

UNIVERSITY OF MISSOURI RESEARCH REACTOR

OPERATIONS MONTHLY SUMMARY

March 1995

Prepared by:
Operations Staff

APR 26 1995

F/H

March 1995

The reactor operated continuously in March with the following exceptions: four shutdowns for scheduled maintenance and refueling; one unscheduled shutdown.

On March 20, a manual rod run-in was initiated during a normal reactor startup due to inadequate change in count rate on the Source Range Monitor. The reactor was subcritical with rods withdrawn to 10 inches at the time of the rod run-in. Technical Specification 3.4.a. requires an operable source range nuclear instrument during reactor startups.

Upon determining that the Source Range Monitor was not functioning properly during the startup, a manual rod run-in was initiated. Electronics technicians eventually determined that the cabling between the detector and amplifier was faulty. They replaced the co-axial cable and tested the instrument satisfactorily. A normal startup was subsequently completed and no further problems of this type have occurred.

A License Event Report detailing the source range nuclear instrument problem and corrective action was sent to the Nuclear Regulatory Commission April 19, 1995.

Major maintenance items for the month included: dumping a depleted pool deionization bed into drying barrels and loading a new bed; installing (for preliminary testing) new drywells for fission chamber and compensated ion chamber detectors.

UNSCHEDULED SHUTDOWNS

<u>Date</u>	<u>Number</u>	<u>Type</u>	<u>Cause</u>
3/20/95	1033	Manual Rod Run-In	Inadequate source range response during startup

OPERATION SUMMARY

HOURS OPERATED THIS PERIOD	675
TOTAL HOURS OPERATED	185,062
HOURS AT FULL POWER THIS PERIOD	673
TOTAL HOURS AT FULL POWER	184,095
INTEGRATED POWER THIS PERIOD	281 MWD
TOTAL INTEGRATED POWER	70,854 MWD

MAINTENANCE ACTIVITY

3/1/95 Dumped depleted pool DI bed.

3/3/95 Loaded new pool DI bed.

3/6/95 Refueled - removed core 95-9, loaded core 95-10.

3/13/95 Refueled - removed core 35-10, loaded core 94-11.

3/20/95 Refueled - removed core 95-11, loaded core 95-12; replaced coaxial cable between source range detector and amplifier; installed new fission chamber and compensated ion chamber drywells.

3/27/95 Refueled - removed core 95-12, loaded core 95-13; installed new fission chamber detector in previously installed (3/20/95) drywell.



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MURR Reactor Advisory Committee Meeting
March 6, 1995

The Reactor Advisory Committee met in W1004 Engineering Building East on March 6, 1995.

Members present: H. White (chair), E. Blaine, L. Clark (left 2:44 PM), D. Cowan, J. Ernst (*ex officio*), W. Folk (arrived 1:10 PM, left 2:45 PM), S. Loyalka, J. McCormick (*ex officio*), C. McKibben (*ex officio*), J. Meese, J. Rhyne (*ex officio*), D. Riddle, T. Storvick (left 1:38 PM, returned 2:55 PM), R. Sunde, J. Thompson and W. Volkert

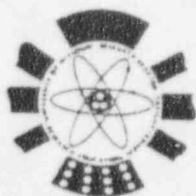
Members absent: J. Atwood and B. Defacio

Guests present: C. Errante

Chairman White called the meeting to order at 1:07 PM. Items of business were as follows:

- On behalf of Chancellor Kiesler, McCormick thanked the Committee members for their willingness to serve. He outlined the Committee's mission as defined by the Chancellor, to give advice to the MURR Center director and campus administration on issues of policy, planning, resources, academic interests and license specifications. The membership largely is composed of persons who themselves are not conducting research at the Center, allowing distance from the decisions needing to be made. Considerations will include building on existing and establishing new linkages with campus programs to bridge Center activities with MU's Schools and Colleges, keeping in mind the implications of new programs on the Center's infrastructure.
- White suggested the Committee meet monthly during this early stage, adding that in the fall they would need to develop a report/set of recommendations. The next two meetings will be held Monday, April 3 and Monday, May 1 from 1-3 PM. It was decided that substitutions would not be made for members unable to attend a particular meeting, but meetings will be scheduled so that a large and consistent core of Committee members can attend. The Committee quorum is 10 of the 14 voting members.
- Rhyne presented "An overview of the Center's research functions, operational groups and budgets." Blaine asked why the MURR is the best, and was told that the original design was well-conceived by a committee appointed by the University's Dean of Engineering, who intended it to be the best in terms of power output and design base. Rhyne added that little would be changed today to improve on the design. Another important factor is that the reactor was placed under system administration and not assigned to a particular school or department. Rhyne called it a very smart move, noting that most other university research reactors have failed when assigned to a department.

Sunde asked what the reactor could do at half the power, whether anything would be gained. Rhyne said that about 40% of what we do could not be done, and that the remaining 60% would be half as efficient/take twice the time. McKibben said the MIT and Georgia Tech reactors run at about 5 MW, and there is not one-fourth as much research utilization at those reactors. The research depends upon either neutron beams or radioisotopes, both of



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which benefit from the maximum neutron fluence. The fluence is proportional to the product of operating power and time. Rhyne pointed out that MURR's operating time is the highest in the country, far exceeding that of the national labs.

Thompson asked whether the national labs were used only internally, and Rhyne responded that user programs at the national labs were not efficient, especially when students were involved. The proposal review process usually takes six months and then one must go back in the queue for additional time. Conversely, MURR provides an unparalleled opportunity for training, a fact widely recognized by the Department of Energy, National Science Foundation, and other agencies.

Rhyne showed charts reflecting MURR staff, graduate research assistants, MURR-administered grants, degrees granted from MURR research, publications and presentations and budget breakdowns.

Thompson asked about the drop in grants from 1993 to 1994, and Rhyne mentioned the large instrumentation grants that had been awarded in 1993. Although he did not have current figures, a year ago he had calculated the growth in grant awards at 40% a year, compounded.

[Storvick left, 1:38 PM]

One chart on grant awards compared MURR-administered dollars with all grant awards that had been identified on Grant Data Forms as having a connection to the MURR Center through investigators and shared credit, no matter which department administered the funds. McKibben said one of the goals of the committee could be help in getting the second set of numbers up.

To answer Blaine's request for the cost of a tour of MURR, McKibben figured the annual load of 2700+ tours takes up about 15-20% of the senior receptionist's time plus various other staff members who assist with tours. Rhyne noted that the major component of tour groups is students, primarily from Missouri's secondary schools, and he underlined the importance of promoting the benefits of nuclear-based research through such an outreach program. About a fifth of the tour population is from professional organizations.

Folk inquired about Group Leaders who are not MURR staff. Rhyne listed Turk Storvick (Actinide Chemistry), Guy Schupp (Gamma-Ray Scattering), Sam Werner (Interferometry) and Bill Miller (Non-Destructive Evaluation). White wanted to know about funding for the Post Docs; all but one are paid by grants.

Blaine asked if the Facilities Operations group is available to the rest of the campus. The group is for Reactor programs only, and McKibben disclosed that the Center needs additional shop support and uses the Science Instrument Shop and the Physics Shop at the rate of some \$150,000 each, annually. McCormick's questioned how much of the cost for the Facilities Operations group is charged to grants, and Rhyne responded 12% and that the PIs work with Chester Edwards (Manager of Facilities Operations) to estimate the number of hours required. The Center is not a recharge operation, so the amounts included in grant proposals vary depending upon which staff are required for a particular project. Clark asked if the Instrument Development group is a recharge operation, and was told no. White asked whether there is a standard charge to use the facility or a person, and Rhyne said no. White raised the concern about A-21 violations, and McKibben stated that the cost for the time spent is the same whether the work is funded by a grant or not. Rhyne said work not funded by grant awards could be seen as being paid for with "grants" from Service Applications.

Folk asked if Service Applications (SA) is totally self-supporting, and Rhyne said the ratio of revenue versus cost is 4:1. Riddle wanted a breakdown of the 25 SA staff, and McKibben estimated 4 in silicon, 8 in topaz, 4 in isotopes and 6 in shipping. [Actual counts are 5 for administration and quality control; 2 in silicon; 7 in topaz; 5 in isotopes; and 6 in shipping. One of the admin/qual control staff is part-time.] McKibben noted that several of the SA personnel are also used in research activities that require sample handling, irradiation, processing and shipping.

Earlier Clark had asked how fluid the research programs and groups were, and Rhyne's response was that they had been changed in 1992, but not significantly since. He later pointed out that the one inactive research group, Radiobiochemistry, is one that he would like to see reactivated as an expansion of the nutrition research.

Blaine brought up the Center's system for promotions among the scientists. Rhyne said there are evaluation committees that include non-MURR members, and that outside letters of support are submitted.

One of Rhyne's charts presented the funding sources for the three major components of the Center's budget: keep-open costs, research groups and research support groups. He remarked that the MURR Center is the only organization on campus besides the Hospital that is required to pay its own Health Physics charges, currently about \$560K. He identified the Center's keep-open costs this year as \$3.1M, which are only 70% funded by GO dollars. The keep-open costs do not include certain percentages of groups that can be considered as supporting service functions. As an example, McKibben stated that although it would be difficult to reduce the Reactor Operations staff if the Center were not involved in service work, 20% of Reactor Operations's costs are not charged to keep-open costs.

Clark asked whether the Center would be able to close the commercial operations if the University were to cover all keep-open costs. Rhyne answered that we would not be able to pay for the researchers and much of the other infrastructure. McKibben said that the percent of Service Applications cost is up right now because of capital investment in instrumentation to improve the revenue stream.

White asked for the annual rate of increase for the total budget; Rhyne did not have that figure. He did say that the Center's staff had grown from 90 to 120 since 1991, mainly in the support groups, and that the research component growth rate has not been as strong. White then asked about the rate of increase in GO dollars. Rhyne's reply was that there has been very little increase because the S&W component is small compared with the E&E portion that has received little or no increase. Thompson asked about the budget and administrative transfer in 1989. Rhyne commented that a block amount was transferred from System and has changed very little. White said former UM President Magrath had told him that before 1989 there had been a budget shortfall in the Extension program and the money had been taken from the reactor to cover it.

Sunde inquired about the philosophy for selecting service applications. Rhyne remarked that we are pushing much stronger in the area of isotopes, less strongly on topaz. He added that the increased push on isotopes was getting good support from the University administration. McKibben said projects were considered only if they have favorable operational and infrastructural costs, and gave as an example the high production cost of fission product moly. An advantage of the topaz program is that it allows the Center to "bank" neutrons for six months to a year in pre-irradiated stones that give financial protection in the event of an extended reactor shutdown.

Thompson asked how the billing rates were established and whether overhead is built in. Rhyne replied that charges are market driven. MURR's primary NTD-Si customers are Japanese, and the Center's competitors are in Europe, Russia and Australia. McKibben mentioned the new Korean reactor, which at 30 MW, a heavy water MAPLE X design, could begin doing NTD-Si, and we may be seeing a drop in silicon. Rhyne spoke about the importance of the long-term relationship that Center staff have nurtured with our Japanese customers, and how the Japanese had pulled business from France and brought it to MURR. The main competition in topaz is in Studsvik. While the price of stones is down, the demand remains high, so it is a question of having to process considerably more stones to keep the revenue constant.

Sunde asked if the RAC would be looking at new ventures, and Rhyne said new considerations certainly would be brought to the Committee. Sunde mentioned the CoStar tower. Rhyne stated that the addition of this storage unit had been coupled with required preventive maintenance to minimize the impact on research programs.

Folk wondered about costs for decommissioning, whether they were reflected in the charts being shown or were a hidden cost that would appear when the reactor is shut down. Rhyne estimated that the reactor would be operational for at least another 40 years, and that, as projected now, GO dollars would need to continue for about 10 years beyond shutdown to cover decommissioning costs. McKibben said that the way NRC licensing is, the most cost effective decommissioning is to let the facility decay in place.

Volkert asked about the educational expense to the Center. GRA stipends at MURR are not fixed and generally depend on the various departments' rates; Rhyne suggested multiplying the 37 GRAs by \$17K (\$629K).

Loyalka wanted clarification on the grant award figures. Rhyne said they did not reflect Prime Fund matching dollars, which have been considerable, but did include internal awards such as Research Board. The TRUMP-S award is currently about \$600K for the combined Chemical Engineering and MURR components. Cowan asked what percentage of researchers have grants, and Rhyne thought only three scientists did not have grant funding. White said he could see why Rhyne wants to increase the researchers' grant support, currently at 19% of salaries, to 25%. Riddle wondered why the goal isn't 50%. He admitted that it was difficult to get that kind of salary funding from NSF but said it was possible from NIH. White said that is a question that needs to be put on the table. Meese said an advantage of using the MURR service income for research activities is that it keeps the University from having income tax liabilities. Loyalka questioned whether the researchers are sufficiently productive.

[Clark left, 2:44 PM]

McCormick asked about the three amounts of service income listed for researchers on Rhyne's budget sources chart, and Rhyne explained that the Center underwrites 75% of the researchers' salaries and one technician per program. Researchers can also generate revenue through analyses and other services, which is billed into the Center's Research Service account. The third amount is the shortfall that is not covered by the first two and grant funds, and is therefore listed as "supplemental" on the chart.

Rhyne responded to Loyalka's productivity question by saying that he is pushing hard to get grants up, and that the number of proposals is high. With 20 research scientists, the average grant dollars per scientist are about \$100K.

[Folk left, 2:46 PM] It was observed that the Committee had lost its quorum.

White said the annual average in Physics was about \$50K, and Thompson commented that Tier 1 Engineering schools pull in about \$200-250K a year. Loyalka estimated that Stanford's 200 engineering faculty bring in about \$40M.

Riddle asked about payment for teaching responsibilities, and conjectured that the staff's main reward is access to the students. Rhyme said that currently only one department is paying for teaching, but this may be something that needs to be expanded.

- McKibben briefly outlined the four NRC licenses that MURR operates under: the reactor license (R-103), which is where the primary RAC responsibilities lie; the broad scope materials license; the Cobalt-60 facility license; and the specific material license that covers the counting and release of topaz. To give the Committee an idea of the technical requirements imposed on the Reactor, McKibben produced notebooks on the Reactor's Technical Specifications (from which pertinent pages concerning the RAC had been distributed with the minutes), the Hazards Summary, and two sets of Standard Operating Procedures.

[Storvick returned, 2:55 PM] The Committee's quorum was restored.

- Rhyme said future RAC meetings would have two components: *license* issues and *programmatic* issues. He suggested two separate agendas and sets of minutes, and thought the first meeting for license issues would be short and avoid quorum problems. McKibben asked what the Committee's needs were regarding previous Committee and Subcommittee actions. White said that the Subcommittees should present motions for items needing RAC's consideration. McKibben stated that (as allowed by the charters) the Subcommittees may take actions before the RAC reviews their decisions. The Subcommittee minutes are presented to the RAC for review, and the Committee votes whether to approve the Subcommittees' actions. The Committee decided that minutes from past meetings were not necessary for an historical perspective, but that background materials for items that need review would be appropriate.

Rhyme encouraged the Committee members to notify White to arrange for group discussions, and he called attention to the second to last page of his presentation handouts on "Suggestions for the New RAC."

- McKibben turned to Subcommittee membership and chair appointments. He asked the Committee to consider concurring with the Chairman's appointment of Storvick as Chair of the Reactor Safety Subcommittee. Charter requirements are for the Reactor Safety Subcommittee Chair to serve on the RAC. Earlier he had mentioned the Reactor Action Committee, which in eighteen years has been called on twice—for a stuck control rod and a cracked beryllium reflector. He asked the Committee to consider concurring with the Chairman's appointment of Storvick as a member and the Chair of the Reactor Action Subcommittee. This action would also satisfy charter requirements for RAC membership.

Cowan made a motion, seconded by Blaine, to appoint Storvick as Chair of the Reactor Safety Subcommittee and as a member and Chair of the Reactor Action Subcommittee; the motion carried.

- Errante announced that the previous RAC members had approved the minutes of the December 19, 1994 meeting by mail ballot.

- McKibben referenced the NRC correspondence that had been sent with the agenda, and distributed copies of a MURR/NRC reply to a notice of violation dated December 21, 1994. McKibben also provided copies of the December 21 and December 30 meeting minutes of the MURR Radiation Safety Committee, which exchanges minutes with the RAC on a purely informational basis.
- Rhyne turned to the MURR External Review scheduled for April 20-21. White asked who had requested it and what the mandate is. Rhyne explained that he had been wanting to have one for the last three years but had been waiting for the completion of new instruments. This year the Chancellor gave us strong encouragement to schedule it. Plans are to have one every two years. Rhyne agreed to provide the RAC with a copy of the Chancellor's charge to the External Review Committee.
- McKibben reported on the February 1-2 NRC inspection of the materials license and TRUMP-S lab. At its exit interview the NRC had identified a potential for violation on the Alpha Lab. He also announced that the NRC's final ruling on the TRUMP-S litigation has been received. We have 30 days to ask for reconsideration. McKibben said the ruling supported the University's stand and acknowledged its strengths.
- White reminded the Committee that the next two meetings will be held on April 10 and May 1. Rhyne volunteered to make MURR staff available to respond to format questions. White said the Committee may wish to put presentations of research programs on the agenda on its own initiative. McCormick offered to check with Provost Sheridan about attending a future meeting.

The meeting adjourned at 3:17 PM.