UNION CARBIDE CORPORATION
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CORPORATE
RESEARCH LABORATORY

70-687
SNM-639 - 16

ENCLOSURE TRANSMITTED HEREWITH
CONTAINS 10 CFR 2.790 INFORMATION

November 10, 1978

Dr. Clifford V. Smith, Jr., Director
Office Of Nuclear Material Safety & Safeguards
United States Nuclear Regulatory Commission
Washington, D. C. 20555

Subj: Request For Exemption Pertaining To 10 CFR 73.50.

Dear Dr. Smith:

Attached please find a document entitled, "Union Carbide Nuclear Reactor (UCNR), Request For Exemption Pertaining To 10 CFR 73.50, November 10, 1978".

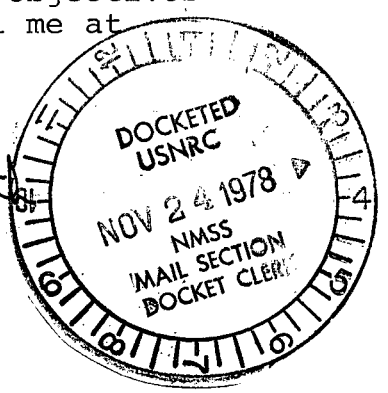
It is requested that pursuant to 10 CFR 2.790 (d) the attached information be withheld from public disclosure.

If we can be of further assistance in meeting the objectives stated in the attachment, please feel free to call me at (914) 351-2131 extension 345.

Yours very truly,

Marcus H. Voth

Marcus H. Voth
Manager
Nuclear Operations



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Attachment

FEE EXEMPT

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11219

UNION CARBIDE NUCLEAR REACTOR (UCNR)
REQUEST FOR AN EXEMPTION PERTAINING TO 10 CFR 73.50
NOVEMBER 8, 1978

SUMMARY

Union Carbide operates a nuclear research reactor and hot laboratory facility at Sterling Forest, New York, for the production of medical radioisotopes under NRC licenses R-81 and SNM-639. A unique aspect of our operation is that self-protected Special Nuclear Material (SNM) is routinely processed. The requirements of 10 CFR 73.50 apply if the formula quantity of SNM is greater than 5000 grams; self-protected SNM in the form of fuel elements removed from the reactor core need not be included in the formula quantity. We believe the self-protected target material in our facility meets the same criteria concerning theft and industrial sabotage as does the irradiated reactor fuel. Therefore, we conclude that an exemption that allows us to also exclude self-protected target material from this formula quantity will not endanger life or property or the common defense and security and is in the public interest. We request that an exemption be issued which reads as follows:

"Pursuant to the provisions of 10 CFR 73.5, and a showing of good cause by the licensee in his submittal dated November 10, 1978, an exemption is hereby granted by revising the last sentence of the first paragraph of 10 CFR 73.50, as it applies to license numbers R-81 and SNM-639, to read as follows:

'The requirements of this section do not apply only when such material is located in the core of the reactor, stored as irradiated fuel elements removed from the reactor core and/or possessed in the form of irradiated target material which has a total external radiation dose rate in excess of 100 rems per hour at a distance of 3 feet from any accessible surface without intervening shielding.'"

The need for such an exemption, a safety evaluation in support of the exemption, and a discussion of how hardships can be averted by timely action are presented below.

NATURE OF FACILITY AND OPERATION

The portion of the Sterling Forest site under discussion consistsof two adjoining buildings, the reactor building and hot laboratory facility. The two buildings share a common wall, penetrated by a personnel airlock, an equipment transfer airlock, and a water-sealed transfer canal. The reactor operates under license number R-81 which allows up to 40,000 grams of uranium-235, up to 5000 of which may be in the form of unirradiated reactor fuel elements and the remainder in the form of either fuel in the reactor core or self-protected fuel removed from the reactor core. (In this letter the term "self-protected" is used to describe any material having a total external radiation dose rate in excess of 100 rems per hour at a distance of 3 feet from any accessible surface without intervening shielding as provided in 10 CFR 73.6 (b)). Since there is no longer a commercial supplier of research reactor fuel in the United States, UCNR fuel is fabricated in France by CERCA. Standard fuel elements contain approximately 200 grams of fully enriched U-235; control elements contain 110 grams each. The most economical means of fuel delivery has been in 3000 to 4000 gram shipments. The primary function of the reactor has been to irradiate uranium targets to produce fission product molybdenum which is used for medical diagnostics.

The hot laboratory building is used primarily to prepare targets for irradiation and to process irradiated targets. The fully enriched U-235 targets comprise the majority of the material under license SNM-639. Targets are physically 1¼" diameter by 18" long. After being irradiated to the desired fluence the target is well above the self-protected threshold. It is placed in a hot cell where the uranium and fission products are dissolved off the tube. The Mo-99 is separated and processed. The majority of the uranium does not fission and is packaged as a self-protected solidified waste material.

Table 1 shows the typical quantities of SNM and the relative license limits. The inventory varies as feed material for targets arrives and is depleted, wastes (processed targets) accumulate and are shipped, new fuel arrives and is irradiated, and spent fuel accumulates and is shipped.

SECURITY CONSIDERATIONS

Security regulations have the stated purpose of protecting against theft and industrial sabotage. A physical security plan which has been in effect for several years is on file with the Commission. The hot laboratory and the reactor are part of the protected area defined in the plan. The main objective of the plan is to establish and maintain protective barriers with intrusion detection devices and to define liaison and communication with law enforcement authorities.

The potential consequences of theft or sabotage of unirradiated material are minimized by maintaining the inventory of unirradiated material at less than strategic quantities, that is, below the 5000 gram threshold. A fundamental nuclear material control measurement and accounting program is in effect pursuant to 10 CFR 70.57 and 58. Material balance areas are defined, transfers from one to another are independently monitored and assayed, and the inventory in each area is audited on a regular basis. Anyattempted diversion would be detected promptly and corrective action taken.

The potential for diversion or sabotage is further diminished by the fact that the unirradiated SNM is either in process under the supervision of site personnel or in one of nine locked storage areas. Futhermore, the SNM exists in a number of physical forms; sealed calibration sources, fuel elements, liquid plating solution, and sealed targets. Anyone posing a security threat would be most interested in adequate quantities of material in one location of one form such that he needs the least amount of time with the least knowledge of the facility and the techniques required to convert the material to a useable form. This diversity in form and storage location should in itself be adequate justification for an exemption from the requirements of 10 CFR 73.50. However, such an exemption regarding unirradiated SNM is not necessary if the requested exemption concerning self-protected material is granted.

This exemption request seeks to have 10 CFR 73.50 treat all self-protected target material in the same manner as irradiated fuel. Irradiated fuel and irradiated target material are equally self-protected for security considerations. Having demonstrated this fact in the remainder of this paragraph, considering self-protected target material to be equivalent to irradiated fuel will not endanger life or property or the common defense and security. The radiation levels are such that theft of either would require heavy shipping casks. Loading a cask requires the operation of slow-moving overhead cranes and other special handling devices. Both spent fuel and irradiated target material are within the protected area at all times. Local law enforcement personnel could respond to avert such a theft before material in either form could be removed from the site. A saboteur intent on contaminating the site and/or vicinity by manual dispersion, conventional explosive devices, or nuclear chain reaction would find it more difficult to do so with irradiated target material than with spent fuel. The nature of spent fuel, its location and the quantity is information a potential saboteur might conceivably acquire from public information. The same set of information regarding the processing of irradiated target material is not nearly as available and, in fact, may change on a daily or weekly basis. Futhermore, most self-protected target material is confined within hot cells, requiring a potential saboteur to have a knowledge of hot cell design,

skills in manipulator operation, and a willingness to risk receiving a lethal radiation dose.

The Sterling Forest facility is unique from most other reactor facilities in that we have a sizeable quantity of irradiated target material being self-protected to the same degree as irradiated fuel. The unnecessary burden placed on our facility was probably not contemplated when 10 CFR 73.50 was promulgated. By granting the requested exemption the situation will be rectified. An equally acceptable alternative, if it can be accomplished in as timely a manner as granting an exemption, is to amend the regulation.

NEED FOR AN EXEMPTION

Regulations promulgated in recent years raised the issue of additional security requirements for licensees possessing greater than 5000 grams of formula quantity SNM. We questioned the applicability of 10 CFR 73.50 to our situation since we hold two licenses for the same site with limits stated independently of one another. On September 21, 1978 Mr. G. W. McCorkle of your office informed us that the requirements of 10 CFR 73.50 apply whenever the total U-235 in unirradiated fuel elements outside the core and irradiated and unirradiated target material exceeds 5000 grams.

To comply with this recent interpretation, efforts were immediately concentrated on reducing the formula quantity to below 5000 grams. (The alternative of implementing 10 CFR 73.50 was not judged to be a reasonable and viable approach because the Sterling Forest operation does not involve strategic quantities of non-self-protected materials.) We first reviewed our inventory to determine if it could be reduced without affecting production. We began irradiating new fuel to its self-protected threshold as rapidly as possible. We deferred indefinitely plans to receive the final 4000 gram shipment of fuel from France, originally scheduled for delivery in late October. We searched for other facilities in the area at which our new fuel might be received and stored, both facilities meeting 10 CFR 73.50 and those where the inventory could be maintained below 5000 grams. We considered licensing other Union Carbide

sites to store up to 5000 grams of unirradiated fuel assemblies. We began investigating arrangements to have fuel delivered from France in small shipments. Finally, we began an evaluation of the self-protected material in production to see if an exemption from 10 CFR 73.50 is justified.

The action taken provides only temporary relief. Table 1 summarizes the current inventory. The only way to make a significant reduction is to irradiate the new fuel to the self-protected threshold. The reference fuel elements (330 grams) must remain unirradiated for comparison to incoming CERCA fuel, an agreement made with the NRC while seeking the export and import licenses. We will soon reluctantly begin loading into the core the remaining unirradiated fuel (660 grams). These six control elements were left for last in hopes of another alternative because loading them into the reactor requires dismantling of other reactor components. The additional handling increases the probability of damage to the close tolerance fuel element fitting which mates with the control rod drive mechanism. Once irradiated, it can be difficult or impossible to repair a damaged element for further use. Delaying the receipt of fuel from France is only an interim measure. In addition to a desire to have the fuel in our possession as soon as possible and avoid storage problems aboard, we are committed by our import license to have the fuel elements in this country by May 1, 1979. Table 1 shows that after all non-reference fuel elements are irradiated to the self-protected limit, the typical inventory subject to the 500 gram limit is 4680 grams. By closely scheduling waste shipments and receipt of target material, it may be possible to reduce this inventory to about 4200 grams for a few days without interfering with production. This would allow a 800 gram delivery of new fuel elements from an offsite storage lcoation or from France. Once the fuel is loaded into the core the SNM inventory can again return to its normal level. Delivery of fuel directly from France to the UCNR in small batches presently appears to be the most likely possibility for the near term, albeit a very expensive alternative. No available offsite storage locations have been identified to date where fuel can be stored without further licensing action.

While a short term course of action appears tenable, we are placed in a precarious position. Being the sole domestic supplier of our product, we feel a great responsibility to maintain the production level of medical radioisotopes. Because of the short halflives involved we cannot rely on an inventory but must maintain uninterrupted production. It is not prudent to rely on the coordination between foreign deliveries of fuel and manipulation of the SNM inventory as a long range resolution. It is therefore in the public interest that this request for an exemption be processed expeditiously.

Not mentioned to this point is our U-235 reclamation program. A very small fraction of the U-235 target material fissions before the target must be processed. To date, the unfissioned U-235 has been processed as waste. Realizing that this is a waste of natural resources, an unnecessary burden on waste disposal sites and an unnecessary expense in production, we have recently developed and are about to implement a process of reclaiming U-235 from irradiated targets. The reclaimed U-235 will be reprocessed at Savannah River. With the process in operation a net annual savings of $500,000 is anticipated. The inventory of self-protected target material will most likely increase to some degree due to the reclamation program. Wastes could conceivably be stored until the reclamation process is operational so as to conserve additional resources, waste disposal commitments and money. This can not be done without this requested exemption. Being virtually at the 5000 gram limit as the present time, the reclamation process may be in jeopardy should an exemption not be granted.

TIMING

There are four important considerations involving the timing of events. We request your timetable so that we can incorporate that into our decisions.

From November 17 to December 15, 1978 we intend to irradiate the remaining control elements to the self-protected threshold. We consider this a necessary response to the September 21, 1978 letter, despite the risk of damage discussed earlier.

Waste reclamation is expected to begin in early January. After that time it may be increasingly more difficult to drop the inventory to accept shipments of fuel from France in four element batches. Two element shipments (at virtually twice the already escalated shipping cost) would still be a possibility.

In order to meet the May 1, 1979 expiration date of our import license, we can wait no longer than February 1, 1979 to finalize shipping arrangements, allowing time to irradiate one shipment to self-protected limits before receipt of the next shipment. If there is a good possibility of receiving an exemption by February 1, it would be to our advantage to defer receipt of any CERCA fuel until after receiving the exemption, at which time we could receive it as a single shipment.

We have signed a letter of intent for fabrication of another batch of CERCA fuel which should be available for delivery in mid-1979. The exemption issue should certainly be resolved well in advance of that time so that delivery in small shipments need not be a consideration.

It is clearly in the best interest to have an exemption granted promptly. If sufficiently timely, this would allow us to terminate the premature irradiation of control elements. Also, we could accept earlier delivery of fuel now stored aboard.

PART 2.790 (d) INFORMATION

TABLE 1

Material	Equivalent Grams of U-235		
	Typical Current Inventory	Limit Under License R-81	Limit Under License SNM-639
Calibration sources - U-233 & Pu-239	200	NA	250
Irraidated fuel elements in hot cells	0	NA	400
Unirradiated target material	750	NA	4200
Irradiated target material and waste (self-protected)	3,400	NA	
Unirradiated reference fuel elements	330	5,000	NA
Unirradiated fuel elements (other than reference elements)	660		
Irradiated fuel elements (self-protected)	5,000	40,000	
Fuel in reactor core	5,000		

PART 2.790 (d) INFORMATION

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CORPORATE
RESEARCH LABORATORY

November 10, 1978

Mr. Victor Stello, Jr., Director
Division of Operating Reactors
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Subj: Exemption From 10 CFR 73.50.

Dear Mr. Stello:

We have appreciated your recent interest and concern regarding the hardships imposed on test, research, and training reactors by the promulgation of new security regulations. Because of the unique nature of the design and operation of each reactor in this group, we believe that certain of the regulations are without sound technical bases in their application to these unique facilities.

For your information two letters are attached. Mr. George W. McCorkle's (USNRC) letter to Union Carbide Corporation dated September 21, 1978 states that the requirements of 10 CFR 73.50 apply to our site whenever the total uranium-235 in unirradiated fuel elements and in irradiated and unirradiated target material exceeds 5,000 grams. My response to Dr. Clifford V. Smith dated November 10, 1978 provides numerous reasons why 10 CFR 73.50 is inappropriate for our facility at Sterling Forest. However, the route we have taken, which we hope to be more expedient, is to request an exemption from 10 CFR 73.50 in that self-protected target material, in addition to irradiated fuel elements, be exempt from the 5,000 gram limit.

We solicit your staunch support of what we trust you will find to be a sound technical resolution to our special situation. We are most receptive to any questions or comments you may have regarding this matter.

Yours very truly,

Marcus H Voth

Marcus H. Voth
Manager
Nuclear Operations

MHV:js
Attachments

cc: Dr. Clifford V. Smith (USNRC)