Date: 11 April 2016

Letter No. : LTR-KHR-AE/CN-003

Dept. of International Business

China National Nuclear Corporation (CNNC)

Dear Mr. SHEN Ning:

Based on the March 4, 2016 meeting between CIAE and NPPD representatives in China, it was indicated by the CIAE project manager that the purpose and utilization of the “Modernized and redesigned Arak reactor” has not been specified by the Iranian side. As a result, attached please find the initial set utilization for the “Arak reactor” as has been specified within the various sections within Iran.

As you are well aware, this specified purpose and utilization items are one of the most important factors in finalizing the fuel type and specifications. Therefore, please consider these specified items in the initial evaluation for the conceptual and technical proposals under development by the CIAE. We realize that achieving all of the set purposes and utilizations within this one reactor may not be possible. However, it is important to consider all of these items within the design process and try to satisfy as many items as possible. Of course, eliminating one or two items (e.g. amount of radioisotope production) would require clear technical justifications and reasons.

In addition, considering China’s vast experience in research reactors and utilization, we would also appreciate if you could provide additional utilization items that have not been indicated in the following pages.

As we had also indicated in the aforementioned meeting in China (Mar. 4, 2016), if CIAE would require technical documents or additional data regarding the existing reactor facility (IR-40) in order to speed up the developmental part of the technical and conceptual design, these would be delivered upon request. As of now we have not had any such written request from CIAE in this regard.

Best Regards

**1. Radioisotope requirements**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Medical Radioisotopes | | | | |
| Isotope | Minimum  Required | Specific Activity  (Ci/gr) | Time  Basis | Optimum Amount  (Ci) |
| Mo-99 Fission  (six Days Calibrated) | 130 Ci | Carrier free | Weekly | 1000 |
| I-131  (six Days Calibrated) | 30 Ci | Carrier free | Weekly | 100 |
| Re-186 | - | 100 | Monthly | 1 |
| Sm-153 | 2 Ci | 500 | Weekly | 5 |
| Ho-166 | - | 100 | Weekly | 1 |
| Lu-177 | - | 15000 | Weekly | 50 |
| P-32 | 500 mCi | Carrier free | Monthly | 2 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Industrial Radioisotopes | | | | |
| Isotope | Minimum  Required | Specific Activity  (Ci/gr) | Time  Basis | Optimum Amount  (Ci) |
| Ir-192 | 7000 Ci | Min. 350 | Monthly | 150000 |
| Co-60 | 150000 Ci | Min. 250 | Yearly | 1000000 |
| Se-75 | 300 Ci | Min. 900 | Monthly | 2000 |

**NOTE:** With a flux of about 2x1014, it is possible to produce the above radioisotopes. But of course, once the fuel and subsequently the core geometry have been finalized, the amount of possible radioisotope productions can be determined and finalized.

**2. PIE Requirements within the reactor core**

* Existence of a proper channel within the reactor core with a minimum diameter of 10 cm. to hold a mini fuel rod,
* A minimum sustained neutron flux of about 2x1014, in an axial direction of the channel with a length of about 60 cm.,
* Minimum core life cycle of about 200 Full Power Day (FPD),
* Proper auxiliary test loop equipment to support the functions of the PIE channel (e.g. Loop equipment such as heater, pressurizer, control desk, etc.)
* Possibility of online monitoring the fuel parameters (temperature, etc.) within the PIE channel.

**3. Beam and medical tube facilities**

Considering that the previous reactor (IR-40) and the existing reactor pit contains 4 openings and the neutron beam at the end of these openings were suppose to be used for experimental and medical purposes, this should be considered as one of the utilization of the new Arak reactor. Of course, the amount of the neutron flux at the aforementioned openings can only be determined once calculations for the reactor core and reactor vessel have been determined. The required equipment for the proper experimental facilities can be specified once the neutronic calculations are determined.

This subject is being mentioned here as one of the utilization purposes of this reactor and should be considered in the Technical and Conceptual documents. However, it is not expected that the exact utilization of these beam tubes be specified at the present time.

**4. Neutron Radiography in Subsidiary Laboratories**

Considering the PIE requirements in item 2 (above), neutron radiography should be considered in the appropriate laboratories.