of each spray pump by recirculation to the borated water storage tank.

    1.2 Verify that the nozzle flow paths are open.

2. Prerequisites

    2.1 The Reactor Building Spray System filled with water to the ES valves.

    2.2 All required instrumentation associated with the system is operable or operating.

3. Test Method

    3.1 System will be operated in recirculation mode to verify component operation.

    3.2 Air or smoke will be forced through each spray header.

4. Data Required

    4.1 Spray pump flow and pressure.

    4.2 Observation to verify nozzle flow paths are open.

5. Acceptance Criteria

    5.1 Pump performance is in accordance with one point on the pump head curve.

    5.2 Spray nozzle flow paths are open.

ABSTRACT OF

CONTROL ROD DRIVE SYSTEM
INTEGRATED SYSTEM TEST

METROPOLITAN EDISON COMPANY
THREE MILE ISLAND UNIT 1

1. Purpose

1.1 The purpose of this test is to check the proper function of all circuits and components which receive input signals from the controls at the operator panel. This includes the CRD power supply trip breakers, the power supply programmer motors, the transfer relays, clamping contractors, and the (relative) PI reset pulser.

2. Prerequisites

2.1 Water must be supplied to CRD stator cooling jackets.

2.2 There shall be no fuel in the reactor core.

2.3 CRD stator temperature indication must be available.

2.4 Each CRD must be filled and vented.

2.5 All CRD system equipment installed and connected.

2.6 All PI boards and electronic modules must be calibrated according to their associated operating manual.

3. Test Method

3.1 Check system logic cabinets for proper power supply outputs and all control circuits energized.

3.2 Set up initial conditions at the operator panel.

3.3 Checkout of lamp circuits.

3.4 PI panel lamp tests.

3.5 Check transformers, regulating power supplies and transfer cabinets for proper operation.

3.6 Operator panel checkout.

3.7 Power supply checkout.

3.8 Integrated System Checkout.

4. Data Required

4.1 As required for the specific steps of test method.

5. Acceptance Criteria

5.1 System operates satisfactorily in all modes of control.

ABSTRACT OF

INITIAL ISOLATION VALVE LEAK TEST

METROPOLITAN EDISON COMPANY
THREE MILE ISLAND UNIT I

1. Purpose

   1.1 Determine the leakage rate of every reactor building isolation valve prior to the initial preoperational integrated leakage rate test.

2. Prerequisites

   2.1 The systems in which the valves are being checked must be in the proper alignment for testing.

   2.2 The Penetration Pressurization and Fluid Block systems are inoperable.

3. Test Method

   3.1 Pressurize the valves to approximately 55 psig and determine the leakage rate.

4. Data Required

   4.1 Record the leakage rate.

5. Acceptance Criteria

   5.1 The leakage rate for all isolation valves must not exceed the defined limit.

ABSTRACT OF

REACTOR BUILDING PROOF PRESSURE TEST

METROPOLITAN EDISON COMPANY
THREE MILE ISLAND UNIT I

1. Purpose

    1.1 Verify the structural integrity of the reactor building at 115 percent and of design pressure for one hour.

2. Prerequisites

    2.1 Completion of reactor building penetration leak tests.

    2.2 Verification of the leak tightness of the containment isolation valves.

    2.3 All test instrumentation and equipment installed and operable.

    2.4 Reactor building ventilation system operating to control the inside air temperature prior to and during the testing period.

    2.5 Containment complete.

    2.6 RC system vented to the reactor building.

3. Test Method

    3.1 The reactor building will be pressurized in steps up to a maximum of 115 percent of design pressure. At selected pressure levels, data will be recorded and inspections will be made to verify the structural integrity. After remaining at 115 percent of design pressure for approximately one hour, depressurization will begin. Data will be recorded at selected pressure levels during depressurization. During the test, visually inspect Reactor Building, hatches, penetrations, and gaskets.

4. Data Required

    4.1 Record displacement and strain measurements at selected pressure levels.

    4.2 Record temperature and pressure of reactor building atmosphere.

5. Acceptance Criteria

    5.1 Structure is capable of withstanding internal pressure of 1.15 times the design pressure without exceeding its intended design displacements and strains.

ABSTRACT OF

INITIAL REACTOR BUILDING INTEGRATED
LEAK RATE TEST

METROPOLITAN EDISON COMPANY
THREE MILE ISLAND UNIT I

1. Purpose

1.1 Verify the integrated leakage rate does not exceed the design basis accident leakage rate, which is 0.2 percent by weight of the contained atmosphere in 24 hours.

1.2 Establish a leakage rate (L_{LT}) at reduced pressure (P_T) that will be used during subsequent integrated leakage rate tests as the criteria for test frequency.

1.3 Establish the leakage characteristics of the containment system.

2. Prerequisites

2.1 All containment penetrations, access hatches, fuel transfer tubes, and containment isolation valve leak tested and repaired if necessary.

2.2 Reactor building ventilation system operable for temperature control.

2.3 The Penetration Pressurization and Fluid Block systems inoperable.

2.4 All test instrumentation and equipment installed and operable.

3. Test Method

3.1 The leakage rate will be determined by measuring the leakage from the Reactor Building over a period of at least 24 hours after the building temperature and pressure have established.

The first phase of this test will be performed with the Reactor Building pressurized with air at the design accident pressure (50.6 psig). A second phase of this initial test will be performed at a pressure of 30 psig.

The Absolute Pressure-Temperature Method of measuring leakage from the Reactor Building will be employed during both of the above leakage rate tests.

Verification of the leakage rate will be obtained by measuring leakage from the Reactor Building while a known leakage rate is superimposed on the normal building leakage rate. The difference between the total leakage and the superimposed known leakage results in the actual leakage rate. This leakage rate (difference) is compared with the original leakage rate as a check against its accuracy.

4. Data Required

    4.1 Record the following:

    Reactor Building Temperature
    Reactor Building Pressure
    Reactor Building Humidity
    Atmospheric Pressure
    Atmospheric Temperature
    Known Leakage Flow Rate
    Time

5. Acceptance Criteria

    5.1 The governing criteria is that the maximum allowable leakage rate, Lp, does not exceed 0.2 percent by weight of contained atmosphere in 24 hours at design basis accident pressure (P_p = 50.6 psig) and test temperature range.

    5.2 The maximum allowable initial test leakage rate ($L_{T½}$) at reduced pressure, P_T (30 psig) does not exceed 0.2. (P_T/P_P).

    5.3 The operational leakage rate L_{TO} which must be met before achieving initial criticality must not exceed 0.75 L_T.

ABSTRACT OF

PROCESS RADIATION MONITORING SYSTEM CALIBRATION
AND FUNCTIONAL TEST

METROPOLITAN EDISON COMPANY
THREE MILE ISLAND UNIT I

1. Purpose

    1.1 Adjust the system fluid flows, alarms, interlock functions, and tape speeds.

    1.2 Calibrate the system to manufacturers' radioactivity calibration data.

2. Prerequisites

    2.1 Liquid and Air Radiation Monitoring System is operable.

3. Test Method

    3.1 Calibration of Detectors - using radioactive sources, calibrate output to manufacturers' radioactivity calibration data.

    3.2 Adjust alarms, interlocks, and recorders.

    3.3 Adjust sampling parameters including fluid flow rates and tape speeds.

4. Data Required

    4.1 Output from each channel for radioactive sources and installed operational check sources.

    4.2 Alarm and interlock settings.

    4.3 Fluid flow rates and tape speeds.

5. Acceptance Criteria

    5.1 Outputs in agreement with calibration data.

    5.2 Proper sampling, alarms and interlocks operate as designed.

ABSTRACT OF

AREA RADIATION MONITORING SYSTEM CALIBRATION
AND FUNCTIONAL TEST

METROPOLITAN EDISON COMPANY
THREE MILE ISLAND UNIT I

1. Purpose

    1.1 Adjust the system alarms and verify manufacturers initial calibration.

2. Prerequisites

    2.1 Area Radiation Monitoring System is operable.

3. Test Method

    3.1 Using a radiation source, calibrate detectors.

    3.2 Adjust alarms, and recorders.

4. Data Required

    4.1 Output from each channel for radiation source.

    4.2 Alarm settings.

5. Acceptance Criteria

    5.1 Outputs in agreement with source radiation levels.

    5.2 Proper alarm operation.

ABSTRACT OF

REACTOR INTERNALS VENT VALVE INSPECTION TEST

METROPOLITAN EDISON COMPANY
THREE MILE ISLAND UNIT I

1. Purpose

   1.1 Demonstrate exercising of internals vent valves.

2. Prerequisites

   2.1 The reactor vessel closure head and the internals upper plenum will be removed.

   2.2 The internals vent valves are installed in the core support shield.

3. Test Method

   3.1 For the exercise test each valve disc will be cycled using the normal exercise tool.

4. Data Required

   4.1 For the exercise test the forces required to move the valve off its seat and to hold the disc wide open.

5. Acceptance Criteria

   5.1 The force required to move each valve off its seat is 120 lbs. or less.

   5.2 The force to hold each valve wide open is 540 lbs. or less.

ABSTRACT OF

SOLUBLE POISON CONTROL TEST

METROPOLITAN EDISON COMPANY
THREE MILE ISLAND UNIT I

1. Purpose

   1.1 Test the equipment used to change the boron concentration in the reactor coolant system.

2. Prerequisites

   2.1 Reactor coolant system and makeup system in operation.

   2.2 Boric acid mix tank, bleed holdup tanks and deborating demineralizers operable.

3. Test Method

   3.1 Increase and decrease the boron concentration in the Reactor Coolant system or Makeup Purification system using the boron control equipment.

4. Data Required

   4.1 Boron concentration as required.

5. Acceptance Criteria

   5.1 Boron concentration in the RC system can be controlled.

ABSTRACT OF

MAKEUP SYSTEM ENGINEERED SAFEGUARD TEST

METROPOLITAN EDISON COMPANY
THREE MILE ISLAND UNIT I

1. Purpose

1.1 Demonstrate emergency MU injection flow to the RC system for each MU pump.

1.2 Verify the operating times of Makeup and Purification System engineered safeguards-related equipment are within FSAR limits.

2. Prerequisites

2.1 Core not installed in reactor vessel.

2.2 RCS temperature (T-AVE): >DTT ≤150F
MU system temperature; within same band as RCS
BWST Temperature: within same band as RCS

2.3 RC pumps stopped.

2.4 RC system pressure (approximately 500 psig) maintained by nitrogen in pressurizer.

2.5 Pressurizer level approximately 190 inches and heaters deenergized.

2.6 Power operated relief valve operable.

2.7 The BWST filled to a minimum of 12 feet with demineralized water at >DTT (RCS) ≤150F.

2.8 Cooling water flow to seal return coolers.

2.9 RC pump seal injection paths valved out.

2.I0 MU tank filled to a minimum of 75 inches with a pressure of 20 psig by nitrogen overpressure. Close N_2 valve to MU tank to prevent further addition of nitrogen during test.

2.11 Letdown secured.

2.12 Normal makeup secured.

2.13 Two MU pump controllers secured for each test.

3. Test Method

    3.1 Each MU pump will be started individually on an ES signal. The normal ES lineup will be used, i.e.:

    MU-P1A to Loop A
    MU-P1B to Loop A
    MU-P1C to Loop B

4. Data Required

    4.1 Makeup Injection Flow
    RC Pressure
    RC Temperature
    Pressurizer Temperature
    Pressurizer Water Level
    BWST Temperature
    BWST Level
    MU Tank Level
    Emergency Injection Valve Opening Times

5. Acceptance Criteria

    5.1 Mu flow to the RC system ^{3}500 gpm at 600 psig RC system pressure.

    5.2 Emergency injection valves open in less than ten seconds from receipt of ES actuation signal.

    5.3 No abnormal conditions detected in MU pumps and ES valves during test.

ABSTRACT OF

REACTOR COOLANT SYSTEM HOT LEAKAGE TEST

METROPOLITAN EDISON COMPANY
THREE MILE ISLAND UNIT I

1. Purpose

 1.1 Demonstrate that reactor coolant leakage, at hot pressurized system conditions, is within the limits set in the Technical Specifications.

2. Prerequisites

 2.1 Hydrostatic tests of systems which form the reactor coolant boundary are complete.

 2.2 The high pressure injection system and the reactor coolant system are operating as a closed system.

 2.3 Concurrent with hot functional testing.

3. Test Method

 3.1 Calculate reactor coolant inventory change by measuring changes in pressurizer and/or makeup tank levels during a specified time interval, with correction for reactor coolant temperature change.

4. Data Required

 4.1 Record reactor coolant system average temperature, pressurizer level, and makeup tank level at the beginning and end of the time interval.

5. Acceptance Criteria

 5.1 Reactor coolant leakage does not exceed limits set by the Technical Specifications.

ABSTRACT OF

CONTROL ROD DRIVE TRIP TEST

METROPOLITAN EDISON COMPANY
THREE MILE ISLAND UNIT I

1. Purpose

1.1 Measure CRD trip time from fully withdrawn to 3/4 inserted and to verify CRD reaches fully inserted position.

2. Prerequisities

2.1 Reactor at hot shutdown condition.

2.2 CRD system ready for operation.

3. Test Method

General: For each trip time test the Reactor Trip pushbutton will be used to deenergize the trip breakers undervoltage trip coil. The recorder will be connected to terminals in the cabinet for the trip coil a-c voltage as a common reference point for all rod trip initiations.

3.1 Withdraw each control rod group to upper limit and trip.

4/5. Data Required/Acceptance Criteria

4/5.1 Record reactor coolant temperature, pressure, flow, number of reactor coolant pumps running and trip time for each control rod drive.

4/5.2 Verify rods bottom by full-in light CN and by absolute position indication after each rod is tripped.

4/5.3 Trip times do not exceed the values in the Technical Specifications.

ABSTRACT OF

CONTROL ROD DRIVE SYSTEM
OPERATIONAL TEST

METROPOLITAN EDISON COMPANY
THREE MILE ISLAND UNIT I

1. Purpose

   1.1 Define tests to be conducted during hot functional testing to assure proper CRD operation under actual thermal operating conditions.

2. Prerequisites

   2.1 Concurrent with hot functional testing.

   2.2 Cooling water must be supplied to the control rod drives prior to energizing any CRD motor stator.

3. Test Method

   3.1 Each control rod drive will be trip tested at RC system operating temperature, pressure and full flow.

   3.2 Cycle each control rod drive periodically to assure there is no binding or obstruction of travel.

   3.3 CRD operating procedure will be used to exercise the drives.

4. Data Required

   4.1 As required by the specific steps of the test method.

5. Acceptance Criteria

   5.1 Trip time must be consistent with previous tests.

ABSTRACT OF

REACTOR PROTECTION SYSTEM
FUNCTIONAL TEST

METROPOLITAN EDISON COMPANY
THREE MILE ISLAND UNIT I

1. Purpose

   1.1 The purpose of this test is to verify that each of the four RPS Channels respond to their respective inputs from the nuclear and non-nuclear instrumentation and to assure that, for any combination of two out of four channel trips, the appropriate breakers will open with the CRD system.

2. Prerequisites

   2.1 Fuel is not loaded in the Reactor Vessel.

   2.2 Reactor Coolant Pump Monitors are ready for operational testing.

3. Test Method

   3.1 Very each trip parameter to determine satisfactory operation of each subassembly and module.

   3.2 Logic relays and output circuitry checkout.

   3.3 Channel trip bypass check.

4. Data Required

   4.1 Record trip value for each parameter.

   4.2 Record proper operation of the associated breaker during test 3.2 and 3.3.

5. Acceptance Criteria

   5.1 That each RPS subassembly and module performs satisfactorily according to its inputs and that the appropriate circuit breaker in the CRD system opens on reactor trip signals.

ABSTRACT OF

DECAY HEAT REMOVAL SYSTEM ENGINEERED SAFEGUARD TEST

METROPOLITAN EDISON COMPANY
THREE MILE ISLAND UNIT I

1. Purpose

   1.1 Demonstrate emergency injection flow capability to the Reactor Coolant System from the Decay Heat System.

   1.2 Verify that the operating times of Decay Heat Removal System engineered safeguards-related equipment are within FSAR limits.

2. Prerequisites

   2.1 Core not installed in reactor vessel, but reactor vessel internals may be installed. Vessel closure head installed.

   2.2 RC Pumps not running and RC system pressure approximately 50 psig with nitrogen in pressurizer.

   2.3 Pressurizer level approximately 90 inches and heaters deenergized.

3. Test Method

   3.1 Open motor control breakers for ES pumps and valves not under test (all systems) except those required for normal operation.

   3.2 Establish RC system initial conditions.

   3.3 Line up pump to inject into the RV.

   3.4 Start recording devices for monitoring system.

   3.5 Simulate an ES signal to the DH system.

   3.6 Repeat for second pump.

4. Data Required

   4.1 Flow from DH Pump
   RC System Pressure
   Pressurizer Level
   BWST Level
   BWST Valve V5A & V5B Cycle Time
   DH ES Valve V4A & V4B Cycle Time

5. Acceptance Criteria

5.1 DH system ES components function properly.

5.2 DH flow ≥3000 gpm to the RV with 100 psig pressure in the RC system.

5.3 Operating times of Decay Heat Removal System and engineered safeguard related equipment are within the values given in Section 6 of the FSAR.

ABSTRACT OF

INTEGRATED ENGINEERED SAFEGUARDS ACTUATION TEST

METROPOLITAN EDISON COMPANY
THREE MILE ISLAND UNIT I

1. Purpose

   1.1 Demonstrate the full operational sequence of the Engineered Safeguards Actuation System.

   1.2 Demonstrate the transfer to alternate power sources.

2. Prerequisites

   2.1 All systems actuated by the Engineered Safeguards System should have their individual functional tests completed.

   Emergency Core Cooling System
   Reactor Building Spray System
   Reactor Building Emergency Cooling and Isolation System

3. Test Method

   3.1 Actuate Engineered Safeguard channels on the normal Engineered Safeguards power sources.

   3.2 Actuate Engineered Safeguard channels with simultaneous simulated failure of normal Engineered Safeguard power sources.

4. Data Required

   4.1 Initial and final status for each Engineered Safeguards component during operation with normal power and with emergency power.

5. Acceptance Criteria

   5.1 The Engineered Safeguards System and Electrical Power Systems responds as described in Section 6 of the FSAR.

ABSTRACT OF

ZERO POWER TEST

METROPOLITAN EDISON COMPANY
THREE MILE ISLAND UNIT I

1. Purpose

1.1 The purpose of this test is to define the tests to be executed beginning with initial criticality and ending with power escalation above zero percent FP. In particular, the zero power reactor physics experimental program is sequenced to assure that appropriate design physics parameters are verified.

2. Prerequisites

2.1 The overpower trip set point is set per page 3-36 of Tech Specs.

2.2 The reactor coolant system boron concentration is greater than or equal to 1800 PPM boron.

2.3 Reactor building containment integrity is established.

2.4 All reactor areas and systems are ready for criticality.

2.5 All precritical checks are completed.

2.6 Reactor Coolant temperature at 532 ±2°F, pressure 2155 ±25 psig.

3. Test Method

3.1 Differential CRA group worths for groups 5, 6, 7 and 8 as functions of group positions.

3.2 Differential boron worths as functions of boron concentration.

3.3 All rods out boron concentration data.

3.4 Temperature coefficients of reactivity as a function of CRA group position.

3.5 Ejected CRA worth for the most worthy control rod.

3.6 Total CRA worth

3.7 Stuck rod margin shutdown capability for the worst case control rod.

4. Data Required

   4.1 Boron Concentration.

   4.2 Source Range Neutron Level.

   4.3 Relative Control Rod Positions.

   4.4 NI Intermediate Range Level.

   4.5 Reactivity.

   4.6 Pressurizer Level.

   4.7 RC Pressure.

   4.8 RC Temperature Average.

5. Acceptance Criteria

   5.1 The moderator temperature coefficient will not be greater than specified in Technical Specifications.

   5.2 The hot shutdown margin is not less than 1 percent delta-K/K with the highest worth CRA fully withdrawn.

   5.3 The worth of a single inserted regulating CRA will be greater than specified in Technical Specifications.

ABSTRACT OF

ROD REACTIVITY WORTH MEASUREMENT

METROPOLITAN EDISON COMPANY
THREE MILE ISLAND UNIT I

1. Purpose

   1.1 Define the method for determination of differential CRA(s) reactivity worth during zero power and power operation.

2. Prerequisites

   2.1 The reactor is critical.

3. Test Method

   3.1 Predetermined CRA(s) differential reactivity worth measurement during power operation.

4. Data Required

   4.1 Boron Concentration.

   4.2 Relative CRA Position.

   4.3 Reactivity.

   4.4 NI Power Range Readouts.

   4.5 NI Intermediate Range Readouts.

   4.6 RC Pressure.

   4.7 RC Temperature.

5. Acceptance Criteria

   5.1 Measured rod worths compare favorably with predict rod worths.

ABSTRACT OF

REACTOR COOLANT PUMP FLOW TEST

METROPOLITAN EDISON COMPANY
THREE MILE ISLAND UNIT I

1. Purpose

1.1 Determine the functional capabilities of the Reactor Coolant System and the reactor coolant pumps for the following test conditions.

a. HF - hot flow test prior to installing core.

b. HFC - hot flow test after installing core.

1.2 Determine the reactor coolant flow for appropriate pump combinations for the conditions above and compare the measured flows for each test with the predicted flow.

2. Prerequisites

2.1 Reactor Coolant Pump Initial Operation Test.

2.2 Reactor Coolant System Hydrostatic Test.

2.3 Unit Heatup Test.

2.4 Intermediate Cooling System operable.

2.5 Makeup and Purification System operable.

2.6 Supply of demineralized water available to makeup storage tank.

2.7 Nuclear Services Closed Cycle Cooling Water System operable.

3. Test Method

3.1 Predetermined pump combinations will be used to obtain data and verify the predicted parameters. Operating procedures will be used when applicable.

4. Data Required

4.1

Item	Parameter
1	RC Flow Loop A (Forward or Reverse)
2	RC Flow Loop B (Forward or Reverse)
3	RC Pump 1A/A RPM

4	RC Pump 1B/A RPM
5	RC Pump 1A/B RPM
6	RC Pump 1B/B RPM
7	RC Temperature T_c
8	RC Pressure

5. Acceptance Criteria

5.1 Flow must exceed acceptable values.

ABSTRACT OF

REACTOR COOLANT FLOW COASTDOWN TEST

METROPOLITAN EDISON COMPANY
THREE MILE ISLAND UNIT I

1. Purpose

1.1 Determine flow decay versus time for various (worst case) reactor coolant pump trip combinations.

1.2 Compare flow coastdown with minimum design flow coastdown to meet DNB limits on loss of flow.

2. Prerequisites

2 1 Reactor Coolant Flow Test.

2.2 Nuclear Services Cooling Water System operable.

2.3 Intermediate Cooling System operable.

2.4 Makeup and Purification System (sealwater) operable.

2.5 Reactor Coolant System temperature and pressure maintained at approximately 525F and 2155 psig.

2.6 Reactor Coolant System water chemistry maintained within specified limits.

3. Test Method

3.1 Predetermined flow coastdown test cases will define the reactor coolant flow coastdown characteristics for various combinations of pump trips occurring from the allowable RC sytem operation flow conditions. The results of "Reactor Coolant Flow Test" will determine the presence of flow imbalance should it exist, and will also provide the criteria for determining which of the flow coastdown tests may be eliminated due to flow similarities.

4. Data Required

4.1 For each test run, start the appropriate coolant pumps and record the following parameters until consistent readings are obtained (minimum of three readings) indicating that the reactor coolant system is at equilibrium. Trip the appropriate reactor coolant pumps and record the following parameters during coastdown until steady-state conditions are reached.

Item	Parameter
1	RC Flow Loop A (Forward or Reverse)
2	RC Flow Loop B (Forward or Reverse)
3	RC Pump 1A/A RPM
4	RC Pump 1B/A RPM
5	RC Pump 1A/B RPM
6	RC Pump 1B/B RPM
7	RC Temperature T_c
8	RC Pressure

5. Acceptance Criteria

5.1 Core flow during each "worst case" coastdown is equal to or greater than the calculated minimum allowable flow required to prevent DNB.

ABSTRACT OF

UNIT STARTUP AND POWER
ESCALATION TEST

METROPOLITAN EDISON COMPANY
THREE MILE ISLAND UNIT I

1. Purpose

1.1 Startup the nuclear plant from zero power to 100 percent full power commercial operation.

2. Prerequisites

2.1 Individual tests for all nuclear systems and components, including pre-operational calibration of the integrated control system (I) shall be completed.

2.2 Zero power physics tests shall be completed.

3. Test Method

Increase reactor power from zero to 100 percent full power. Perform testing at various power plateaus as sequenced in this procedure.

4. Data Required

As required by individual test procedures.

5. Acceptance Criteria

All individual tests sequenced within have been satisfactorily completed.

ABSTRACT OF

NSS HEAT BALANCE

METROPOLITAN EDISON COMPANY
THREE MILE ISLAND UNIT I

1. Purpose

   1.1 Determine core power by calorimetric methods using plant instrumentation for use in operating the NSS during power tests.

2. Prerequisites

   2.1 Zero power tests completed.

3. Test Method

   At steady-state power levels do the following:

   3.1 Record data required for primary and secondary heat balance.

   3.2 Calculate core power level from primary and secondary heat balance.

   3.3 Perform heat balance calculations at each test power level.

4. Data Required

   4.1 Reactor Power Level (MWt)
   Miscellaneous Energy Losses and Credits
   Electrical Input to Reactor Coolant Pump Motors (KW)
   Loop B (BTU/LB)
   Loop A (BTU/LB)
   Reactor Coolant Flow Loop A (LBS/HR)
   Reactor Coolant Flow Loop B (LBS/HR)
   Feedwater Flows
   Feedwater Temperatures
   Feedwater Pressure
   Steam Pressure
   Steam Temperature
   Letdown Flow
   Letdown Temperature
   Letdown Pressure
   R.C. Temperatures
   R.C. Pressure

5. Acceptance Criteria

   5.1 Core thermal power is determined.

ABSTRACT OF

NUCLEAR INSTRUMENTATION CALIBRATION AT POWER

METROPOLITAN EDISON COMPANY
THREE MILE ISLAND UNIT I

1. <u>Purpose</u>

   1.1 Verify that the power range nuclear instrumentation indicates the power level and axial power imbalance at predetermined power levels.

   1.2 Verify nuclear instrumentation calibration procedure at power.

2. <u>Prerequisites</u>

   2.1 Reactor at power level specified.

3. <u>Test Method</u>

   3.1 Obtain heat balance.

   3.2 Adjust the power range channels to heat balance.

   3.3 Adjust the out-of-core axial power imbalance indication to that detected by the incore monitors after accuracy of incore monitors has been verified.

4. <u>Data Required</u>

   4.1 Power Range Levels
   Power Range Imbalance
   Incore Monitor Readouts
   Heat Balance
   Linear Amplifier Gain and Output Voltages
   Sum Amplifier Output Voltage
   Difference Amplifier Output Voltage
   High Power Level Bistable Trip Point

5. <u>Acceptance Criteria</u>

   5.1 The power range nuclear instrumentation indicates the power level within 2 percent of the heat balance and the axial power imbalance within predetermined limits.

ABSTRACT OF

CORE POWER DISTRIBUTION

METROPOLITAN EDISON COMPANY
THREE MILE ISLAND UNIT I

1. Purpose

1.1 Measure core power distribution at predetermined power levels and control rod configurations.

2. Prerequisites

2.1 Incore monitoring system operable.

2.2 Steady-state reactor power.

3. Test Method

3.1 Obtain the required data at predetermined conditions of reactor power and control rod drive positions.

4. Data Required

4.1 Power Range Levels

Power Range Imbalance

Boron Concentration

CRA Position

Incore Monitoring Readouts

5. Acceptance Criteria

5.1 The DNBR and the maximum linear heat rate are within the limits specified in the Technical Specifications.

ABSTRACT OF

POWER IMBALANCE DETECTOR CORRELATION TEST

METROPOLITAN EDISON COMPANY
THREE MILE ISLAND UNIT I

1. Purpose

   1.1 Determine the relationship between the indicated out-of-core power distribution and the core power distribution.

2. Prerequisites

   2.1 Incore Monitoring system operational.

   2.2 Reactor at predetermined power level.

   2.3 Selected integrated control system stations in automatic.

   2.4 Equilibrium xenon concentration.

3. Test Method

   3.1 Imbalance measurement will be made at prescribed conditions.

   3.2 Where practicable, the Group 7 Control Rods will be moved to create core flux imbalance and measurements will be taken to obtain information regarding the correlation between incore and outcore detectors.

4. Data Required

   4.1 Reactor Coolant loops A&B inlet and outlet temperatures.

   4.2 Power Range channel levels.

   4.3 Reactor Coolant loops A&B pressure.

   4.4 Incore Monitor readouts.

   4.5 Heat balance.

   4.6 Boron concentration.

   4.7 Linear amplifier gain (bottom detector).

   4.8 Linear amplifier gain (top detector).

5. Acceptance Criteria

   5.1 The indicated out-of-core imbalance represents the imbalance as detected by the incore system within allowable limits.

ABSTRACT OF

REACTIVITY COEFFICIENTS AT POWER

METROPOLITAN EDISON COMPANY
THREE MILE ISLAND UNIT I

1. Purpose

1.1 This test specifies the method to determine the power doppler coefficient of reactivity and the moderator coefficient of reactivity at power.

2. Prerequisites

2.1 Establish the following conditions for reactivity coefficients at power:

Stable Reactor Power

Stable Coolant Temperature

Stable Coolant Pressure

2.2 Axial power shaping rod assemblies positioned to maintain power balance.

3. Test Method

3.1 This method requires a known differential rod worth in the operating range of the CRA group. The power doppler coefficient of reactivity is defined as that amount of reactivity feedback resulting from an increase in reactor power of 1 percent (rated power) at a specified reactor power. The average moderator temperature is maintained at a constant value. The moderator coefficient of reactivity is defined as that amount of reactivity feedback resulting from an increase in average reactor coolant temperature of 1 degree F at a specified reactor power. The reactor power is maintained at a constant value.

4. Data Required

4.1 Relative Control Rod Positions

NI Power Range

NI Intermediate Power Range

Reactivity

RC Pressure

RC Temperature (Hot & Cold in each loop)

RC Temperature Average

5. Acceptance Criteria

5.1 The power doppler and moderator coefficients are consistent within limits specified in the FSAR.

ABSTRACT OF

BIOLOGICAL SHIELD SURVEY TEST

METROPOLITAN EDISON COMPANY
THREE MILE ISLAND UNIT I

1. Purpose

   1.1 Measure radiation in accessible locations of the plant outside of biological shields.

   1.2 Obtain base-line radiation levels for comparison with future measurements.

2. Prerequisites

   2.1 Radiation survey instruments are calibrated.

   2.2 Background radiation levels measured in designated locations during zero power physics testing.

3. Test Method

   3.1 Measure gamma and neutron dose rates at predetermined power levels.

4. Data Required

   4.1 Power level, gamma and neutron dose rates at each specified location.

5. Acceptance Criteria

   5.1 Radiation levels are acceptable for plant operation.

ABSTRACT OF

UNIT LOAD STEADY STATE TEST

METROPOLITAN EDISON COMPANY
THREE MILE ISLAND UNIT I

1. Purpose

Measure reactor coolant system (RCS) and steam generator steady state parameters as a function of reactor power.

1.1 Determine turbine steam temperature versus reactor coolant system average temperature.

1.2 Measure reactor coolant system and steam generator parameters with selected reactor coolant pumps operating.

2. Prerequisites

2.1 All necessary systems ready for power operation.

3. Test Method

At selected power levels, measure reactor coolant system performance by:

3.1 Establishing steady state at test power level with

delta-Tc set to zero for proper load sharing between OTSG
T_{ave} constant
Feed flow constant
Megawatt demand constant
Integrated control system in auto, unit load demand in manual

3.2 Measuring power by heat balance

3.3 Predict trend of Nuclear Steam Supply System parameters from all measured steady state data for next selected power level.

3.4 Repeating test at next selected power level.

4. Data Required

4.1 Reactor coolant pressure, temperatures, flows, pressurizer level, and reactor power.

4.2 Steam generator steam temperatures, pressures, levels.

4.3 Turbine header pressure.

4.4 Feedwater temperature, flow, and feed pumps operating.

4.5 Control rod drive positions.

4.6 Generated megawatts.

5. Acceptance Criteria

5.1 Results of measurements at each power level are sufficient to predict performance at the next power level.

5.2 Reactor outlet temperature increases and reactor inlet temperature decreases monotonically with increasing power level.

5.3 Unit parameters do not exceed equipment or limiting safety settings.

ABSTRACT OF

UNIT TRANSIENT TEST

METROPOLITAN EDISON COMPANY
THREE MILE ISLAND UNIT I

1. Purpose

   1.1 Demonstrate plant capability to change power at design ramp rates in turbine following mode, steam generator/reactor following mode, and integrated mode after optimization of the Integrated Control System at 100 percent of rated reactor power.

   1.2 Demonstrate proper Integrated Control System response to starting and stopping one reactor coolant pump.

   1.3 Demonstrate proper Integrated Control System response during a runback resulting from loss of a main feedwater pump.

2. Prerequisites

   Unit operating at power

3. Test Method

   3.1 Perform load reduction and load increase at selected power levels between 15 percent and 100 percent power.

   3.2 Stop and start one reactor coolant.

   3.3 Trip one main feed pump turbine at 76 percent and 100 percent power to initiate a runback.

4. Data Required

   4.1 Reactor power.
   4.2 Reactor coolant system pressure, pressurizer level, flow and temperatures.
   4.3 Steam generator levels, temperature, and pressure.
   4.4 Steam header pressure.
   4.5 Feedwater flow and temperature.

5. Acceptance Criteria

   The Reactor Coolant System will follow step or ramp load changes under automatic control without relief valve or turbine bypass valve action as stated in the FSAR, Section 4.1.

ABSTRACT OF

TURBINE/REACTOR TRIP TEST

METROPOLITAN EDISON COMPANY
THREE MILE ISLAND UNIT I

1. Purpose

This test measures the plant response during and after a deliberate reactor or turbine trip from power. This information will be used in verifying adequate nuclear steam supply system design and in optimizing the control systems performance. Specific purposes are listed below.

1.1 Record data from which the reactor power decay can be calculated.

1.2 Determine response of pressurizer level, reactor coolant pressure, and reactor coolant temperature control during a turbine or reactor/turbine trip.

1.3 Determine response of feedwater control and OSTG level control during a turbine or reactor/turbine trip.

1.4 Determine response of main steam pressure control during a turbine or reactor/turbine trip.

2. Prerequisites

2.1 Four reactor coolant pumps in operation.

2.2 Pressurizer level control in automatic.

2.3 Reactor coolant temperature at 579 ± 2F.

2.5 Integrated control system in automatic.

2.6 Both auxiliary transformers and both diesel engine generators will be operational.

Note: This is to insure back up power supply for seal injection to the reactor coolant pumps during this test.

2.7 Makeup tank at its normal operating conditions.

3. Test Method

This test consists of two distinct parts: A reactor trip with subsequent turbine trip and a turbine trip in which the reactor is not tripped automatically. This test will be performed at predetermined power levels.

3.1 Establish steady state conditions.

3.2 Manually trip the reactor or turbine as required.

3.3 For a reactor or turbine trip follow the applicable procedures except as stipulated in the specific test.

4. Data Required

4.1 MU tank
NI Power Range
NI Intermediate Range Level
R.C. Spray Valve Open
R.C. Pressurizer Level
R.C. Pressure
R.C. Temperatures
R.C. Loop Flows
Reactor Trip Signal
Feedwater Temperature
OTSG Pressure
Main Feed Flow
OTSG Startup Range Level
OTSG Operating Range Level
Turbine Trip Signal

5. Acceptance Criteria

5.1 Acceptance criteria for a turbine trip.

5.1.1 Reactor coolant pressure must remain within the protection system envelope of Figure 15-2 in FSAR.

5.1.2 Main steam pressure at the OTSG outlet must not exceed 1170 psia.

5.1.3 Pressurizer spray actuates at setpoint.

5.1.4 Confirm power actuated relief valve actuates at setpoint.

5.1.5 Reactor power runs back to approximately 15 percent in a predetermined time interval.

5.1.6 Pressurizer operating range level instrumentation indicates less than 100 percent.

5.1.7 Confirm bypass system operates to maintain steam pressure at approximately 900 psia (header pressure).

5.2 Acceptance Criteria for a reactor trip.

5.2.1 RC pressure remains above the actuation pressure for high pressure injection.

5.2.2 Main steam pressure at the OTSG outlet must not exceed 1170 psia.

5.2.3 Confirm the makeup system responds to pressurizer level.

5.2.4 Confirm turbine bypass system setpoint transfers to approximately 985 ± 10 psig.

ABSTRACT OF

GENERATOR TRIP TEST

METROPOLITAN EDISON COMPANY
THREE MILE ISLAND UNIT I

1. Purpose

This test measures the plant response during and after a deliberate generator trip from power. This information will be used in verifying adequate nuclear steam supply system design and in optimizing the control systems performance. Specific purposes are listed below.

1.1 Record data from which the reactor power decay can be calculated.

1.2 Determine response of pressurizer level, reactor coolant pressure, and reactor coolant temperature during a generator trip.

1.3 Determine response of feedwater flow and OTSG level during a generator trip.

1.4 Determine response of main steam pressure during a generator trip.

1.4 Determine turbine response to generator trip.

2. Prerequisites

2.1 Four reactor coolant pumps in operation.

2.2 Pressurizer level control in automatic.

2.3 Reactor coolant pressure control in automatic.

2.4 Reactor coolant temperature at 579 ± 2F.

2.5 Integrated control system in automatic.

2.6 Both auxiliary transformers and both diesel engine generators will be operational.

NOTE: This is to insure backup power supply for seal injection to the reactor coolant pumps during this test.

2.7 Makeup tank at its normal operating condition.

2.8 All normally operating transmission lines are in service.

2.9 Plant at predetermined power level.

3. Test Method

This test will be performed at predetermined power levels.

3.1 Establish steady-state conditions.

3.2 Manually unload the generator by opening the main transformer breakers (GBI-02 and GBI-12).

4. Data Required

4.1

MU Tank Level	Main Breaker Position
NI Power Range	Feedwater Temperature
NI Intermediate Range Level	OTSG Pressure
R.C. Spray Valve Open	Main Feed Flow
R.C. Pressurizer Level	OTSG Operating & SU Range Level
R.C. Pressure	Control Valve Position
R.C. Temperatures	Turbine Bypass Valve Position
R.C. Loop Flows	Turbine Speed (RPM)
	Power - Actuated Relief Valve Actuation

5. Acceptance Criteria

5.1 Acceptance criteria for a generator trip.

5.1.1 Reactor coolant pressure must remain within the protection system envelope of Figure 2.3-1 in Technical Specifications.

5.1.2 Main steam pressure at the OTSG outlet must not exceed 1170 psia.

5.1.3 Pressurizer spray actuates at setpoint.

5.1.4 Confirm power actuated relief valve actuates at setpoint.

5.1.5 Pressurizer operating range level instrumentation indicates less than 100 percent.

5.1.6 Confirm turbine bypass system operates to maintain steam pressure at approximately 900 psia (header pressure).

5.1.7 Turbine does not exceed overspeed limits.

5.1.8 Turbine generator returns to set or lower RPM (102 percent rated speed).

5.1.9 Feed control system maintains proper OTSG level.

ABSTRACT OF

SHUTDOWN FROM OUTSIDE THE CONTROL ROOM

METROPOLITAN EDISON COMPANY
THREE MILE ISLAND UNIT I

1. Purpose

1.1 Demonstrate the ability to remove sensible and decay heat from the reactor coolant system with control of all systems remote from the Control Room.

2. Prerequisites

2.1 The reactor is operating at approximately 15 percent power.

2.2 The generator is at minimum electrical load.

2.3 Observers in the Control Room will not take control on any process unless an emergency exists.

3. Test Method

After leaving the Control Room, the shift foreman and Control Room operators will establish a communications center in the relay room. The following events will be executed:

3.1 Trip the reactor and turbine generator breakers.

3.2 Start the emergency feedwater pumps.

3.3 Trip the main feedwater pumps.

3.4 Trip the reactor coolant pumps and evacuate the Control Room.

3.5 Control reactor coolant temperature by varying the amount of steam flow through the atmospheric steam dump valves MS-V-4A and MS-V-4B.

3.6 Contol steam generator level by varying feed flow through control of EF-V-30A and EF-V-30B.

3.7 Control reactor coolant water inventory by operation of a make-up pump through MU-V-17. The source of H_3BO_3 to the make-up tank can be the boric acid mix tank or the reclaimed boric acid tank through a bleed tank. Water for R.C. system contraction is available in the reactor coolant Bleed Tanks.

3.8 Reduce Coolant Temperature to 500F.

4. Data Required

4.1 Reactor Coolant system temperature and pressure.

4.2 Pressurizer level.

4.3 Steam pressure.

4.4 Steam generator level.

4.5 Make-up tank level.

5. Acceptance Criteria

5.1 Reactor coolant system temperature can be safely controlled from locations outside the Control Room.

ABSTRACT OF

EFFLUENT MONITORING SYSTEM TEST

METROPOLITAN EDISON COMPANY
THREE MILE ISLAND UNIT I

1. Purpose

   1.1 To compare the actual radioactive gas and liquid effluent monitor response with the predicted response during periods of radioactive effluent releases.

2. Prerequisites

   2.1 Liquid and gas radiation effluent monitors are operable, calibrated, and have been functionally tested.

   2.2 Quantities of radioactive liquid and gaseous waste with activities in excess of monitor sensitivity have accumulated and are to be released using normal procedures.

3. Test Method

   3.1 Based on gaseous or liquid waste activities and predicted effluent monitor response cures, estimate the expected effluent monitor response during release of radioactive waste gas or liquid.

   3.2 Release the radioactive liquid or gas to the environment using normal operating procedures.

   3.3 Compare the predicted effluent monitor response to the actual monitor response during the radioactive gas or liquid release.

4. Data Required

   4.1 Predicted gas and liquid radiation effluent monitor response.

   4.2 Actual gas and liquid radiation effluent monitor response during release.

5. Acceptance Criteria

   5.1 Effluent monitor response values measured during liquid and gas release approximate the predicted value.

ABSTRACT OF

LOSS OF OFF-SITE POWER TEST

METROPOLITAN EDISON COMPANY
THREE MILE ISLAND UNIT I

1. Purpose

1.1 Verify the response of the reactor and auxiliary systems to loss of off-site power with generator trip.

1.2 Verify the ability to safely shut down the plant while receiving power only from the diesel generators and station batteries.

2. Prerequisites

2.1 Reactor is at 15 percent power.

2.2 Normal and emergency power source are operable.

2.3 Transient recorders supplied power from a vital bus.

3. Test Method

3.1 Trip incoming feed to the station and the turbine generator.

4. Data Required

4.1 Initial conditions - List of equipment operating prior to loss of power.

Final conditions - List of equipment automatically restarted following loss of power.

Final conditions - List of equipment automatically restarted following loss of power.

R.C. Pressurizer Level	OTSG Levels
R.C. Pressure	Main Steam Pressure
R.C. Temperature	Diesel Generator on Line
R.C. Loop Flows	Breaker Position (time zero)

5. Acceptance Criteria

5.1 No fuel damage.

5.2 No Excessive pressures in the reactor coolant system.

5.3 Diesel generators start automatically and connect to ID and IE busses.

5.4 Equipment for safe plant shutdown and post shutdown operation either start automatically or can be manually started.