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Docket Nos. 50-329
and 50-330

JAN. 13 1976

Consumers Power Company
ATTN: Mr. S. H. Howell
Vice President
212 West Michigan Avenue
Jackson, Michigan 49201

Gentlemen:

The enclosed comments and requests for information are in response to your letters of November 7, 1975, regarding the implementation of ten Regulatory Guides at your Midland Plant. We have also requested information concerning the emergency cooling system.

Your response to this request by February 6, 1976 will allow us to complete our review by March 12, 1976. Please inform us within seven (7) days after receipt of this letter of your confirmation of this date or the date you will be able to meet.

Please contact us if you have any questions regarding the information requested.

Sincerely,

Original signed by

A. Schwencer, Chief
Light Water Reactors Branch 2-3
Division of Reactor Licensing

Enclosure:
Request for Additional
Information

cc: see page 2

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SURNAME ▶	SMacKay:ph	ASchwencer				
DATE ▶	1/13/76	1/13/76				

cc w/encl:
Howard J. Vogel, Esq.
Knittle & Vogel
814 Flour Exchange Building
310 Fourth Avenue South
Minneapolis, Minnesota 55415

Myron M. Cherry, Esq.
Jenner & Block
1 IBM Plaza
Chicago, Illinois 60611

Harold F. Reis, Esq.
Lowenstein, Newman, Reis & Axelrad
1025 Connecticut Avenue, N. W.
Washington, D. C. 20036

Honorable William H. Ward
Assistant Attorney General
Topeka, Kansas 66601

Irving Like, Esq.
Reilly, Like & Schneider
200 West Main Street
Babylon, New York 11702

James A. Kendall, Esq.
135 N. Saginaw Road
Midland, Michigan 48640

OFFICE ➤						
SURNAME ➤						
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ENCLOSURE

000.0 GENERAL

000.1 Based on our discussions of December 19, 1975, we understand that your design will conform with regulatory guides 1.1 (NPSH for ECCS pumps - 11/2/70), 1.7 (Control of Combustible Gas In Containment 3/10/71) and 1.49 (Power Levels).

000.2 Since the adoption of Appendix I to 10 CFR 50, Regulatory Guide 1.42 (As Low As Practicable Iodine Releases - 3/74) has been considered inoperative. This guide will be replaced later this year and we will be glad to discuss the new guide with you after it has been issued.

000.3 Your letter of November 7, 1975 indicates that the degree of conformance to Regulatory Guide 1.70 remains undefined with regard to analyses for the Safety Analysis Report. Please define the alternatives you wish to follow and provide the basis for such alternatives.

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010.0 EFFLUENT TREATMENT SYSTEMS BRANCH

010.1 (6.5) Regulatory Guide 1.52 provides guidelines for the design of ESF air filtration systems. Identify your ESF air filtration systems and provide the volumetric flow rate and adsorption bed depth for each system. You indicate that your design will not meet several positions of Regulatory Guide 1.52. Justify your design with regard to the following recommendations of Regulatory Guide 1.52:

C.2.a You should state that you will conform to the Guide.

C.2.c The fuel storage facility ventilation and filtration systems should be designated as seismic Category I.

C.2.j Filtration systems should be totally enclosed and installed in a manner which permits replacement of the train as a minimum number of segmented sections without removal of individual components.

C.3.b You should state you will conform to the Guide.

C.3.j The design of the adsorber section should consider possible iodine desorption and adsorbent autoignition that may result from radioactivity induced heat in the adsorbent and concomitant temperature rise. Acceptable designs include a low flow air bleed system, cooling coils for the adsorber section, or other cooling mechanisms. The system design should provide for fire protection to inhibit adsorber fires. Combustible gas that may be generated by an adsorbent fire should be considered in the design.

C.4.d Replaceable components should be spaced five linear feet from mounting frame to mounting frame.

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Auxiliary and Power Conversion Systems Branch
Request for Additional
Midland Plant, Units 1 & 2
Docket Nos. 50-329/330

020.1
(9.2.5)

In order to permit an evaluation of the ultimate heat sink and other heat removal systems, provide an analysis of the thirty-day period following a design basis accident listing the total heat rejected, the sensible heat rejected, the station auxiliary system heat rejected, and the decay heat release from the reactor.

In submitting the results of the analysis requested, include the following information in both tabular and graphical presentations:

1. The total integrated decay heat.
2. The heat rejection rate and integrated heat rejected by the station auxiliary systems, including all operating pumps, ventilation equipment, diesels and other heat sources.
3. The heat rejection rate and integrated heat rejected due to sensible heat removed from containment and the primary system.
4. The total integrated heat rejected due to the above.
5. The maximum allowable inlet water temperature taking into account the rate at which the heat energy must be removed, cooling water flow rate, and the capabilities of the respective heat exchangers.
6. The available NPSH to the service water pumps at the minimum Ultimate Heat Sink water level vs. the required NPSH.

The above analysis, including pertinent backup information, should demonstrate the capability of the ultimate heat sink to provide adequate water inventory and provide sufficient heat dissipation for the safe shutdown and cooldown of both units following a LOCA in one unit.

Use the methods set forth in the enclosed Branch Technical Position APCSB 9-2, "Residual Decay Energy for Light Water Reactors for Long Term Cooling," to establish the input due to fission product decay and heavy element decay. Assume an initial service water temperature based on the most adverse conditions for normal operation.

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213.0 REACTOR SYSTEMS

213.1 The monitoring of leakage from the Reactor Coolant Pressure Boundary (RCPB) is a safety function required by General Design Criteria 30. The staff recommends the monitoring of airborne particulate radioactivity for implementation of GDC 30. As stated in Regulatory Guide 1.45, at least one leakage detection system should remain functional to assist in evaluating conditions in containment following an SSE.

Describe the monitoring systems or procedures for sampling and surveillance of the containment atmosphere that are able to detect a significant increase in RCPB leakage following an SSE and before the system can be brought to cold shutdown.

310.0 ACCIDENT ANALYSIS

310.1 The source term to be used by the applicant is not clear. The source terms specified in Regulatory Guide 1.4 should be used for the Midland LOCA analysis.

310.2 An analysis of the iodine removal of the containment sprays should be provided, indicating the fraction of each form of iodine that will be removed from the containment atmosphere following a LOCA.

310.3 The applicant's proposal of meeting Guide 1.4, Paragraph C.2.3 is not in conformance with current NRC practice. This should be revised to meet this Regulatory Guide. The exposure doses from the LOCA should be based on a semi-infinite cloud for $\beta + \gamma$.

310.4 It is noted that the applicant states, "If charcoal filters are employed in the (fuel) building ventilation system. . ." It is recommended that the spent fuel building be provided with an ESF grade charcoal filter system which is automatically actuated by a high radiation signal.

310.5 Consumers Power Company asserts that the coatings to be used within the Midland containment building will meet the intended purposes of Regulatory Guide 1.54 adequately, although some documentation as to the qualification of the personnel applying the coatings will not exist due to agreements with labor unions made prior to the issuance of that guide. To substantiate that assertion, the applicant should identify and estimate the quantity of all protective coatings applied within the containment. Significant amounts of coatings which will enter the containment on equipment to be installed there should also be identified and estimated. "Significant" is to be interpreted such that the total mass of unknown polymeric material within the containment is likely to be no greater than 100 kilograms, and appears as small surfaces with a typical dimension less than about 10 cm. Precoated small items may be identified by the resin base of their coatings, e.g., glyptal and phenolic heat-cured resin coatings. Thermosetting ("baked enamel") coatings having a phenol or phthalic acid base are likely to withstand LOCA conditions on small surfaces, even though non-rated.

A description of the "phosphating" surface treatment of 56 valves should also be supplied.

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BRANCH TECHNICAL POSITION APCSB 9-2

RESIDUAL DECAY ENERGY FOR LIGHT WATER REACTORS FOR LONG-TERM COOLING

A. BACKGROUND

The Auxiliary and Power Conversion Systems Branch has developed acceptable assumptions and formulations that may be used to calculate the residual decay energy release rate for light water cooled reactors for long-term cooling of the reactor facility.

Experimental data (Refs. 1 and 2) on total beta and gamma energy releases for long half-life (> 60 seconds) fission products from thermal neutron fission of U-235 have been considered reliable for decay times of 10^3 to 10^7 seconds. Over this decay time, even with the exclusion of short-lived fission products, the decay heat rate can be predicted to within 10 percent of experimental data (Refs. 3, 7, and 8).

The short-lived fission products contribute appreciably to the decay energy for decay times less than 10^3 seconds. Although consistent experimental data are not as numerous (Refs. 4 and 5) and the results of various calculations differ, the effect of all uncertainties can be treated in the zero to 10^3 second time range by a suitably conservative multiplying factor.

B. BRANCH TECHNICAL POSITION

1. Fission Product Decay

For finite reactor operating time (t_o) the fraction of operating power, $\frac{P}{Po}(t_o, t_s)$, to be used for the fission product decay power at a time t_s after shutdown may be calculated as follows:

$$\frac{P}{Po}(\infty, t_s) = \frac{1}{200} \sum_{n=1}^{n=11} A_n \exp(-a_n t_s) \tag{1}$$

$$\frac{P}{Po}(t_o, t_s) = (1 + K) \frac{P}{Po}(\infty, t_s) - \frac{P}{Po}(\infty, t_o + t_s) \tag{2}$$

where:

$\frac{P}{Po}$ = fraction of operating power

t_o = cumulative reactor operating time, seconds

t_s = time after shutdown, seconds

K = uncertainty factor; 0.2 for $o \le t_s \le 10^3$ and 0.1 for $10^3 \le t_s \le 10^7$.

A_n, a_n = fit coefficients having the following values:

n	A_n	a_n (sec^{-1})
1	0.5980	1.772×10^{0}
2	1.6500	5.774×10^{-1}
3	3.1000	6.743×10^{-2}
4	3.8700	6.214×10^{-3}
5	2.3300	4.739×10^{-4}
6	1.2900	4.810×10^{-5}
7	0.4620	5.344×10^{-6}
8	0.3280	5.716×10^{-7}
9	0.1700	1.036×10^{-7}
10	0.0865	2.959×10^{-8}
11	0.1140	7.585×10^{-10}

The expressions for finite reactor operation may be used to calculate the decay energy from a complex operating history; however, in accident analysis a suitably conservative history should be used. For example, end of first-cycle calculations should assume continuous operation at full power for a full cycle time period, and end of equilibrium cycle calculations should assume appropriate fractions of the core to have operated continuously for multiple cycle times.

An operating history of 16,000 hours is considered to be representative of many end-of-first or equilibrium cycle conditions and is, therefore, acceptable. In calculating the fission produce decay energy, a 20 percent uncertainty factor (K) should be added for any cooling time less than 10^3 seconds, and a factor of 10 percent should be added for cooling times greater than 10^3 but less than 10^7 seconds.

2. Heavy Element Decay Heat

The decay heat generation due to the heavy elements U-239 and N_p-239 may be calculated according to the following expressions (Ref. 6):

$$\frac{P\,(U\text{-}239)}{P_o} = 2.28 \times 10^{-3}\, C\, \frac{\sigma_{25}}{\sigma_{f25}} \left[1 - \exp(-4.91 \times 10^{-4}\, t_o)\right] \left[\exp(-4.91 \times 10^{-4}\, t_s)\right] \qquad (3)$$

$$\frac{P(N_p\text{-}239)}{P_o} = 2.17 \times 10^{-3}\, C\, \frac{\sigma_{25}}{\sigma_{f25}} \Big\{ 0.007 \left[1 - \exp(-4.91 \times 10^{-4}\, t_o)\right]$$

$$\cdot \left[\exp(-3.41 \times 10^{-6}\, t_s) - \exp(-4.91 \times 10^{-4}\, t_s)\right]$$

$$+ \left[1 - \exp(-3.41 \times 10^{-6}\, t_o)\right] \left[\exp(-3.41 \times 10^{-6}\, t_s)\right] \Big\} \qquad (4)$$

where:

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$\frac{P\ (U\text{-}239)}{Po}$ = fraction of operating power due to U-239

$\frac{P\ (N_p\text{-}239)}{Po}$ = fraction of operating power due to N_p-239

t_o = cumulative reactor operating time, seconds

t_s = time after shutdown, seconds

C = conversion ratio, atoms of Pu-239 produced per atom of U-235 consumed

σ_{25} = effective neutron absorption cross section of U-235

σ_{f25} = effective neutron fission cross section of U-235

The product of the terms $C \cdot \frac{\sigma_{25}}{\sigma_{f25}}$ can be conservatively specified as 0.7.

The nuclear parameters for energy production by the heavy elements U-239 and N_p-239 are relatively well known. Therefore, the heavy element decay heat can be calculated with a conservatively estimated product term of $C \cdot \frac{\sigma_{25}}{\sigma_{f25}}$ without applying any other uncertainty correction factor.

3. Figures 1, 2, and 3 give the residual decay heat release in terms of fractions of full reactor operating power based on a reasonably realistic reactor operating time of 16,000 hours.

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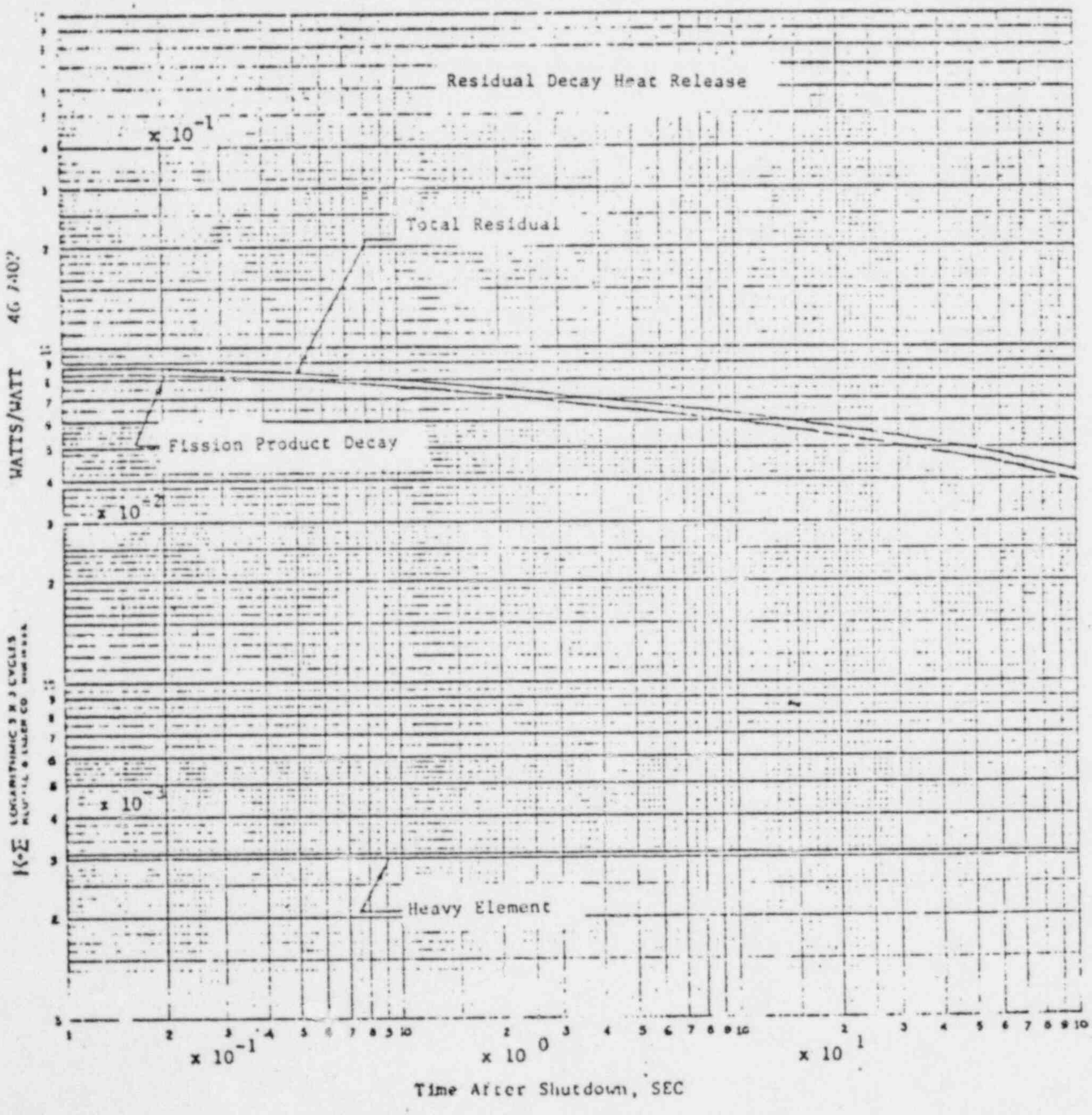

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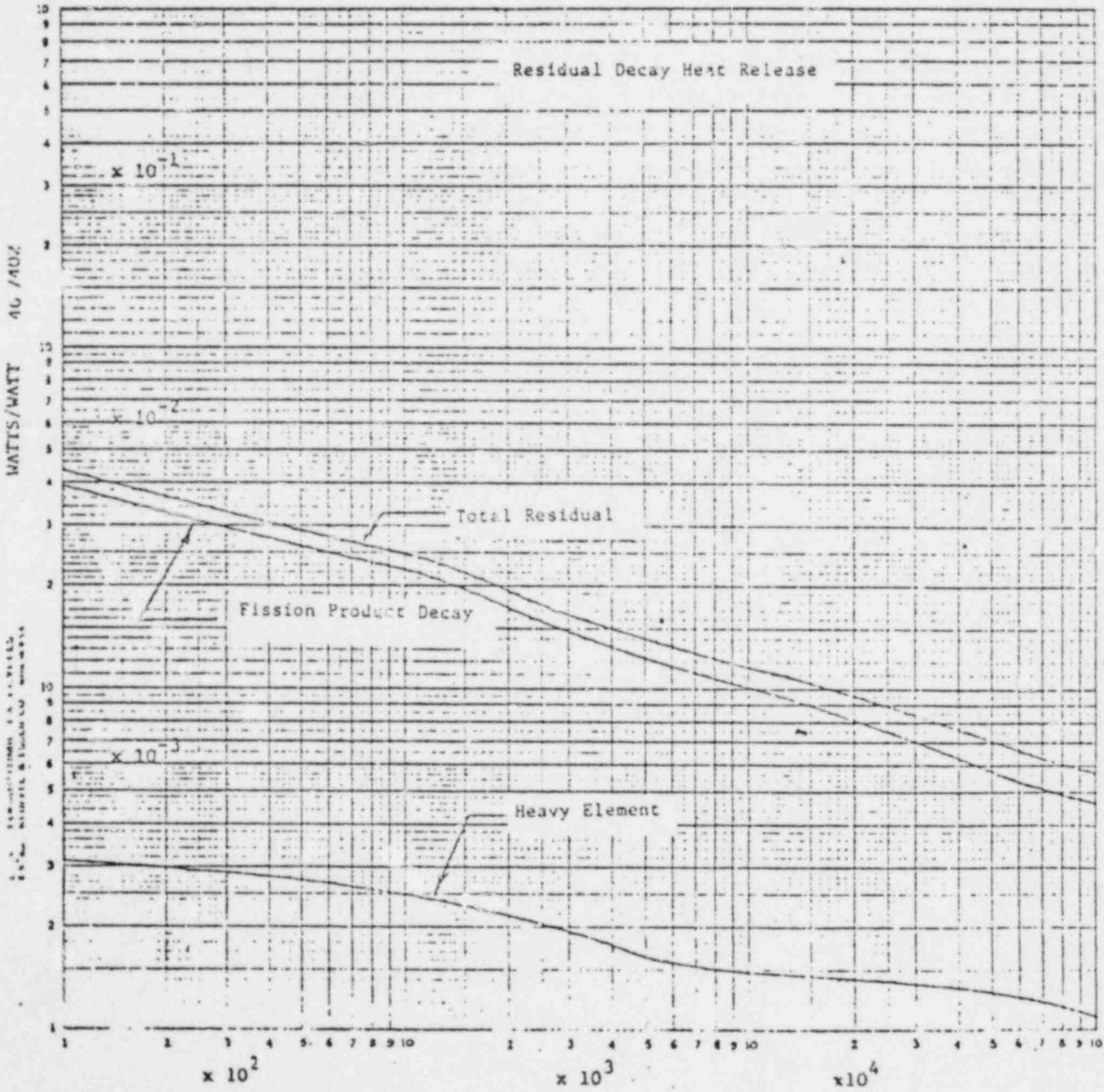

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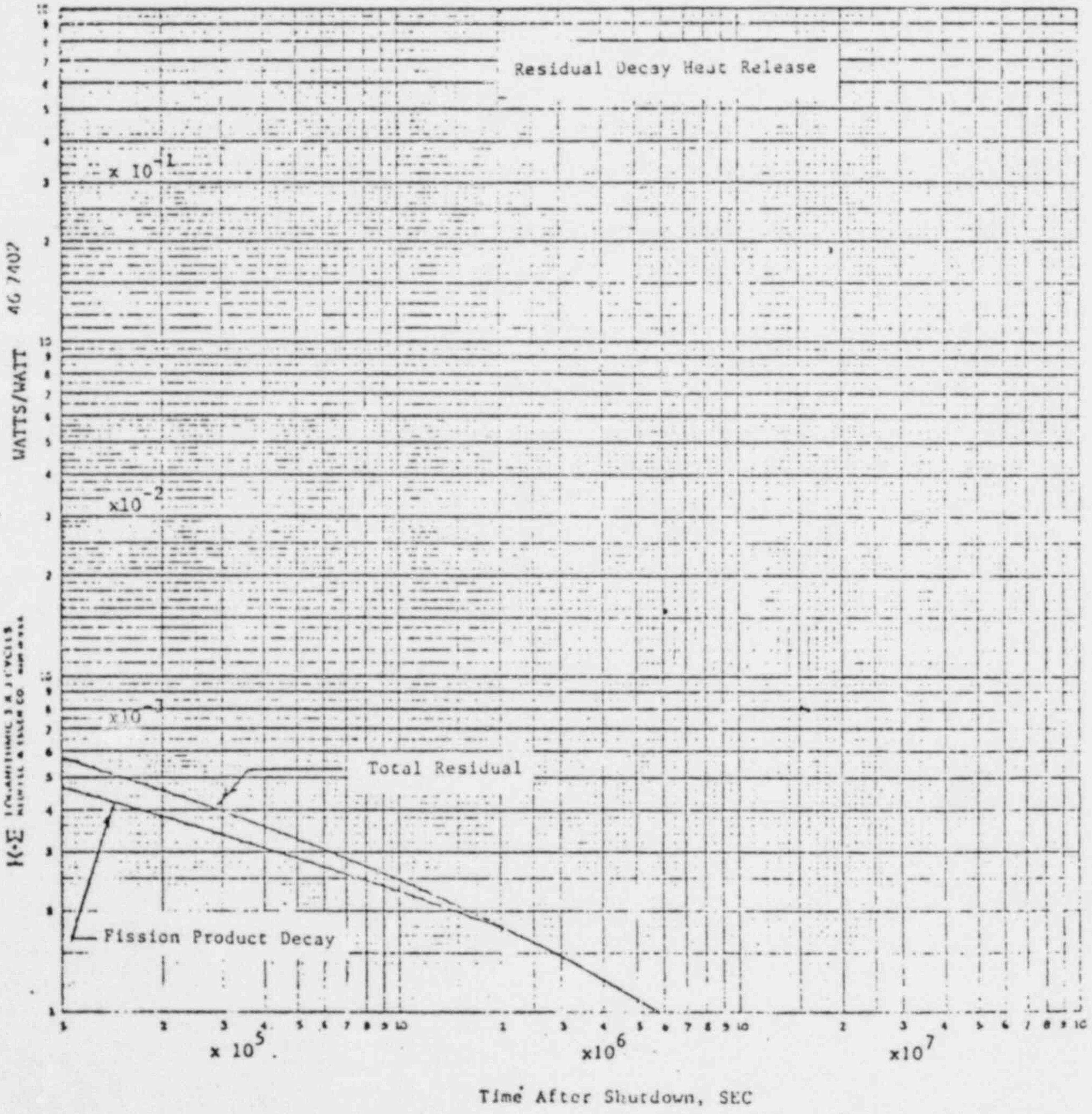

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