YANKEE ATOMIC ELECTRIC COMPANY

DOCKET NO. 50-29

L I C E N S E

License No. DPR-3
Amendment No. 4

1. This license applies to the pressurized water reactor (hereinafter referred to as the "reactor") which is owned by Yankee Atomic Electric Company (hereinafter referred to as "Yankee"), located in Rowe, Massachusetts, and described in the technical specifications attached as appendix A hereto.
2. Subject to the conditions and requirements incorporated herein, the Commission hereby licenses Yankee:
   A. Pursuant to section 104(b) of the Atomic Energy Act of 1954, as amended, (hereinafter referred to as the "Act") and Title 10 CFR, Chapter 1, Part 50, "Licensing of Production and Utilization Facilities" to possess and use the reactor as a utilization facility;
   B. Pursuant to the Act and Title 10 CFR, Chapter 1, Part 70, "Special Nuclear Material", to receive, possess and use 2300 kilograms of contained uranium 235 as fuel for the operation of the reactor; and
   C. Pursuant to the Act and Title 10 CFR, Chapter 1, Part 30, "Licensing of By-product Material", to possess, but not to separate, such by-product material as may be produced by operation of the reactor.
3. This license shall be deemed to contain and be subject to the conditions specified in section 50.54 of Part 50 and section 70.32 of Part 70 of

the Regulations, Title 10 CFR, Chapter 1; is subject to all applicable provisions of the Act and rules, regulations and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:

A. Technical Specifications

The technical specifications contained in Appendix A hereto (hereinafter referred to as technical specifications) are hereby incorporated in this license. Except as provided in Section 50.59 of the Commission's regulations, Yankee shall operate the facility in accordance with the technical specifications.

B. Authorization of Changes, Tests and Experiments

Yankee may (1) make changes in the facility as described in the hazards summary report, (2) make changes in the procedures as described in the hazards summary report, and (3) conduct tests or experiments not described in the hazards summary report, only in accordance with the provisions of Section 50.59 of the Commission's regulations. As used in this license, the term "hazards summary report" means Part 2 of the license application as amended as of the date hereof and as may be further amended from time to time in accordance with the procedures of paragraph 3.E. of this license.

C. Records

In addition to those otherwise required under this license and applicable regulations, Yankee shall keep the following records:

(1) Reactor operating records, including power levels and periods of operation at each power level.

(2) Records showing the radioactivity released or discharged into the air or water beyond the effective control of Yankee as measured at or prior to the point of such release or discharge.

(3) Records of radioactivity levels on-site and at off-site monitoring stations.

(4) Records of scrams, including reasons therefor.

(5) Records of reactor tests and measurements performed pursuant to the requirements of the technical specifications.

(6) Records of maintenance operations involving substitution or replacement of reactor equipment or components.

(7) Records of changes made in the systems listed in paragraphs "B" and "C" of the technical specifications and the reasons therefor.

D. Reports

In addition to those otherwise required under this license and applicable regulations, Yankee shall make the following reports:

(1) Yankee shall make an immediate report of any indication or occurrence of a possible unsafe condition relating to the operation of the reactor, including, without implied limitation: (a) any accidental release of radioactivity, whether or not resulting in personal

injury or property damage or exposure above permissible limits; and (b) any substantial variance disclosed by operation of the reactor from the performance specifications set forth in the technical specifications.

(2) At least yearly, Yankee shall submit an operation report summarizing data with respect to the following:

(a) Hours use of the reactor.

(b) The electric output of the plant.

(c) Shutdowns of the reactor, with a brief explanation of the cause and duration of each shutdown.

(d) Levels of radioactivity recorded at the site and at off-site monitoring stations.

(e) Levels of radioactivity in principal systems established by chemical analysis.

(f) Routine releases, discharges and shipments of radioactive materials.

(g) Principal maintenance performed with the reasons therefor.

(h) A description of significant tests performed and the results of any test analyses completed. The tests reported shall include periodic determinations of the effects of plutonium build-up on reactivity coefficients and of reactor power distribution as measured by use of the in-core instrumentation.

(i) Significant changes or new information regarding transient or accident analyses.

(j) A description of any other significant or unusual occurrence or operating condition experienced.

(3) Within 90 days following the end of each calendar year, Yankee shall submit a financial report for such year, including a balance sheet at the end of such year and a statement of income and surplus for such year; and a summary of the amount and type of financial protection in effect at the end of such year pursuant to section 170 of the Act.

Each such report sahll be in writing, signed by a responsible officer of Yankee and shall be addressed to the Commission, Attention: Division of Licensing and Regulation. 25 copies of each report shall be submitted. Reports submitted pursuant to (1) above may be made initially by telephone, telegram or orally but shall be confirmed in writing promptly thereafter.

E. Amendments to the License Application

Yankee may submit amendments to its license application at any time or from time to time, but no such amendment to the license application shall be effective to change or modify the technical specifications unless authorized by the Commission pursuant to section 50.59 of the Regulations, Title 10 CFR, Chapter 1, Part 50.

4. Pursuant to section 50.60 of the Regulations, Title 10 CFR, Chapter 1, Part 50, the Commission has allocated to Yankee for use in the operation of the reactor 6,002.6 kilograms of uranium 235 contained in uranium at the isotopic ratios specified in Yankee's license application. Estimated schedules of special nuclear material transfers to Yankee and returns to the Commission are contained in Appendix B which is attached hereto. Shipments by the Commission to Yankee in accordance with Column (2) in Appendix B will be conditioned upon Yankee's return to the Commission of material substantially in accordance with Column (3) of Appendix B.

5. This license is effective as of the date of issuance and shall expire November 4, 1997.

FOR THE ATOMIC ENERGY COMMISSION

/s/ R. Lowenstein
Director
Division of Licensing and Regulation

Attachments:
1. Appendix A
2. Appendix B

Date of Issuance: October 11, 1962

YANKEE ATOMIC ELECTRIC COMPANY

Technical Specifications

A. SITE

The reactor shall be located on the property owned by Yankee in Rowe, Mass. The site includes the property owned by Yankee and New England Power Company as shown on the map on page 300:2 of the license application.

No part of the site shall be sold or leased without the prior approval of the Commission. No structure shall be located on the site without the prior approval of the Commission except structures owned by Yankee or New England Power Company and used in their utility operation and except railroad facilities owned and used by the Hoosac Tunnel and Wilmington Railroad Company.

B. DESIGN SPECIFICATIONS

1. The following sections of the license application are considered to be design specifications of the reactor and are incorporated herein in their entirety:

   101 Core Mechanical Design
   201 Main Coolant System
   202 Pressure Control and Relief System
   203 Charging and Volume Control System
   204 Chemical Shutdown System
   210 Shutdown Cooling System
   212 Safety Injection System
   230 Reactor Vessel

2. The pressures and temperatures used as a basis for design, materials of construction, general arrangements of the systems and their components, weights, volumes, dimensions and tolerances, methods of fabrication and applicable codes, tests and inspection procedures which appear in the following sections of the license application (excluding drawings) are considered to be design specifications of the reactor and are incorporated by reference herein:

   102 Core Thermal and Hydraulic Design
   103 Core Nuclear Design
   106 Reactor Coolant Chemistry
   107 Core Instrumentation
   205 Purification System
   207 Corrosion Control System--Primary Plant
   209 Radioactive Waste Disposal System
   213 Reactor Control System
   214 Nuclear Instrumentation System
   215 Radiation Monitoring System
   218 Fuel Handling System
   224 Compressed Air Systems
   231 Vapor Containment
   232 Radiation Shielding
   235 Architectural Features

Physical arrangements of structures and equipment will be as described in Section 200 of the license application. Mechanical equipment and systems will be interconnected as shown in the Fundamental Flow Diagram included in that section.

Electrical equipment and systems which provide station auxiliary power supply will be as described in Section 226 of the license application and will be interconnected as shown in the 2400 volt one-line diagram and the 480 volt one-line diagram, sheets 1, 2 and 3, included in that section.

The ventilation system for the control room area, radiochemical laboratory, decontamination cubicle, fuel transfer pit house, and other potentially contaminated portions of the Turbine Generator, Service, Primary Auxiliary, and Waste Disposal Buildings shall be in accordance with the description contained in Section 228 of Part B of the license application.

C. PERFORMANCE SPECIFICATIONS

Calculated values of operating variables such as pressures, temperatures, flows, heat fluxes, reactivity coefficients and on-site radiation levels under steady state and transient conditions which are stated in the sections of the license application listed in Paragraph B, above, are considered to be performance specifications of the reactor and are incorporated by reference herein. Yankee shall not operate the facility under circumstances where there is a substantial variance between the foregoing performance specifications and the corresponding values determined by operation of the facility.

The performance and function of the systems described in the following sections of the license application shall be substantially as described; however, the details of individual components and their arrangement as described in each of these sections may be altered by Yankee at its own discretion provided that such an alteration would not violate some other provision of these Technical Specifications.

206 Component Cooling System
208 Sampling System
211 Vent and Drain System, Primary Plant
216 Vapor Container Atmosphere Control Systems
219 Main and Auxiliary Steam System
220 Condensate and Feed Water Systems
221 Circulating Water System
222 Water Supply System

D. OPERATING PROCEDURES AND RESTRICTIONS

1. Operating Procedures

The reactor will at all times be operated in accordance with generally accepted standards of safe operating procedure, subject to the operating restrictions set forth below. All operations will be conducted in accordance with written procedures and under the direct and personal supervision of technically qualified and designated personnel.

The Objective, Conditions and Precautions set forth in the individual instructions contained in the following sections of the license application will be observed:

504 Normal Plant Operation Instructions
505 Emergency Instructions
506 Plant Maintenance Instructions

2. Operating Limits

a. Reactivity

(1) During core loading the fuel assemblies, control rods and shim rods will be loaded one by one in water sufficiently borated to render the fully loaded core at least 5% $\triangle$ K/K sub-critical at room temperature.

(2) During the refueling operation a record will be made of the neutron count rate before and after any change in core geometry. If a significant unexpected increase in the count rate occurs on any one channel or if an unexpected increase in the count rate by a factor of two on two of the three channels occurs after addition of a new fuel assembly or removal of a control rod, the fuel loading operation will be suspended until the situation can be reviewed by plant technical supervisory personnel. If necessary to establish the shutdown margin of the core, a single control rod will be withdrawn using the manipulator crane and regulated by a plot of control rod position vs. inverse count rate multiplication. Using the inverse count rate data obtained in this manner, the shutdown margin will be calculated. If these calculations indicate that there will be less than 5% $\triangle$ K/K shutdown with all control rods inserted in the fully loaded core, the boron concentration will be increased to provide the required 5% $\triangle$ K/K shutdown margin.

(3) At all times when the reactor is at operating temperature full insertion of all control rods shall render the reactor not less than 3% $\triangle$ K/K sub-critical without boric acid in the main coolant system.

(4) Sufficient boric acid will be added to the main coolant system prior to cold shutdown to maintain the cold core with all control rods inserted at least 5% $\triangle$ K/K sub-critical. This will be done before the temperature of the main coolant system has been reduced to a point where full insertion of all control rods would no longer render the reactor 2% $\triangle$ K/K sub-critical without the presence of boric acid.

(5) The maximum reactivity insertion rate due either to withdrawal of the highest worth control rod group or to reduction of boric acid concentration in the main coolant system through dilution will not exceed 1.5×10^{-4} $\triangle$ K/K per second.

(6) Whenever the reactor is shut down, before any operation which might result in a change of reactivity, a control rod group shall be withdrawn to a height sufficient to provide a reactivity worth of 1% for emergency shutdown capability. If for any reason this is not practical, the main coolant system shall be borated to provide 5% Δ K/K cold shutdown margin with all control rods inserted.

(7) The reactor will be scrammed automatically below 15 MW electric by a high startup rate signal set at a maximum of 5.2 decades/minute.

b. Power Level

(1) The steady state power level of the reactor will not exceed rated power of 540 MW thermal.

(2) The reactor will be scrammed automatically by a high neutron flux level signal, set at not more than 108% of rated power as defined in (1) above.

(3) During operation with one loop of the four main coolant loops isolated from the system, the steady state thermal power level of the reactor will not exceed 378 MW thermal.

(4) During operation with one main coolant loop isolated, the reactor will be scrammed automatically by a high neutron flux level signal, set at not more than 108% of the power level defined in (3) above.

(5) Except for operation of the reactor at power levels not exceeding 15 MW electric, the reactor shall not be operated with less than three main coolant loops in service.

c. Thermal

(1) At rated power the calculated heat flux at the point closest to burnout in the hottest channel shall not exceed 50% of the burnout heat flux as predicted by the "W-2" correlation, shown on page 102:19 of the license application. This ratio shall be checked every 1000 equivalent full power hours of operation utilizing data derived from the in-core instrumentation.

(2) At rated power the calculated temperature of the coolant at the exit of the hottest channel shall not exceed 609° F.

(3) At rated power the calculated maximum clad surface temperature in the hottest channel shall not exceed 663° F.

d. Main Coolant System

(1) The reactor will be scrammed automatically above 15 MW electric by a low main coolant pressure signal set at a minimum of 1800 psig.

(2) The reactor will be scrammed automatically above 15 MW electric by a low main coolant flow signal. Low flow scram will be initiated by low flow in not more than two of four loops for operation at or below 485 MWt. Low flow scram will be initiated by low flow in one of four loops above 485 MWt. A loop low flow condition is defined as 80% or less of normal flow in the loop.

(3) The reactor will be scrammed automatically by a high pressurizer water level signal set at a maximum of 200 inches whenever the turbine generator is operating.

(4) The reactor will not be brought to criticality at a main coolant system temperature lower than 250° F except for scheduled low power physics testing which will be performed in accordance with written procedures.

(5) During normal plant startup boric acid dilution will not be commenced until the main coolant system temperature has reached equilibrium at 250° F.

(6) The plant will not be operated at loads above 15 MW electric unless the boron concentration in the main coolant system is less than 80 ppm. The plant will not be operated below 15 MW electric with more than 220 ppm of boron in the main coolant system except during normal startups or during low power physics testing which will be performed in accordance with written procedures.

(7) Whenever a main coolant loop is isolated from the system, it will be borated at full shutdown concentrations before its temperature is reduced below 485° F.

(8) An isolated main coolant loop will be returned to service only after the boron concentration and the water temperature have been closely matched to existing main coolant system conditions. An automatic valve interlock prevents any isolated loop from being returned to service if the loop temperature is more than 30° F lower than the highest cold leg temperature in the other loops.

e. Other Plant Protection

(1) The reactor will be scrammed automatically, above 15 MW electric, when the turbine is tripped for any reason. The turbine will be protected by all usual protective trips including high thrust bearing temperature, low bearing oil pressure, low condenser vacuum and overspeed.

(2) The reactor will be scrammed automatically, above 15 MW electric when the generator is tripped for any reason. The generator will be protected by all usual protective trips including overcurrent, differential and loss of field.

(3) The safety injection system will be maintained in readiness to pump borated water into the reactor at all times when the main coolant pressure is 1000 psig or higher. A pressure switch set at not less than 800 psig main coolant pressure will automatically initiate operation of the motorized valves in this sytem and a pressure switch set at not less than 800 psig main coolant pressure will automatically start the high pressure safety injection pump, and a second pressure switch set at not less than 270 psig main coolant pressure will automatically start the low pressure safety injection pumps.

(4) The boiler feed pumps will be automatically tripped out of service, above 15 MW electric, by any reactor scram.

(5) Valves in all outgoing lines from the vapor container will close automatically if at any time vapor container pressure increases above 5 psig.

(6) The integrity of the vapor container will be maintained at all times when the reactor is critical or when the main coolant system is above 200° F or above 300 psig with the reactor core in place.

(7) The automatic controls associated with the reactor protection system will be maintained at the set points listed in Table I, attached hereto, or at set points representing more conservative values of the particular variables being measured. Table I also shows the number of channels associated with each function and the number of channels normally required to initiate a scram signal. In the event of failure of one instrument channel when multiple channel protection is provided for a function, the plant will continue regular operation. The scram circuits, however, will then operate so that activation of any of the remaining channels for that function will cause scram operation.

f. Plant Protection when the Reactor Vessel Head is Removed and the Vessel Contains Fuel.

(1) All operations will be conducted in accordance with written procedures.

(2) The water in the reactor vessel and in the shield tank cavity will be sufficiently borated to render the core at least 5% Δ K/K sub-critical at room temperature.

(3) Normal plant source range instrumentation will be in service at all times with the count rate recorded and a startup rate alarm set at 1 decade/minute.

(4) An AEC licensed operator will be on duty in the control room at all times.

(5) The chemical shutdown system will be lined up and available at all times to provide emergency shutdown under the control of the AEC licensed operator.

(6) Equipment which would make possible inadvertent reactivity changes will be made inoperable and tagged out of service.

(7) Manipulation of reactor vessel components or internals will be carried out under the direct and personal supervision of technically qualified and designated personnel.

g. Waste Effluents

(1) Solids -- No radioactive solid wastes will be disposed of at the site.

(2) Liquids -- No radioactive liquid wastes having concentrations in excess of those specified in Appendix B., Table II, 10CFR20, will be discharged from the plant.

(3) Gases -- As determined at the point of discharge from the primary vent stack and averaged over a period not exceeding one year, the concentrations of radioactive gaseous wastes discharged shall not be in excess of 1,000 times the limits specified in Appendix B, Table II, 10CFR20. Any discharge to the atmosphere from the gas stripper or the combustible waste incinerator shall be continuously monitored at or prior to the point of such discharge. The monitor in the incinerator stack shall be kept in continuous service in order to provide an alarm and a record in the event of the release of radioactive gas from the waste disposal blanket gas system through the loop seal.

h. Radiological Health and Safety

Personnel radiation exposures will be maintained below the limits established in Title 10, CFR 20, or in any future amendments to this regulation.

i. Routine and Continuing Tests

Routine and periodic tests will be made at the times and in the manner set forth in Section 509 of the license application.

Att.

TABLE I

REACTOR PROTECTION SET POINTS

Function	No. of Channels Required to Trip	Bypasses	Set Point Limits	Remarks:
High Startup Rate - Reactor Scram	1 out of 2	Auto bypass Above 15 MWe	5.2 dec/min - max	
High Neutron Flux Level - Reactor Scram	2 out of 6	None	Neutron flux corresponds to 108% rated power - max	Minimum of 4 operable channels required for reactor operation.
Neutron Flux Level Decrease - Reactor Scram	1 out of 6	Auto bypass Below 15 MWe	Neutron flux decrease corresponding to 15% of 540 MWt - max	
Low Main Coolant Pressure - Reactor Scram	1 out of 2	Auto bypass Below 15 MWe	1800 psig - min	
Low Main Coolant Flow - Reactor Scram	Not more than 2 out of 4 below 485 MWt; 1 out of 4 above 485 MWt	Auto bypass Below 15 MWe	80% of normal main coolant flow in any loop - min	
High Pressurizer Water Level - Reactor Scram	1 out of 1	Manual	200 inches - max	In service whenever turbine generator is operating.
Manual - Reactor Scram	Not Applicable	None	Available any time	
Turbine Trip - Reactor Scram	Not Applicable	Auto bypass Below 15 MWe	Usual Turbine Trip set points	Turbine trip scrams reactor and trips generator above 15 MWe.
Generator Trip - Reactor Scram	Not Applicable	Auto bypass Below 15 MWe	Usual Generator Trip set points	Generator trip scrams reactor and trips turbine above 15 MWe.
Manual Turbine Generator Trip - Reactor Scram	Not Applicable	Auto bypass Below 15 MWe	Available any time above 15 MWe	
Safety Injection Operation	1 out of 1	Manual	800 psig main coolant pressure-min (motorized valves and high pressure pump operate) 270 psig main coolant pressure-min (low pressure pumps start)	During normal operation system is set for automatic initiation. Safety injection may be initiated manually at any time.
Pressurizer Safety Valve Operation	Not Applicable	None	2485 psig, No. 1 Valve - max 2560 psig, No. 2 Valve - max	
Vapor Container Outgoing Line Trip - Valve Operation	1 out of 2	None	5 psig vapor container pressure-max	Closes trip valves in outgoing lines in vapor container.
Main Coolant Valve Interlock	Not Applicable	None	30°F temperature differential - max	Prevents any isolated loop from being placed into operation if the loop temperature is more than 30°F lower than highest cold leg temperature in the remaining loops.

Note: Reactor Scram always initiates turbine and generator trip.

Estimated Schedule of Transfers of Special Nuclear Material from the Commission to Yankee and to the Commission from Yankee:

(1)	(2)	(3)	(4)	(5)
Date of Transfer (Fiscal Year)	Transfers from AEC to Yankee (a) Kgs. U-235	Returns by Yankee to AEC (b) Kgs. U-235	Net Yearly Distribution Including Cumulative Losses Kgs. U-235	Cumulative Distribution Including Cumulative Losses Kgs. U-235
1959	208.8	-	208.8	208.8
1960	590.2	-	590.2	799.0
1961	719.1	-	719.1	1,518.1
1962	803.1	623.2 (c)	179.9	1,698.0
1963	-	545.9	(545.9)	1,152.1
1964	814.3	622.8	191.5	1,343.6
1965	815.0	-	815.0	2,158.6
1966	-	622.8	(622.8)	1,535.8
1967	815.0	622.8	192.2	1,728.0
1968	815.0	-	815.0	2,543.0
1969	-	622.8	(622.8)	1,920.2
1970	815.0	622.8	192.2	2,112.4
1971	815.0	-	815.0	2,927.4
1972	-	622.8	(622.8)	2,304.6
1973	815.0	622.8	192.2	2,496.8
1974	815.0	-	815.0	3,311.8
1975	-	622.8	(622.8)	2,698.0
1976	815.0	622.8	192.2	2,881.2
1977	815.0	-	815.0	3,696.2
1978	-	622.8	(622.8)	3,073.4
1979	815.0	622.8	192.2	3,265.6
1980	815.0	-	815.0	4,080.6
1981	-	622.8	(622.8)	3,457.8
1982	815.0	622.8	192.2	3,650.0
1983	815.0	-	815.0	4,465.0
1984	-	622.8	(622.8)	3,842.2
1985	815.0	622.8	192.2	4,034.4

(Continued)

(1)	(2)	(3)	(4)	(5)
1986	815.0	-	815.0	4,849.4
1987	-	622.8	(622.8)	4,226.6
1988	815.0	622.8	192.2	4,418.8
1989	815.0	-	815.0	5,233.8
1990	-	622.8	(622.8)	4,611.0
1991	815.0	622.8	192.2	4,803.2
1992	815.0	-	815.0	5,618.2
1993	-	622.8	(622.8)	4,995.4
1994	815.0	622.8	192.2	5,187.6
1995	815.0	-	815.0	6,002.6
1996	-	622.8	(622.8)	5,379.8
1997	815.0	622.8	192.2	5,572.0
1998	-	622.8	(622.8)	4,949.2
1999		61.2 *(a)	(61.2)	4,888.0 **
	21,065.5	16,177.5	4,888.0 **	

(a) 3.4% U-235
(b) 2.65% U-235 (Hot Fuel) except (c) and (a)
(c) 3.025% U-235 (Hot Fuel)

* Inventory to be returned

** Fabrication and burnup losses