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

June 5, 1979

MEMORANDUM FOR: Chairman Hendrie
Commissioner Gilinsky
Commissioner Kennedy
Commissioner Bradford
Commissioner Ahearne

FROM: B. J. Snyder, Acting Director, OPE B J Snyder

SUBJECT: ESTIMATED FUEL REQUIREMENTS FOR TARAPUR REACTORS

I am providing for your information a revised analysis of the fuel requirements and schedule for the Tarapur reactors. This updates information given to you in my previous memorandum dated January 16, 1979 and factors in the current application, XSNM-1379.

CONCLUSIONS

1. With the receipt of XSNM-1222 (approved by the Commission on March 23, 1979) and considering the fuel already on hand, the Indians have adequate material for operation of TAPS I until May 1983 and TAPS II until December 1982.

2. If approved, XSNM-1379 permits another refueling and year of operation for both plants: TAPS I probably can operate until August 1984 and TAPS II until March 1984.

3. Shipment of XSNM-1379 by sea could occur as late as December 1981 without any apparent impact on the reactor schedules. Air shipment could extend this date by up to two months, at considerably greater cost.

4. The above schedules of fuel supply and usage may not allow adequate operational contingency in case of a major problem (e.g., high leakage rate of fuel during reactor operations).

DISCUSSION

As discussed in my January 16 memorandum, the average usage during 1977 and 1978 has been 56 subassemblies (S/A) per refueling. Acknowledgement of this lower usage rate, as opposed to the optimum rate of 85 S/A per refueling, is given in the State Department's March 28 submission on XSNM-1379 (ref. SECY-79-233, March 30, 1979). An average usage rate of 60 S/A per refueling has been

Contact:
B. J. Snyder, OPE
63-43276

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assumed, in this memorandum, consistent with the State Department's figure for "nonoptimum" operations.*

The total fuel available if XSNM-1379 is approved is:

ENRICHMENT	ON HAND**	XSNM-1222	XSNM-1379	TOTAL
2.66%	13,165 kg	9,120 kg	12,160 kg	34,445 kg
2.1%	10,350	6,080	6,080	22,510
1.66%	3,625	1,520	1,520	6,665

**Includes scrap

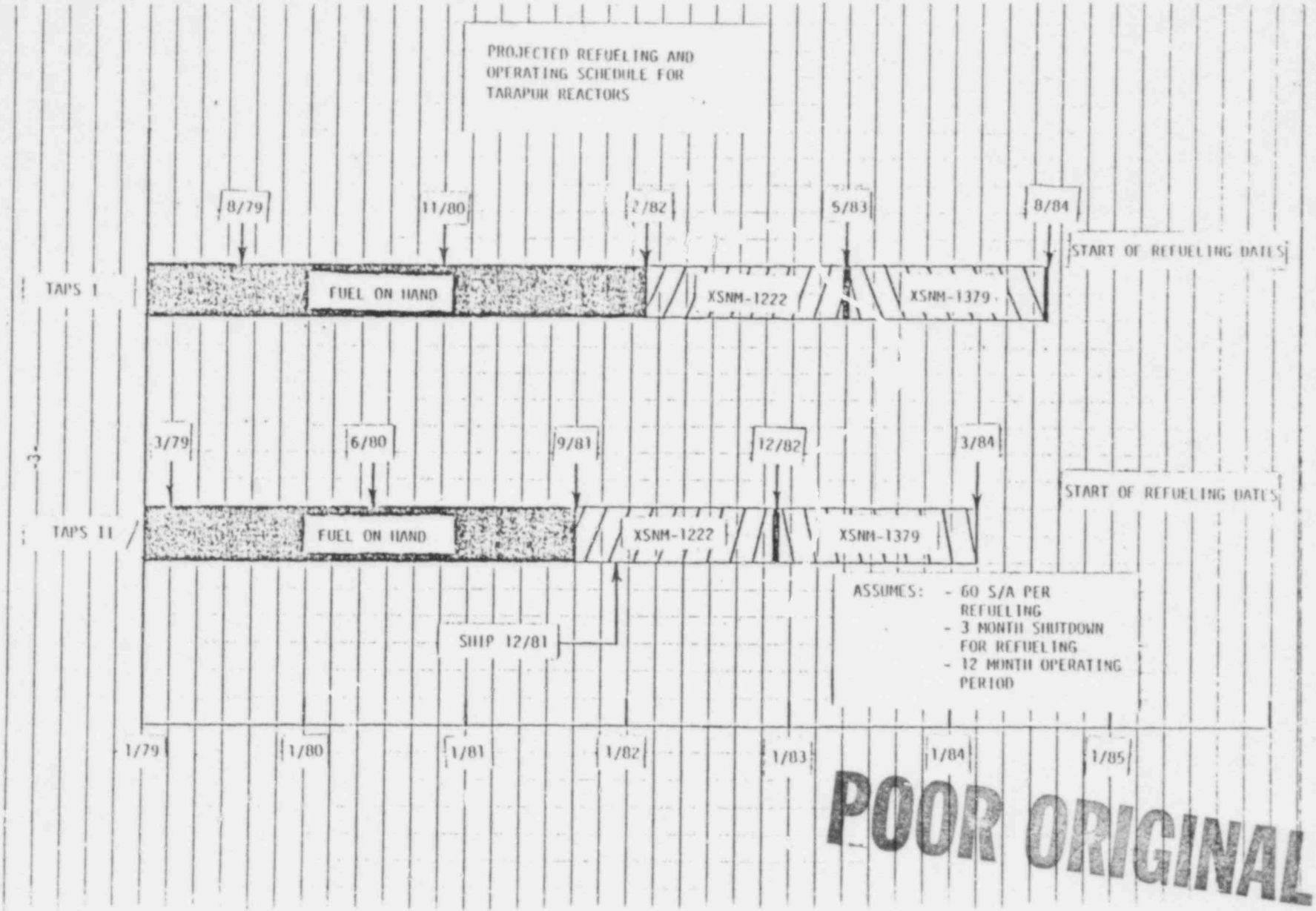
Assuming no losses in processing and fabricating, the 34,445 kg of the 2.66% enrichment limits the fuel production to 402 S/A. To this is added the number of completed S/A--97 (ref. State Department telegram of December 18, 1978) giving a total of 499 S/A available. The March 28, 1979 State Department submission states that 488 S/A would be available. The difference of 11 S/A can be accounted for by an assumed 2% material loss during processing and fabrication, which appears reasonable. Using the 488 S/A at the average rate of 60 per refueling allows for eight refuelings.

The figure on the next page shows the projected refueling and operations schedule, based on a 3-month refueling shutdown and 12-month operating cycle. This figure is basically the same as given in my earlier analysis (January 16), with corrections for a 1-month slip in the schedule for TAPS II as given by State in their March 28 submission. In a more recent State Department telegram from Bombay, on April 20, 1979, it was reported that delays were being experienced in the ongoing TAPS II refueling. The cause and duration of these delays were not specified, nor were the number of fuel S/A to be inserted.

As may be seen in the following figure, TAPS I can probably operate until August 1984 and TAPS II until March 1984 if XSNM-1379 is shipped by sea no later than December 1981. This allows adequate time for transport, customs clearances and fuel fabrication.

Maintaining the most efficient operation of the Nuclear Fuel Complex (NFC) where the TAPS fuel is produced has not been factored into this analysis. This point was discussed in more detail in my previous memoranda of January 16 and January 18 on this subject.

*In the March 28 State Department submission, they state that annual refueling with 60-65 S/A is a non-optimum condition and has resulted in power reductions to about 70% of design level. They go on to state that this non-optimum operation has been chosen largely because of continuing uncertainties regarding the supply of fresh fuel. Not mentioned by State were the recent problems with adequate spent fuel storage capacity.



In the attached Appendix, I have presented for your information an analysis of the anticipated unbalance among the three enrichments of fuel the Indians will have available, assuming XSNM-1379 is approved. As may be seen in the Appendix, this unbalance among quantities of fuel enrichments could be corrected by the Indians ordering a different mix of enrichments than they have in recent orders. This provides up to three more refuelings and 2-1/2 years more operation (until September 1986) of TAPS II and 15 months more operation (until November 1985) of TAPS I.

I hope this information will be useful to you. Please let me know if you have any questions on the above, or if you want additional information.

Consistent with your decision on my January 16 memorandum, a copy of this memorandum is being placed in the Public Document Room.

Attachment:
Appendix

cc: L. Bickwit, w/atch
S. Chilk, w/atch
L. Gossick, w/atch
J. Shea, w/atch
Public Document Room, w/atch

APPENDIX

APPARENT UNBALANCE IN THE INDIAN FUEL SUPPLY

For some reason the Indian fuel supply has been consistently unbalanced among the three enrichments required for TAPS subassemblies.

Each subassembly requires:

U-Enrichment	kg U-Total
2.66%	85.6
2.1%	42.8
1.66%	11.6
TOTAL	140

As tabulated earlier in this memorandum, the supply of each enrichment, assuming approval of XSNM-1379 is:

U-Enrichment	kg-U Available	"S/A" Possible
2.66%	34,445	34,445/85.6 = 402
2.1%	22,510	22,510/42.8 = 526
1.66%	6,665	6,665/11.6 = 575

Maximized fuel utilization could be accomplished by balancing the supply of the two higher enrichments to use the excess of 1.66% material and produce 575 S/A instead of only 402 S/A.

This would require an order of:

2.66% material

$$575-402 = 173 \times 85.6 = \frac{14{,}808 \text{ kg}}{1520 \text{ kg per } UF_6 \text{ cylinder}}$$

$$= 9.74 \text{ cylinders}$$

or 10 cylinders of UF_6 @ 2.66% enrichment

2.1% material

$$575-526 = 49 \times 42.8 = \frac{2097 \text{ kg}}{1520 \text{ kg per } UF_6 \text{ cylinder}}$$

$$= 1.38 \text{ cylinders}$$

or 2 cylinders of UF_6 @ 2.1% enrichment

Having a total of 672 S/A (575 added to the 97 completed S/A on hand in December 1978), with an average of 60 S/A per refueling provides 11 refuelings. This compares to 8 refuelings possible with XSNM-1379 combined with currently available material. These three additional refuelings would all operation of TAPS I for about 15 months longer, to November 1985 and TAPS II for about 2-1/2 years longer to September 1986.