WASHINGTON STATE UNIVERSITY
PULLMAN, WASHINGTON 99164

NUCLEAR RADIATION CENTER

October 8, 1979

DOCKET NUMBER PR
PROPOSED RULE -70 73(43FR35321)

Dr. Joseph M. Hendrie, Chairman
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Dr. Hendrie:

I am writing to you on behalf of the students and faculty of this University as well as the citizens of the State of Washington and the nation as a whole concerning the application of the "upgrade rule" to non-power reactors. This rule, if applied to non-power reactors would have a devastating effect on this and other research reactors and the associated education and research activities carried on at university research reactors. In order to meet the requirements of the "upgrade rule", it would cost this and other educational reactors of the order of one million dollars. The administration of this and most other universities will shut down the facility rather than spend the necessary funds, let alone provide the required degree of security which is inconsistent with a university environment.

I was shocked by the fact that the Commissioners are really not aware of the type and quantity of research that takes place at a typical university research reactor nor the impact upon the educational system that shutting down the research reactors would have. The transcript of the Public Meeting on the Upgrade Rule held on July 24, 1979 documents the limited understanding by the Commissioners of the activities of a typical university research reactor. I have enclosed for your information a copy of the Short Form Annual Report for this facility. You will note that we, like most research reactors, do a lot more than make a few isotopes and train a few nuclear power plant operators. We are heavily involved with energy and environmental related research projects. The major nuclear activity is in the area of trace element analysis by means of neutron activation analysis.

We recently made application to the Commission for the renewal of the facility license for the W.S.U. TRIGA reactor facility. As part of that application we were required to provide an Environmental Impact Appraisal. Sections 7.0 to 9.0 of that appraisal are repeated below as they are quite applicable in considering the impact of the upgrade rule.

7.0 ALTERNATIVES TO CONTINUED OPERATION OF THE FACILITY

There are no suitable or more economical alternatives which can accomplish both the educational and research objectives of the facility. These objectives include but are not limited to: the training of students in the operation of nuclear reactors; the training of students in the use of

radioisotopic tracer techniques; the production of radioisotopes for use in numerous areas of the physical, biological, and animal sciences; the training of students and research applications of trace element analysis by neutron activation analysis; and also a demonstration tool to familiarize the student body and general public with nuclear reactors and their operation.

8.0 SHORT-TERM EFFECTS VERSUS LONG-TERM GAIN OF FACILITY OPERATION

One of the chief objectives of any institution of higher education is to increase the body of knowledge available to mankind and to impart that knowledge to individuals. Accordingly it is very difficult to compare the long-term gains from the operation of a research reactor in relation to the short-term environmental effects. However, the total environmental effects of the W.S.U. TRIGA reactor and associated Nuclear Radiation Center are not significantly different from other research laboratories at a typical university. For the most part, the cumulative long-term benefits of university activities far outweigh the environmental effects of such activities. This would also be true for the continued operation of the W.S.U. reactor.

9.0 COST BENEFIT ANALYSIS

The facilities at the Nuclear Radiation Center represent an investment of the order of $2 million dollars. If the facility were shut down, the benefits derived from this investment would drop to zero. On the other hand, continued operation would allow the continuation of 10 ongoing research programs and the completion of about 8 graduate thesis research projects per year. The benefits also include the educational objectives mentioned in Section 7.0. Considering the minimal environmental effects of the continued operation of the reactor as previously cited in this report, the environmental cost effects are exceedingly small compared to the benefits to be derived from continued operation.

Enclosed you will find a copy of our response to Mr. Miller's letter of July 30, 1979. The impact of the upgrade rule on this and many other non-power reactors is far from minor and insignificant. The N.R.C. staff, in their report to the Commission (SECY-79-197, Enclosure B, page 4, section 2.3 of March 16, 1979), obviously made an error in judgment in stating "most research facilities will not be covered." Through this error the formal impact consideration required by NPEA and part 51 were not complete in that research reactors were not considered in detail. In order to insure an uninterrupted continuance of nuclear research and educational activities at research reactors, which is vital to our country, I urge you to exempt research reactors from the upgrade rule.

The proposed changes to 10 CFR 73 published in 43 FR 22211 on May 24, 1978 contain a footnote indicating that the Commission was considering developing a set of safeguards requirements specifically for non-power reactors. The NRC staff paper SECY-79-187 of March 16, 1979 to the Commissioners on the subject of the Safeguards Upgrade Rule" on page 4 states, "The non-power reactor protection rule will eventually cover non-power reactor protection (exclude them from the proposed requirements of the safeguards upgrade rule and category II and III rule) . . ." In good faith it would seem to me to be incumbent upon the Commission to carry through with the development of the non-power reactor safeguards regulations and to delay application of rules developed for other types of facilities upon non-power reactors until the latter specific regulations are developed.

Your attentive consideration of this matter is appreciated.

Sincerely,

W. E. Wilson
Associate Director

WEW:sms

Enclosures

Annual Report for 1978-79

(Short Form)

I. Name of Unit: Washington State University Nuclear Radiation Center

II. Director: R. H. Filby

III. Faculty:
R. H. Filby, Director
W. E. Wilson, Associate Director
D. D. Barbee, Assistant Scientist
C. K. Chow, Assistant Scientist
M. L. Hunt, Research Associate
B. Srinivasan, Assistant Scientist
A. Volborth, Scientist
F. Yaghmaie, Research Associate

IV. Graduate Research Assistants:

A. K. DasGupta
V. Ekambaram
F. S. Jacobs
S. R. Khalil
C. A. Palmer
K. J. Peng
C. S. Weiss

V. Classified and Exempt Staff:

S. C. Hawley, Reactor Supervisor
J. M. Frame, Associate Facilities Engineer
M. J. Scott, Engineering Technician II
C. A. Palmer, Research Technologist II
E. F. Bricker, Secretary IV
Office Assistant II-Typing

VI. Date of Establishment

The research unit currently called the Nuclear Radiation Center was initially established as the W.S.U. Nuclear Reactor Laboratory in 1961. In 1969 the facilities of this unit were expanded to form the Nuclear Radiation Center.

VII. Purpose of Unit:

The Nuclear Radiation Center is an all-university research and educational facility intended to serve as the focal point for nuclear related research and instructional activities at W.S.U. The Center provides facilities for faculty and student research projects from a number of different departments on campus. Irradiation services and neutron activation analysis services are provided to the campus and to other educational institutions in the Northwest and to commercial users on a contract or service agreement basis.

VIII. Narrative of Year's Activities:

A. Students Trained

A number of graduate students at W.S.U. used the facilities at the Center for their thesis work during the year as listed below.

1. Degrees Received

a. S. R. Khalil, Ph.D. (Chemistry). Trace Element Distribution in the Solvent Refined Coal Process. Advisor: R. H. Filby

b. V. Ekambaram, M.S. (Geology). Trace Elements in Florite Minerals. Advisor: J. Mills

c. N. Hashmi, M. S. (Environmental Science). Fate of Trace Elements in Brewing and Decaffeination of Coffee. Advisor: R. H. Filby

2. Degrees in Progress

a. S. C. Guess, M. S. student in Engineering. Chemical and Physical Changes in Asphalt Weathering. Advisor: R. H. Filby

b. A. K. DasGupta, Ph.D. student in Chemistry. Development and Applications of Radiochromatography to Studies of Coal. Advisor: R. H. Filby

c. V. Ichimura, Ph.D. student in Geology. Uranium Concentrations in Ground Waters of Pullman/Moscow Basin Measured by Fission Track Method. Advisor: J. Crosby

d. C. A. Palmer, Ph.D. student in Chemistry. Trace Elements in Coal. Advisor: R. H. Filby

e. C. S. Weiss, Ph.D. student in Chemistry. Trace Elements in the Liquid Chromatography of Solvent Refined Coal. Advisor: R. H. Filby

f. F. Y. Iskander, Ph.D. student in Chemistry. Use of Atomic Absorption Techniques. Advisor: R. H. Filby

g. M. A. Purcell, Ph.D. student in Chemistry. Double Beta Decay and Muon Induced Reactions in Natural Samples. Advisor: B. Srinivasan

h. K. A. Hawley, graduate student in Chemistry. Analysis of Meteorite, Lunar, and Terrestrial Samples. Advisor: B. Srinivasan

2. Degrees in Progress (cont'd)

   i. F. S. Jacobs, Ph.D. student in Chemistry. Geochemistry of Trace Element Incorporation in Petroleum. Advisor: R. H. Filby

   j. M. Scheibel, Ph.D. student in Nutrition. Dietary Fiber: Risks or Benefits. Advisor: T. Mehta

   k. K. J. Peng, Ph.D. student in Computer Science. Advisor: K. C. Wang

   In addition, eight graduate education and research projects at other Pacific Northwest educational institutions utilized the irradiation services of the W.S.U. TRIGA reactor. During the Summer of 1978 and 1979 one guest faculty worker and one graduate student from S. Dakota State University carried out research at the NRC.

3. Reactor Operator Training

   During the month of July two successive 2-week Research Reactor Training Programs were conducted for Washington Public Power Supply System involving eight trainees for the WNP2 plant.

B. Research Activities

1. The Trace Element Laboratory under the direction of Dr. R. H. Filby is doing research employing neutron activation analysis in a number of areas including the coal liquefaction process. An ongoing study is underway concerning the behavior and balance of various trace elements in the solvent refined coal pilot plant at Fort Lewis, Washington. Emphasis is on deposition and effluent rates of trace elements in stages of the process from an environmental and process standpoint. Work funded by U.S. Environmental Protection Agency and Pittsburg & Midway Coal Mining Co. (DOE).

2. Dr. M. L. Hunt is working with a flameless atomic absorption spectrometry system. Research work during the past year has involved the development and execution of procedures for the analysis of certain trace elements (Pb, Cd, Be) in coal and solid products from the SRC Process on Coal. This work was funded by the Pittsburg & Midway Coal Mining Co. project.

3. The Center, in cooperation with and with partial support from ScienTerra Inc. established a Geological Materials Radionuclide Analysis Laboratory under the direction of Mr. W. E. Wilson. Large volume intrinsic germanium coaxial-type detectors with high sensitivity and low resolution are used to measure the low energy gamma-ray emission spectra of geological samples and soils. Microprocessor based multichannel pulse height analyzer systems are used to collect and analyze the natural radioactive decay chains for uranium prospecting.

4. The coal chemistry laboratory has investigated coal structure using HPLC and spectrographic apparatus and techniques. In light of national energy problems, detailed studies of synfuels (obtained from non-readily used sources in massive scale) is a recognized necessity. The goal is to examine various fuels with reference to the presence of trace elements and the chemical structure of metal-organic species and thus estimate the effects on the fuel. The investigation involves separation of solvent refined coal into various molecular weight fractions and analysis of trace elements in them via activation analysis and to determine the distribution of organometallic species in the molecular weight fractions.

5. The study being done with the assistance and participation of Washington Senator Sam C. Guess and financial support from the Washington State Department of Highways, involves studying petroleum products used in highway surfacing. Modern scientific techniques are being used to delineate the difference between and good and failed road surfaces and to characterize the parameters that produce a good lasting highway surface.

6. Dr. C. Chow's main research activity focuses on the chemistry of processing related to coal liquefaction and the catalytic behavior of coal minerals in liquefaction. The goal of this research is to fully develop the (positive) catalytic effect of coal minerals in the liquefaction process.

7. Dr. B. Srinivasan has introduced two areas of research to the Center. The first invoves the study of nuclear decay processes with very long half-lives; for example, double beta decay reactions. The other major field of interest is cosmochemistry. Specifically, meteorite, lunar, and terrestrial samples are analyzed to gain a better understanding of the conditions prevalent in early solar nebulae and their condensation into planetary bodies.

8. During the past year the W.S.U. reactor was operated a total of 682 hours and 643 megawatt hours for research and educational activities. A total of 6,736 samples were irradiated during 1,401 irradiations involving over 1,304 user hours.

9. Activation Analysis Services Provided to WSU Faculty

Individual	Department	Type of Sample
Dr. P. E. Rosenberg	Geology	Minerals
Dr. J. P. Hunt	Chemistry	Organometallic compounds
Dr. D. R. Hilbelink	Veterinary Medicine	Animal Tissues
Dr. D. M. Roundhill	Chemistry	Organometallic compound analysis

10. Services to State of Washington

a. Analyses of wastewaters for Zirconium: for Department of Ecology.

b. Analyses of asphalt cores: for Department of Transportation.

11. Radionuclide Production

Individual	Department	Radionuclide
Dr. V. P. Schultz	Zoology	^{182}Ta
Dr. L. P. Mallavia	Bact. & Public Health	^{86}Rb
Dr. L. Kirschner	Zoology	^{42}K

C. Research Proposals and Contracts by Categories

1. Pending

a. A Study on the kinetics and Mechanisms of Mineral Catalysis in Coal Liquefaction, U.S. Department of Energy, $197,307 (Chow).

b. Research on the Formation of Organometallics and Volatility of Trace Elements in the SRC I and SRC II Processes, U.S. Department of Energy, $298,131 (Filby).

c. Double Beta Decay and Muon Induced Reactions in Natural Samples, ACS-PRF Grant for Individual Fundamental Research, Petroleum Research Fund, American Chemical Society, $10,000 (Srinivasan).

d. ^{1}H NMR Relaxation Study on the Structural Changes of Coal during Pyrolysis, ACS-PRF Grant for Individual Fundamental Research in Petroleum, Petroleum Research Fund, American Chemical Society, $10,000 (Chow).

2. Proposals Funded

a. Fuel Cycle Assistance Contract, U.S. Department of Energy, 8/1/78 to 6/30/83, $182,000 (Wilson).

b. Trace Elements in the SRC Process, 3-month no-fund extension, 1/79 to 3/31/79, Pittsburg & Midway Coal Mining Co. (Filby).

c. Renewal contract, Trace Elements in the SRC Process, 4/1/79 to 12/31/80, Pittsburg and Midway Coal Mining Co., $118,729 (Filby).

d. Reactor Operator Training Course, Washington Public Power Supply System, 6/30/78 to 8/11/78, $18,363 (Wilson).

e. Battelle Northwest Laboratories Irradiation Service Contract, 10/1/78 to 9/30/79, $41,915 (Wilson).

f. Uranium Decay Chain Analysis, ScienTerra Inc., 2/1/77 to 6/30/80, $12,000 (Wilson).

g. Chemical Study and Characterization of Asphalts, Washington State Legislative Transportation Commission, 6/8/78 to 6/7/79, $50,000 (Filby, Yaghmaie, Guess).

h. Agreement for Testing of Asphalt Concrete, Washington State Department of Transportation, $7,000 (Filby, Guess).

i. Double Beta Decay in Natural Samples, WSU Research and Arts Committee Grant-in-Aid, $6,118 (Srinivasan).

Service Agreements

a. Analysis of Coal, Ash and Impinger Samples for Trace Metals, Meteorology Research Inc., $28,000 (Filby).

b. Neutron Activation Analysis of Resistor Pastes, etc., Fairchild Camera & Instrument, $2,000 (Hawley).

c. Rock Samples Analyzed by Neutron Activation Analysis for 33 Elements, Cominco Ltd., $1,600 (Filby).

d. Water and Wastewater Samples Analyzed by NAA for Trace Amounts of Zirconium, State of Washington Department of Ecology, $350 (Filby).

D. Courses Taught

The following courses utilized the facilities at the Center or were taught by faculty members associated with the Center.

Course Number	Course Name
Chem 305	Radiochemistry
Chem 405	Nuclear Chemistry
Chem 424	Activation Analysis
Chem 499	Special Problems
Chem 525	Trace Analysis
Botany 527	Radioactive Tracer Techniques
Geology 102	Physical Geology

E. Publications

1. Noble gases in the Allende and Abee meteorites and a gas-rich mineral fraction: investigation by stepwise heating. B. Srinivasan, Roy S. Lewis and Edward Anders. Geochim. Cosmochim. Acta 42, 183 (1978).

2. Noble gases in the Murchison meteorite: possible evidence for the S-process in stars. B. Srinivasan and Edward Anders, Science 201, 51 (1978).

3. Reply to "Isotopic composition of the anomalous xenon in the Murchison meteorite" by Stephen S. Smith. B. Srinivasan and E. Anders, Geophys. Res. Lett. 6, 59 (1979).

4. Compaction behavior in char/coal systems in formed coke processes. C. Chow, A.C.D. Chaklader, I. H. Warren and W. R. Leeder, J. of Fuel 57, 387 (1978).

5. Compaction behaviour of coals. Accepted for publication in J. of Fuel (1979). C. Chow, et al.

6. Microstructures of hot pressed coal briquettes. C. Chow, et al. Accepted for publication in J. of Fuel (1979).

7. Nature of metals in petroleum and coal derived synfuels, in "Ash Deposits and Corrosion due to Impurities in Combustion Gases", R. W. Bryers, ed., R. H. Filby, et al., McGraw-Hill International (1978), pp. 51-64.

8. Trace elements in the SRC processes SRC I and SRC II. R. H. Filby and S. R. Khalil. Proc. Potential Health and Environmental Effects of Synthetic Fossil Fuel Technologies, Sept. 25-28, 1978. Oak Ridge National Laboratory CONF-780903, July 1979.

9. Fast-neutron activation analysis for oxygen, nitrogen, and silicon in coal, coal ash and related products. A. Volborth, Analytical Methods for Coal and Coal Products, Vol. 3, Academic Press (1979).

10. Problems of oxygen stoichiometry in analyses of coal and related products. A. Volborth, Analytical Methods for Coal and Coal Products, Vol. 3, Academic Press (1979).

11. Extended exploration applications of isotopes of the uranium decay sequences, W. E. Wilson, D. A. Hansen and M. Ikramuddin. Proc. Geochemical Exploration Conf., April 10, 1979, Tucson, Arizona (1979).

12. Absolute activity determination on large volume geological samples. W. E. Wilson. Submitted to Nuclear Instruments and Methods (1979).

WASHINGTON STATE UNIVERSITY
NUCLEAR RADIATION CENTER
UPGRADE RULE IMPACT QUESTIONS

1. Added features required:

(a) Complete fencing of the facility	$100,000
(b) Security Force , building and lighting	$250,000

2. Added hardware:

(a) Alarms, detectors, CCTV system, etc.	$500,000
(b) Security Force needs (guns, etc.)	$ 50,000
(c) Badging system	$ 5,000
Total one time costs	$905,000

3. Added annual operating costs:

(a) Manpower	$100,000
(b) Hardware	$ 50,000
(c) 50% increase in facility cost	
Total annual operating costs	$150,000

4. Shut down costs: $690,000
(see recent license renewal application) $ 5,000/yr

5. Cost of possession only status: $ 75,000/yr

6. Industrial impact:

(a) No Research Reactor Training program for WPPSS reactor operators - 8/yr (Required for RO and SRO Licenses)

means complete and additional data from you is solicited.

1. What additional features will be constructed walls, vaults, CAS, protected area and costs associated with these.

2. What is the expected total cost to upgrade hardware? - one time cost - alarms, CCTV, guns, uniforms, badges, detectors.

3. What is the expected cost annually - guards, material, screening, two man rule - for an upgraded physical security plan - manpower and hardware?

4. What is the cost of shutting down the facility?

5. What is the annual cost of maintaining possession only status?

6. Effect of loss of program on US industry - (i.e.) engineers and operators for U.S. Nuclear Power Plants.

7. Effect of loss on medical research, medical treatment.

8. Cost of new plans - security, contingency, guard training.

9. Considering the impact of implementing the Safeguards Upgrade Rule will you continue to operate your facility?

10. Describe the impact of closing the facility on the educational program at your facility (school) - Loss of program and courses.

11. What is the size of the facility staff? - Will it be cut?

12. How many students are in the classes? - Will they finish their degrees?

13. How many graduate students are in facility - related programs? - Will they be able to finish?

14. What is the typical annual operating budget?

15. With 100 r/hr at 3 feet exemption criteria, can you meet and maintain the SNM at such a level continuously? What would the impact be on current financial and operating resources? How would it maintain the self-protection criteria affect fuel replacement and costs therefore?

16. How many courses utilize the facility - will they be cut?

Sincerely,

James R. Miller, Acting Assistant Director
for Site and Safeguards

301-427-7211