SCHOOL OF
ENGINEERING
& APPLIED SCIENCE

DEPARTMENT OF NUCLEAR ENGINEERING
ENGINEERING PHYSICS

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March 4, 1992

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Contracting Officer
Contracts Division
U.S. Department of Energy
Chicago Field Office
9800 South Cass Avenue
Argonne, Illinois 60439

Re: Grant No: DE-FG07-90ER12983 (Univ. Reactor Instrumentation Program)
UVA S-2741

Dear Sir:

In the 1990-91 fiscal year the University of Virginia Reactor Facility was awarded a grant of $60,000 to purchase a gaseous effluent monitor for the stack which exhausts the air from the reactor room. As outlined in a letter from Robert Mulder, Reactor Facility Director, we were not able to purchase this monitoring system for several reasons, the most important being that the actual bids received exceeded suppliers the previously quoted prices by about 50% and the fact that upon further analysis we concluded that such a system would not be able to measure the concentration of the exhaust air during all anticipated circumstances.

An extension to the end of the project period from September 1991 to December 31, 1991 was obtained in order to resolve these problems.

The conclusions reached were:

(1) A stack monitor, no matter how sophisticated, will not measure the concentration of radionuclides in the exhaust air from the UVAR reactor room during "accident" situations when the room is automatically sealed and the stack turned off, as required by procedure.

(2) The presence of an instrument which measures the concentration of noble gas radionuclides in the reactor room air, along with the particulate monitor (with minor upgrading) that is already in use, would provide more useful information than provided by a stack monitor. It will measure the concentrations in the room both during normal operations and during accident conditions.

(3) A room monitor is less costly, easier to calibrate and maintain, and of greater benefit than a stack monitor.

Therefore, we intend to purchase a room monitor to measure the radioactive noble gas levels in the reactor room. This instrument will cost around $12,000 and has been ordered. It is manufactured by EG & G instruments and it should be delivered within two months.

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Reactor Room Noble Gas Monitor $12,000

This instrument monitors operationally produced argon-41. Ambient radiation levels in the reactor room are less than 0.5 mr/hr. During accident conditions this instrument would monitor fission product gasses in much higher radiation fields. Therefore, some means must be provided to monitor and compensate for the ambient radiation level near the detector to determine the actual noble gas activity.

Instrument characteristics are:

(1) Continuous flow, non-pressurized chamber
(2) Means of subtracting signal from ambient radiation
(3) Sensitive enough to detect 2E-7 uCi/ml of argon-41 in the sampled air.
(4) Allow remote reading via serial computer interface
(5) Have analog output for driving strip chart recorder
(6) Read out in Engineering units such as uCi/ml
(7) Have outputs for remote alarms

The proposed new allocation of the balance of the $60,000 grant is as follows:

Item #1 Upgrade Electronics for Existing Continuous Flow Airborne Particulate Monitor $5,000

The existing airborne particulate monitor in use at the UVA reactor facility has been in use for about 15 years. It has a number of minor drawbacks that could be overcome with an upgrade of the electronics. First, the instrument is time-consuming and difficult to calibrate. With the small number of staff members and the high volume of work at the UVA reactor facility, staff time is at a premium. Secondly, the output from the instrument is currently displayed only in units of counts per minute on a simple analog meter and strip chart recorder, which is not a very useful method of conveying this information to the reactor operator. The desired replacement equipment will make this instrument compatible with other equipment we intend to purchase. Also, it will display the rate of change of the radioactivity collected on the filter in the system, which is a desired parameter. Additionally, the ability to monitor the instrument output remotely through an RS-232 connection would allow this instrument to be used for monitoring the airborne activity in the reactor room during both operational accident situations.

A replacement system which encompasses the detection system and the rod control system is commercially available and should reduce maintenance activities and enhance safe operation.

Item #2 Wide Range Linear Neutron Channel with Servo Rod Control $30,000

The existing linear neutron channel and rod control mechanism utilizes some 1950's vintage equipment in a system designed in-house in the early 1960's. The current system consists of:

(1) A compensated ion chamber, manufactured by either Westinghouse or Reuter Stokes. The instruments we utilize are typically used, second-hand models that are 10-20 years old.
(2) Compensation voltage power supply, part of an old Bailey Instruments / Stromberg-Carlson nuclear instrumentation drawer.
(3) Keithley 410 model picoammeter. This particular instrument has been modified over the years to meet our needs and no instrument of current manufacture has the output functions required to operate our servo system. Also, this instrument has needed many minor repairs in the past and there is no good indication of how long it might actually last.
(4) The power supply for the servo control mechanism is an old tube type model. Repair parts are available but because of its age there is no way of telling how much longer the entire instrument will continue to be operable.
(5) The actual input signal to the servo control system is from one of the two channels on a two pen chart recorder. This channel receives its input from the linear power picoammeter. Recently, this recorder has not been exceptionally reliable.

Item #3 Strip Chart Recorders for Radiation Monitors $ 3,000

The output from the new noble gas monitor, the constant flow particulate monitor and a monitor measuring the argon-41 concentration in the exhaust duct need to have a hard copy record of their output. With this amount three pen recorders will be purchased. The recording of the output allows the observation of the rate of change of the signal as well as the analysis of trends in the absolute reading.

Item #4 Reactor Core Differential Temperature Monitor $ 6,000

The absolute thermal power generated by the UVAR reactor is measured by performing a heat balance across the core. Currently, this is done with an instrument designed and built about 15 years ago by a former reactor staff member. This

instrument needs to be replaced with a commercial instrument to provide better reliability and accuracy. This upgrade will enhance safety and regulatory compliance.

Item #5 Contingencies $ 4,000

The original grant was for the amount of $60,000. This $4,000 balance will be used to offset unforseen expenses in the purchase or installation of the items.

In order to apply the balance of the original grant of $60,000 to other safety related instrumentation we would like to request project period extension to August 31, 1992. This is the second extension requested for this project; an extension was granted through December 31, 1991. This new date will correspond to the date of the end of a second instrumentation grant of $35,000. All monies will be spent by August 31, 1992.

Sincerely,

Paul E. Benneche
Supervisor, U.Va.
Reactor Facility

Robert U. Mulder
Director, U.Va.
Reactor Facility

cc: Mr. Craig Basset, NRC, Atlanta