November 21, 1977

Docket No.: 50-271

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R. Ballard

Yankee Atomic Electric Company
ATTN: Mr. Robert H. Groce
Licensing Engineer
20 Turnpike Road
Westboro, Massachusetts 01581

Gentlemen:

The Commission has issued the enclosed Amendment No. 40 to Facility Operating License No. DPR-28 for the Vermont Yankee Nuclear Power Station (VYNPS). The amendment includes changes to the Technical Specifications in response to your application dated September 22, 1975, as supplemented May 10, 1976 and March 8, 1977.

Changes to your proposal were necessary to meet our requirements. These have been discussed with and agreed to by your staff. This amendment allows the use of open-cycle cooling to shut the plant down in the event of a failure of the closed-cycle cooling system.

We have examined the safety significance of this modification to the operation of the VYNPS and have determined that the modification does not alter the accident and transient analyses previously considered by the Commission.

This modification to the limiting conditions for operation of the Appendix B Technical Specifications does not involve significant new safety information of a type not considered in previous Commission safety reviews of the facility. This modification does not involve a significant increase in the probability or consequences of an accident, does not involve a significant decrease in a safety margin, and therefore does not involve a significant hazards consideration. We have also concluded that there is reasonable assurance that the health and safety of the public will not be endangered by this action.

cpl

Copies of the Environmental Impact Appraisal and the Notice of Issuance/ Negative Declaration are also enclosed.

Sincerely,

Original Signed

Robert W. Reid, Chief
Operating Reactors Branch #4
Division of Operating Reactors

Enclosures:
1. Amendment No. to DPR-28
2. Environmental Impact Appraisal
3. Notice/Negative Declaration

cc w/enclosures: See next page

*SEE PREVIOUS YELLOW FOR CONCURRENCES

OFFICE ➤	ORB#4:DOR	ORB#4:DOR	OELD	C-ORB#4:DOR		
SURNAME ➤	RIngram*	JSiegel:rm	AMitchell*	RReid		
DATE ➤	5/ /77	10/12/77	5/ /77	11/21/77		

Form AEC-318 (Rev. 9-53) AECM 0240

☆ U. S. GOVERNMENT PRINTING OFFICE: 1974-526-166

Docket No.: 50-271

Yankee Atomic Electric Company
ATTN: Mr. Robert H. Groce
Licensing Engineer
20 Turnpike Road
Westboro, Massachusetts 01581

Gentlemen:

The Commission has issued the enclosed Amendment No. to Facility Operating License No. DPR-28 for the Vermont Yankee Nuclear Power Station. The amendment includes changes to the Technical Specifications in response to your application dated September 22, 1975, as supplemented May 10, 1976 and March 8, 1977.

Changes to your proposal were necessary to meet our requirements. These have been discussed with and agreed to by your staff. This amendment allows the use of open-cycle cooling to shut the plant down in the event of a failure of the closed-cycle cooling system.

This modification to the limiting conditions for operation of the Appendix B Technical Specifications does not involve significant new safety information of a type not considered in previous Commission safety reviews of the facility. This modification does not involve a significant increase in the probability or consequences of an accident, does not involve a significant decrease in a safety margin, and therefore does not involve a significant hazards consideration. We have also concluded that there is reasonable assurance that the health and safety of the public will not be endangered by this action.

Copies of the Environmental Impact Appraisal and the Notice of Issuance/ Negative Declaration are also enclosed.

Sincerely,

Original

Robert W. Reid, Chief
Operating Reactors Branch #4
Division of Operating Reactors

Enclosures and cc: See next page

OFFICE	ORB#4:DOR	ORB#4:DOR	OELD	C-ORB#4:DOR		
SURNAME	RIngram	JSiegel:rm	A. Mitchell	RReid		
DATE	5/16/77	5/ /77	5/26/77	5/ /77		

Form AEC-318 (Rev. 9-53) AECM 0240 ☆ U. S. GOVERNMENT PRINTING OFFICE: 1974-526-166

Enclosures:
1. Amendment No. to DPR-28
2. Environmental Impact Appraisal
3. Notice/Negative Declaration

cc w/enclosures: See next page

OFFICE ➤						
SURNAME ➤						
DATE ➤						

Yankee Atomic Electric Company

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Washington, D.C. 20460

Yankee Atomic Electr.c
Company

U. S. Environmental Protection
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Region I Office
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JFK Federal Building
Boston, Massachusetts 02203

cc w/enclosures and cy of VY's
filing dtd.: 9/22/75, 5/10/76, & 3/8/77
Public Service Board
State of Vermont
120 State Street
Montpelier, Vermont 05602

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

VERMONT YANKEE NUCLEAR POWER CORPORATION

DOCKET NO. 50-271

VERMONT YANKEE NUCLEAR POWER STATION

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 40
License No. DPR-28

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Vermont Yankee Nuclear Power Corporation (the licensee) dated September 22, 1975, as supplemented May 10, 1976 and March 8, 1977, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraphs 3.B and 3.E.1. of Facility Operating License No. DPR-28 are hereby amended to read as follows:

3.B. Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 40 , are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3.E.1.

If, during power operation, an unexpected failure results in a complete loss of coolant tower system, the above closed cycle restriction may be modified to permit an orderly shutdown using the main condenser as a heat sink in the open cycle mode. (See Appendix B Technical Specification Section 1.1.A.6). In this event, the plant shall be reduced below 25 percent power operation as rapidly as possible and shutdown within twenty-four hours.

3. This license amendment is effective as of the date of its issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Robert W. Reid, Chief
Operating Reactors Branch #4
Division of Operating Reactors

Attachment:
Changes to the Technical
Specifications

Date of Issuance: November 21, 1977

ATTACHMENT TO LICENSE AMENDMENT NO. 40

FACILITY OPERATING LICENSE NO. DPR-28

DOCKET NO. 50-271

Revise Appendix B Technical Specifications as follows:

Remove Pages	Insert Pages
1	1
2a	2a
7	7

The changed areas on the revised pages are shown by marginal lines.

1.0 LIMITING CONDITIONS FOR OPERATION

1.1 CONDENSER COOLING WATER

Applicability:

Applies to discharges of non-radioactive effluents from the station.

Objective:

To assure that non-radioactive effluents are released to the environment in an orderly manner and are maintained below established limits.

Specification:

A. Discharge Temperature

1. Except as specified in Specification 1.1.A.5 and 1.1.A.6 below, thermal discharges into the Vernon Pond will be controlled to meet the following temperature rise conditions:

Maximum River Temperature Measured At The Upstream Monitor	Allowable Increase In Temperature Measured At The Downstream Monitor
Above 66°F	1°F
63°F to 65°F	2°F
59°F to 62°F	3°F
55°F to 58°F	4°F
Below 55°F	5°F

2.0 SURVEILLANCE REQUIREMENTS

2.1 CONDENSER COOLING WATER

Applicability:

Applies to monitoring and sampling of non-radioactive effluents discharged from the station and the determination of their environmental impact.

Objective:

To ascertain that the non-radioactive releases are below the established limits and to determine their effects on the environment.

Specification:

A. Discharge Temperature

1. River water temperatures shall be continuously measured at locations 3-1/2 miles upstream of the plant and 0.65 miles downstream of the Vernon Dam. The downstream monitoring location is subject to confirmation that it provides a representative, well-mixed water temperature of Vernon Pond as determined by the Temperature Monitoring Survey, pg. 11 and 12, Table 2.2-1.

1.0 LIMITING CONDITIONS FOR OPERATION

2.0 SURVEILLANCE REQUIREMENTS

previous conditions 1 through 4 of Section 1.1.A. A reduction or elimination of the thermal effluent as a result of plant outage does not constitute termination of the open cycle tests. Vermont Yankee shall immediately advise the NRC if the States of New Hampshire or Vermont modify or revoke their approval of the test program.

a. The plant induced hourly averaged increase of mixed river temperature at reference Monitor #3 over that at reference Monitor #1 shall not exceed 10^{0}F as a result of plant operation.

b. The plant induced rate of change of temperature at reference Monitor #3 shall not exceed 5^{0}F in any one hour period as a result of plant operation.

c. The hourly averaged temperature at reference Monitor #3 shall not exceed 85^{0}F during the study.

6. In the event a failure of the cooling tower system occurs, open cycle operation is permissible in order to execute an orderly shutdown utilizing the main condenser as a heat sink in the open cycle mode provided that the minimum water flow through Vernon Dam is greater than 1200 cfs. The plant shall be expeditiously reduced below 25 percent power operation and shutdown within 24 hours if the plant is not otherwise authorized to operate in an open cycle mode.

BASES - CONDENSER COOLING WATER

A. The condenser cooling water system is designed to operate with minimal thermal effects on the Connecticut River and is capable of meeting the river temperature requirements of the permit issued by the State of Vermont Water Resources Board, dated June 10, 1968, as amended November 26, 1971, and as set forth above in Specification 1.1, A - Limiting Conditions For Operation - Discharge Temperature. The Water Resources Board, in arriving at the conditions of the permit, had the advantage of considering the opinions of expert witnesses from the Fish & Game Department of the State of Vermont, New Hampshire and Massachusetts, as well as from the Technical Committee for Fishery Management of the Connecticut River Basin. The conditions of the permit, as amended, conform to the "Regulations Governing Water Classification and Control of Quality" (Section 11, Vermont Water Quality Regulations). This regulation has been approved by the Environmental Protection Agency and was adopted by the State of Vermont Water Resources Board on May 29, 1971.

The absolute temperature of the condenser cooling water discharge will be dependent upon the allowable temperature rise in the river and upon river flow. Cooling water leaves the condenser at about 20°F above ambient river water temperature during full power operation. This water is discharged directly to the river, if the river flow is sufficient to reduce the temperature to the allowable increase over ambient within the mixing zone. With low river flows, a portion of the condenser cooling water is diverted through the cooling towers prior to discharge to the river. Thus, when ambient river water temperature reaches 70°F wet bulb temperature, blowdown discharge temperature to the river is estimated to be approximately 90°F which, after mixing with the specified minimum river flow, is calculated to result in a rise in river temperature of 0.146°F. The rate of change of heat discharged to the river is a function of plant power level and condenser cooling system operation. Based on the fact that the station will normally be operated at a steady load, the heat rejected to the condenser cooling system should be constant. Control of this system is maintained such that sudden changes of flow from the discharge structure to the river, or sudden changes in the mode of cooling tower operation, are avoided -- thus minimizing rate of temperature changes. Should an unexpected complete loss of the cooling tower system occur, the above limits may be exceeded for a period not to exceed twenty-four hours to permit an orderly shutdown by utilizing the main condenser as a heat sink and operating in an open cycle mode.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

ENVIRONMENTAL IMPACT APPRAISAL BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 40 TO FACILITY OPERATING LICENSE NO. DPR-28
VERMONT YANKEE NUCLEAR POWER CORPORATION
VERMONT YANKEE NUCLEAR POWER STATION
DOCKET NO. 50-271

Description of Proposed Action

By letters dated September 22, 1975, May 10, 1976, and March 8, 1977, the Vermont Yankee Nuclear Power Corporation (the licensee) submitted information to support a change to the Vermont Yankee Environmental Technical Specifications (Appendix B of Facility Operating License No. DPR-28). The licensee requests that if during power operation an unexpected failure results in breakdown of the closed-cycle cooling system, use of open-cycle cooling be allowed to permit shutdown without the use of the emergency shutdown system. The use of this latter system creates stresses within the plant which should be avoided when possible. Under the proposed amendment the plant would be required to reduce power to below 25% (by means of the open-cycle cooling system) as rapidly as possible and to shut down within 24 hours. By letter dated September 28, 197 the licensee submitted letters received from the appropriate regulatory agencies of Vermont and New Hampshire granting authorization in support of the licensee's request to use open cycle cooling to shut the plant down in the event of a failure of the closed cycle cooling system.

Appendix A of this appraisal contains an evaluation of the size of the 5°F isothermal plume into Vernon Pond and the temperature downstream of the plant under these conditions. Thermal discharges into Vernon Pond are restricted by the Appendix B Technical Specifications such that the resultant temperature at the periphery of a 50 acre zone shall not exceed 45°F when the ambient water temperature is less than 40°F or increase more than 5°F when the ambient water temperature is above 40°F.

Environmental Impacts of Proposed Action

The licensee has had several programs to study the physical and biological characteristics of Vernon Pond since the plant has become operational. These programs are listed in Table 1 with their dates, cooling modes, and river flows during each. Phase IV is ongoing and is scheduled to end in

June 1977. Information that was gathered in each program was used to refine the sampling in succeeding programs. As a result, the amount of information obtained has increased greatly with each succeeding program. Also, the amount of heat that the plant released during each program and thus the size of the thermal plume has gradually increased as the results of each program were analyzed and shown to have no biological impact. Phase I was the most conservative with hybrid operation during the coldest months. Phase II was less conservative than Phase I because 25% of the time the plant operated in open cycle and the program was extended one additional month into May when the water is warmer. Phase III was less conservative than Phase II because more than 50% of the time the plant operated in open cycle and the program started early in the fall when the water temperature was still warm and extended an additional month into June when the river flow decreased and the water temperatures began to rise. Phase IV is the final program in the series. It started in September 1976, one month earlier than the Phase III program, and will end in June 1977. The Phase IV program is also different than the Phase III program in that the plant will operate open cycle throughout its duration. The results of the first three programs and the results we have so far from Phase IV indicate no significant impact to the aquatic biota of the Connecticut River or Vernon Pond.

During the Phase II study there were some periods of time when the plant was at full power and all the heat was being rejected to the river. This occurred during much of April and May 1975. During the Phase III study there were

TABLE 1

PHASE	DATES	COOLING MODE	RIVER FLOW CFS
I	Feb. - Apr. 74	hybrid & closed	8800 - 67,000
II	Dec. 74 - May 75	open, hybrid & closed	1,232 - 38,440
III	Oct. 75 - June 76	hybrid & open	9,803 - 34,092
IV	Sept. 76 - June 77	open	1,200 - 40,000

more extensive periods when the plant was operating close to full power and all the heat was being rejected to the river. During much of November, December, February and May this was the case. There were eight days during the Phase II study when thermal plume surveys were made under these operating conditions. During the Phase III study there were 18 days when thermal plume surveys were made under these operating conditions. The average area within the 5°F isotherm for these 26 days is 11.5 acres. In an Environmental Impact Appraisal issued September 6, 1976, we reviewed the results of the phase programs and found that no significant adverse environmental effects occurred because of them. In Appendix A of this evaluation, we have estimated the size of the 5°F isotherm under the suggested shutdown conditions and found that it would be about 15 acres for short periods and about 10 acres for longer periods. As these excursions will be relatively short in duration in comparison to those which occurred during the Phase II and III studies, and since no adverse environmental effects resulted from these studies, we conclude that the thermal plume that will occur during these shutdowns will also not adversely affect the environment.

Conclusion and Basis for Negative Declaration:

On the basis of the foregoing analysis, it is concluded that there will be no environmental impact attributable to the proposed action other than has already been predicted and described in the Final Environmental Statement. Having made this conclusion, we further conclude that no environmental impact statement for the proposed action need be prepared and that a negative declaration for this action is appropriate.

Dated: November 21, 1977

APPENDIX A

HYDROTHERMAL EVALUATION

The area within the 5°F temperature excess isotherm is estimated using the empirical model developed by the licensee and depicted in Figure 1, based on the plant heat load and flow rate conditions of the June 4, 1975 shutdown, and an assumed low flow in the river of 1200 cfs. The basis for a river flow of 1200 cfs is Appendix B Technical Specification 1.1.C which provides for a minimum flow through Vernon Dam of 1200 cfs. The results are presented for the case of a sinking plume and for the case of a buoyant plume, and are depicted in Figure 2. These results are conservative for the following reasons:

1. The licensee's model overestimated the plume area for observed low river flow cases except when there was a wind blowing upriver (Table 1).

2. The wind directions at the site are predominantly from the North-Northwest (downriver). A wind from this direction would not cause adverse thermal plumes during low flow or stratified conditions.

3. The model predicts the greatest plume area to occur at the beginning of the thermal release. The initial plume will probably be smaller than predicted because it will be diluted by the initial mixing with the unheated water of Vernon Pond.

This model indicates that a conservative estimate of the maximum 5°F buoyant plume would be about 15 acres with longer periods of about 10 acres. During sinking plume conditions the maximum area would be about 9 acres, with longer periods of about 7 acres. The 5°F excess temperature isotherm would probably not extend across to the opposite shore because of the low plant flow which would be used during most of the release, and the thermal inertia of the pond.

Heated effluent from the plant will mix with the water of Vernon Pond and then be carried downstream. A conservative estimate of the temperature rise downstream at monitor No. 3 can be made under the assumption that the heated effluent is reduced in temperature only by mixing with the ambient low river flow of 1200 cfs. This approach ignores surface heat transfer and dispersion of a transient release. The temperature at downstream monitor No. 3 resulting from thermal releases from a plant shutdown was also calculated by means of a simple heat and mass balance relationship incorporating mixing in Vernon Pond, transport and atmospheric heat transfer. Table 2 lists the values of the parameters used in this relationship. The maximum excess temperature would be about 3.6°F, with extended periods of about 2.7°F.

Table 1 - Comparison of Measured and Predicted Acres Within 5°F Isotherm in Vernon Pond

Date	River Flow CFS	River Temp °F	Plant Flow CFS	Plant Temp °F	Wind Speed MPH	Wind Direction	Area Measured ft^2	Area Predicted ft^2	$\frac{A_{pred}}{A_{meas}}$
Dec. 28, 1974	2470	32.6	106	73	6	NW	160000	200000	1.25
May 27, 1975	1340	67	100	87	4	S	473600	295736	0.62
May 30, 1975	1350	67	100	81.5	2	N	60800	191440	3.15

FROM: Ref. 1

Table 2 – Parameters for Calculating Temperature at Monitoring Station 3

Case 1

Initial mixing volume = 7×10^6 ft^3

Surface area of mixing volume = 3.5×10^6 ft^2

Case 2

Initial mixing volume = 1×10^6 ft^3

surface area of mixing volume = 0.5×10^6 ft^2

Both Case 1 & 2

Surface heat transfer coefficient = about 90 $\frac{BTU}{Ft^2 °F\ day}$

River flow = 1200 CFS

Channel downstream of dam assumed to be 500 feet wide, 10 ft deep, and 4000 feet long

Case 3

Straight dilution, $\Delta T_R = \Delta T_O \frac{Q_{DIS}}{Q_R}$

where ΔT_O is the initial discharge excess temperature, °F

Q_{DIS} is the plant discharge, CFS

Q_R is the river flow, 1200 CFS

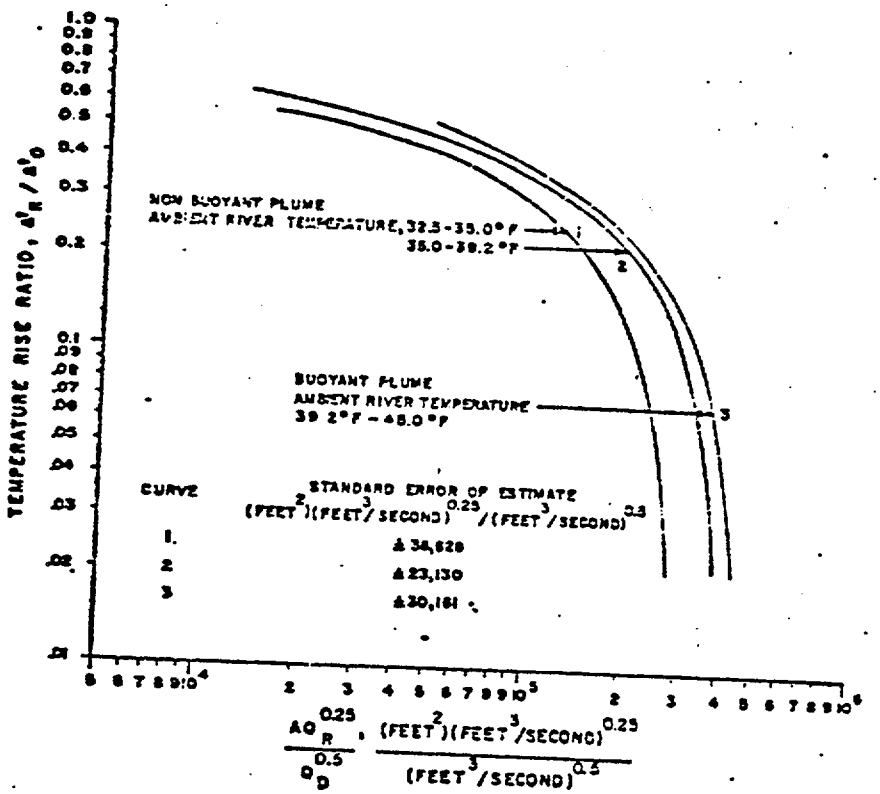

FIGURE 1 – EMPIRICAL RELATIONSHIPS: TEMPERATURE RISE RATIO VERSUS PLUME AREAS, DISCHARGE AND RIVER FLOW RATES FOR VARIOUS AMBIENT TEMPERATURES

From Ref. 1

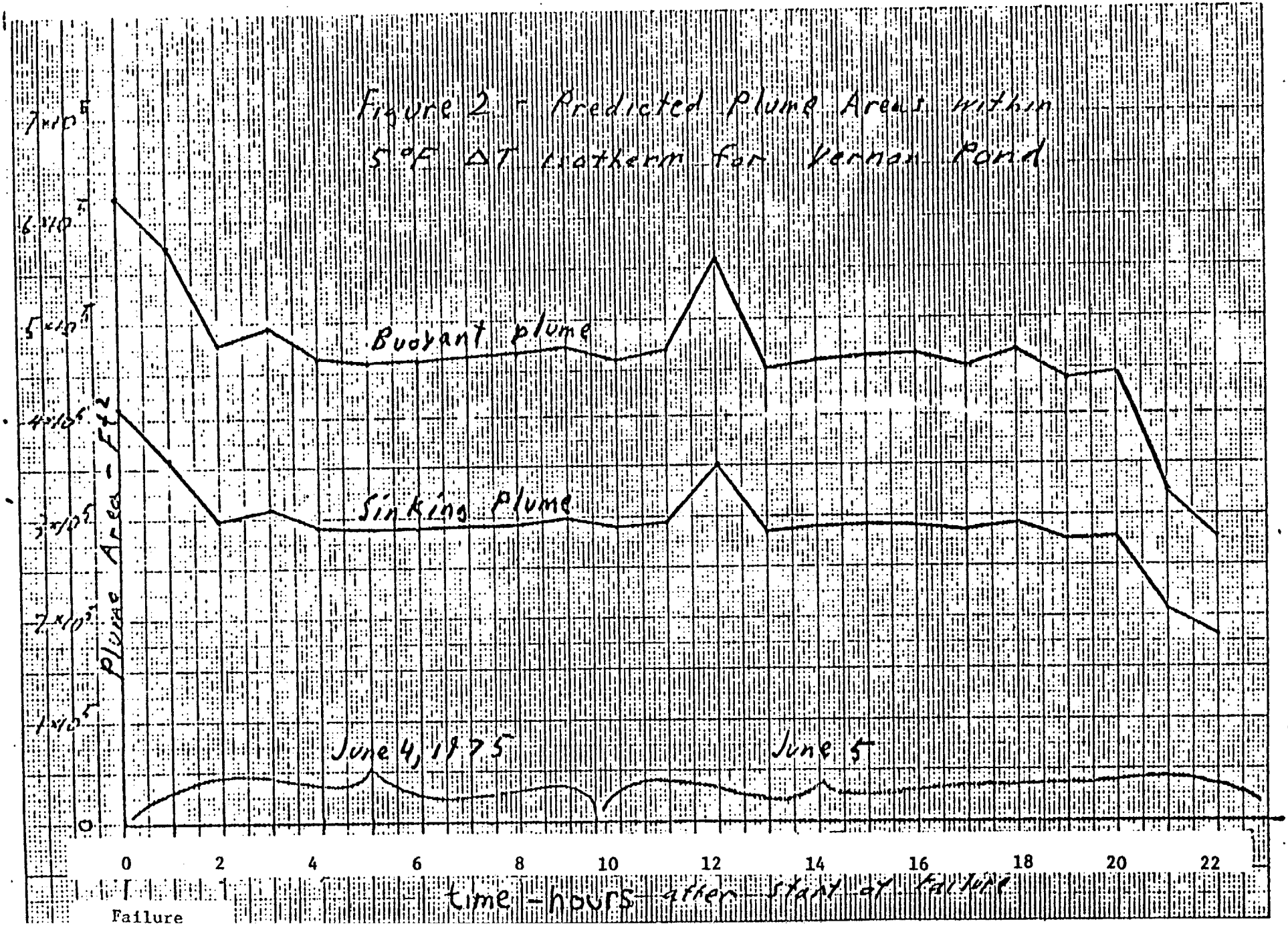
Figure 2 - Predicted plume Areas within 5°F ΔT isotherm for Kerman pond
Buoyant plume
Sinking plume
June 4, 1975
June 5
Plume Area - Ft²
7x10⁵
6x10⁵
5x10⁵
4x10⁵
3x10⁵
2x10⁵
1x10⁵
0
0
2
4
6
8
10
12
14
16
18
20
22
time - hours after start at Failure
Failure

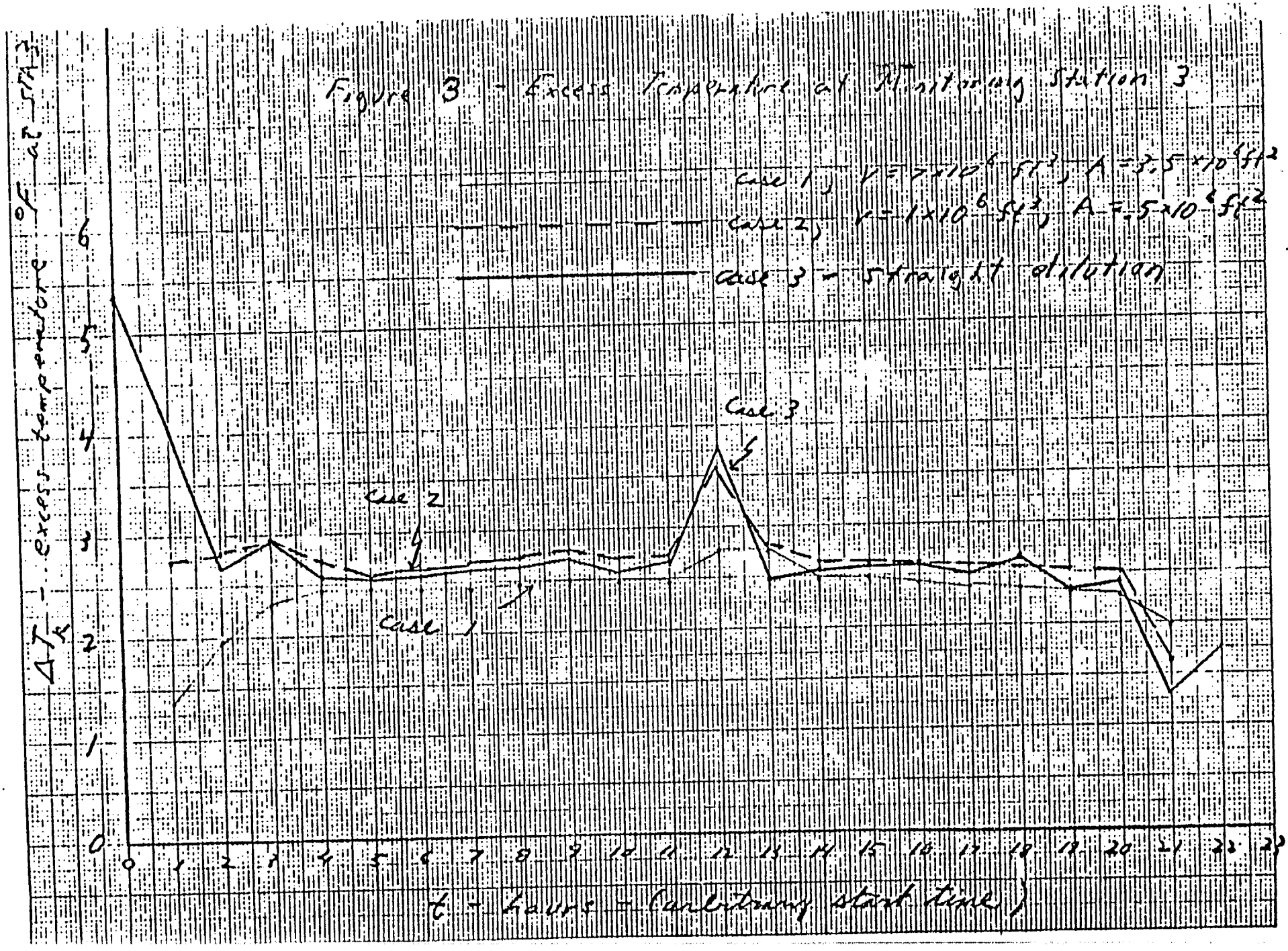
Figure 3 - Excess temperature at Mainstream Station 3
Case 1) V = 7×10⁶ ft³, A = 3.5×10⁶ ft²
Case 2) V = 1×10⁶ ft³, A = 5×10⁶ ft²
Case 3 - Straight dilution
ΔT_x - excess temperature °F at station x
Case 3
Case 2
Case 1
t - hours - (arbitrary start time)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
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21
22
23

References

1. Aquatec Inc., "Hydrothermal and Biological Studies, Connecticut River, Vernon Vermont-Phase II, December 1974, May 1975," Prepared for Vermont Yankee Nuclear Power Corp., Aug 1975.

UNITED STATES NUCLEAR REGULATORY COMMISSION

DOCKET NO. 50-271

VERMONT YANKEE NUCLEAR POWER CORPORATION

NOTICE OF ISSUANCE OF AMENDMENT TO FACILITY OPERATING LICENSE

AND NEGATIVE DECLARATION

The U. S. Nuclear Regulatory Commission (the Commission) has issued Amendment No. 40 to Facility Operating License No. DPR-28, issued to Vermont Yankee Nuclear Power Corporation (the licensee), which revised Technical Specifications for operation of the Vermont Yankee Nuclear Power Station (the facility) located near Vernon, Vermont. The amendment is effective as of its date of issuance.

This amendment allows the use of open-cycle cooling to shut the plant down in the event of a failure of the closed-cycle cooling system.

The application for the amendment complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations. The Commission has made appropriate findings as required by the Act and the Commission's rules and regulations in 10 CFR Chapter I, which are set forth in the license amendment. Prior public notice of this amendment was not required since the amendment does not involve a significant hazards consideration.

The Commission has prepared an environmental impact appraisal for this amendment and has concluded that an environmental impact statement

for this particular action is not warranted because there will be no environmental impact attributable to this action other than that which has already been predicted and described in the Commission's Final Environmental Statement for the facility dated July 1972.

For further details with respect to this action, see (1) the application for amendment dated September 22, 1975, as supplemented May 10, 1976 and March 8, 1977, (2) Amendment No. 40 to License No. DPR-28, and (3) the Commission's related Environmental Impact Appraisal. All of these items are available for public inspection at the Commission's Public Document Room, 1717 H Street, N.W., Washington, D.C. and at the Brooks Memorial Library, 224 Main Street, Brattleboro, Vermont.

A copy of items (2) and (3) may be obtained upon request addressed to the U. S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Director, Division of Operating Reactors.

Dated at Bethesda, Maryland, this 21st day of November 1977.

FOR THE NUCLEAR REGULATORY COMMISSION

Robert W. Reid, Chief
Operating Reactors Branch #4
Division of Operating Reactors