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June 13, 2008

United States Nuclear Regulatory Commission
Attn: Document Control Desk
1 White Flint North
11555 Rockville Pike
Rockville MD 20852

Re: 2007Annual Report for University of California Davis/ McClellan Nuclear Radiation Center, Docket No. 50-607, License No. R-130

To Document Control Desk:

Attached is the 2007 annual report for the McClellan Nuclear Radiation Center, submitted in accordance with the reporting requirements of the Technical Specifications document MNRC-0004-DOC-13 paragraph 6.7.1.

Thanks and Regards,

Robert G. Flocchini PhD
Facility Director
McClellan Nuclear Radiation Center

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NRR

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McCLELLAN NUCLEAR RADIATION CENTER

2007

ANNUAL REPORT

Docket Number 50-607
License Number R-130

1. Introduction

The University of California, Davis McClellan Nuclear Radiation Center (MNRC) consists of a research reactor and associated radiography and positioning equipment. This MNRC Annual Report is published each year in support of the license provided by the United States Nuclear Regulatory Commission (NRC). The aforementioned license is for the operation of a steady-state TRIGA™ reactor with pulsing capability.

It is the intent of this document to provide information relevant to the safe operation of the UCD/MNRC. A brief description of the MNRC facility and administration is followed by operational events and health physics information concerning this facility during CY 2007.

2. UCD/MNRC Facility Description

The UCD/MNRC is located on the McClellan Industrial Park site; the reactor is housed in Building 258. The McClellan Industrial Park site is approximately 2600 acres, located eight miles northeast of Sacramento, California.

The UCD/MNRC facility is a three level 14,720 sq. ft. rectangular-shaped enclosure that surrounds a 2 MW research reactor. The UCD/MNRC provides four neutron beams and four bays for radiography. All four bays are capable of using radiography film techniques, but Bays 1 and 3 will normally use electronic imaging devices. Space, shielding and environmental controls are provided by the enclosure for neutron radiography operations performed on a variety of samples. Adequate room has been provided to handle the components in a safe manner.

In addition to the radiography bays, the UCD/MNRC reactor also has several in-core facilities ranging from a pneumatic tube system to a central irradiation facility.

For more detailed information on the UCD/MNRC project, the reader is referred to the UCD/MNRC Safety Analysis Report.

3.0 UCD/MNRC Administration

UCD/MNRC Organization. The UCD/MNRC is licensed by the Nuclear Regulatory commission (NRC) to operate under the provisions of operating license R-130.

The University of California Regents have designated the Chancellor at UC Davis to be the license holder. The UCD Chancellor has in-turn delegated the Vice Chancellor for Research to be the licensee of record.

The UCD/MNRC is under the direction of the UCD/MNRC Director, and reports to the Vice Chancellor for Research.

4.0 Facility Modifications (Section 50.59 of 10CFR Part 50), and experiments.

1. FM-III-07-02 Liquid Nitrogen Distribution System for the counting lab dewers.
2. FM-II-03-01 Bay 2 Fuel Storage Area.
3. FM-III-05-02 Security System Upgrade
4. FM-III-07-03: Modify Security System

5.0 New Approved Experiments

1. None

6.0 Licensing and Regulatory Activities

6.1 NRC Items

a. The Nuclear Regulatory Commission performed two inspections: 16-19 April., and 15-18 October 2007.

6.2 Nuclear Safety Committee (UCD/NSC)

a. The annual NSC audit of the UCD/MNRC was conducted during the month of December.

b. Two NSC meetings were held: 20 July, 2007 and 13 December, 2007 at MNRC

7.0 OPERATIONS

OPERATING HISTORY:

TOTAL OPERATING HOURS THIS YEAR:	1584.43
TOTAL OPERATING HOURS:	39552.30
TOTAL MEGAWATT HOURS THIS YEAR:	1743.02
TOTAL MEGAWATT HOURS:	54825.52
TOTAL NUMBER OF PULSES PERFORMED THIS YEAR:	0
TOTAL NUMBER OF PULSES PERFORMED:	473

UNSCHEDULED REACTOR SHUTDOWNS and NOTED PROBLEM AREAS:

In 2007, there were four (4) unscheduled shutdowns at the MNRC reactor facility. The following is a list of the unscheduled shutdowns:

2007 REACTOR SHUTDOWNS

Type of Failures	Total Number
CSC	1
Other	3
TOTAL NUMBER OF SHUTDOWNS IN 2007	4

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
CSC	0	1	0	0	0	0	0	0	0	0	0	0
Other	1	0	0	0	0	0	0	1	0	0	0	1
Notes	1	2						3				4

Notes:
1: Bay 1 Radiography Massive Shutter failure
2: Command Center Reset Button
3: Loss of Building Power
4: Bay 4 door/shutter interlock trip

January

1. There was one unplanned shutdown in the month of January.
   a. On 3 January, the Bay 1 massive shutter would not operate closed. The reactor was shutdown to investigate. 3 of the 4 bolts holding the Drive Screw mounting plate had sheared, causing the mechanism to bind. This tripped the overloads. The mounting plate was re-secured, and the operation of the shutter was checked satisfactory. The other three drive screw mounts for Bay 2, 3 and 4 were checked to insure this wasn't a common problem with all the bays. No additional problems were noted.

2. There was 1 callback to the facility in the month of January. The callback was for the Rod Withdrawal Prohibit alert on the CSC. MNRC personnel have been in contact with General Atomics to try to isolate the problem. Monitoring and troubleshooting will continue until this problem is resolved.

February

1. There was one unscheduled shutdown during the month on 26 February. Details are posted in the Anomaly Report section.

2. There were 4 callbacks to the facility in the month of February. All four callbacks involved either the Magnet Supply Voltage Low or Demineralizer flow/conductivity alerts. Troubleshooting these alerts is ongoing, with several rounds of visual, manual, and electronic checks. MNRC personnel have been in contact with General Atomics to try to isolate the problem. Monitoring and troubleshooting will continue until this problem is resolved.

March

1. There were no unscheduled shutdowns in March

2. There were three (3) callbacks to the facility in the month of March.

   a. One callback was due to a Stack CAM alert, with the Argon channel derivative alerting. Acknowledged and cleared.

   b. One callback was due to a Scram Database Timeout. Cleared upon reboot of CSC/DAC computers.

   c. One callback was due to a HX Outlet alarm. Indications normal, cleared on acknowledgement.

April

1. There were no unscheduled shutdowns during the month of April.

2. During the period, Reactor Operations personnel were called back 3 times.

   a. One callback was due to a Security system alarm, undetermined cause. Alarm was clear upon entry

   b One callback was due to a Security system alarm. Cause found and corrected.

   c. One callback was due to a UPS fault. Alarm cleared upon acknowledgement.

May

1. There were no unscheduled shutdowns during the month of May

2. There were no callbacks to the facility in the month of May.

June

1. There were no unscheduled shutdowns in the month of June.

2. There were three callbacks to the facility in the month of June.

   a. One callback was due to a UPS fault, cleared upon acknowledgement

   b. Two callbacks were due to RWP alerts, both cleared upon acknowledgement.

3. Shim 2 fell off during a reactor startup at 175 units withdrawn. Control rods were inserted and troubleshooting showed all rod parameters and conditions normal. Rotated the control rod armature by hand several times, correcting the alignment problem. After performing rod operability checks on Shim 2, the startup was successfully continued to 1 MW.

July

1. There were no unscheduled shutdowns in July.

2. There were three (3) callbacks to the facility in July, all due to RWP alerts which cleared upon acknowledgement.

August

1. There was one unplanned shutdown during the month of August.

   a: Complete loss of building power during reactor operation on 8 August.

2. There were three (3) callbacks to the facility in August, all due to RWP alerts which cleared upon acknowledgement.

September

1. There were no unscheduled shutdown in the month of September.

2. There was one callback to the facility in September:

   a: Equipment Room RAM alert, which cleared upon acknowledgement.

October

1. There were no unscheduled shutdowns or callbacks during the month of October.

November

1. There were no unscheduled shutdowns or callbacks during the month of November.

December

1. There was one unscheduled shutdown in December.

   a: The Bay 4 shutter/door interlock caused an External Scram when the Bay 4 massive shutter was opened. The cause was found to be one of three of the interlock relays was not satisfied. The personnel access door had been "bumped" shut to reduce the danger of damaging instrumentation leads run through the door. This is a recurring problem when running instrumentation and test leads through the Bay door for experiments. The Operations and Maintenance Manual system doors and interlocks checks were performed sat for Bay 4.

2. There were three callbacks to the facility in the month of December.

   a: 2 callbacks for Rod Withdrawal Prohibit alerts which cleared upon acknowledgement. The CSC was rebooted after the second callback in one day.

   b: 1 callback for UPS fault alert and several security system alarms. All conditions were normal upon entry. Probable cause for the alerts/alarms was a power "bump".

3. Several ventilation system issues occurred during December.

   a: AC-1 (reactor room) control circuits experienced a fault which required cycling the unit to clear. This is the first occurrence for this unit, and will bear further watching.

b: AC-5 (Bay 4) heating unit failed, causing the side of the unit to buckle out. The heat call leads have been lifted and the gas supply isolated to the unit. Repair/replacement will be deferred until spring. The air conditioning portion remains on service, following an operational check to verify no further issues with the unit.

7.2 ANOMALIES:

During 2007, there were 5 reported anomalies at the MNRC facility. The specifics are listed below by month.

January

There was one anomaly reported during the month of January. From the Anomaly Report dated 31 January:

Subject: DAC failure during Prestart Checklist.

Time: 0645, 31 January, 2007

Reactor conditions prior to the anomaly and what occurred during the anomaly:
The reactor was shutdown, with a pretest checklist in progress. During the computer generated PRESTART CHECK, checks failed on Hi Temp 1 and 2, and the three NPP checks.

What actions were taken to correct this anomaly:
Several reboots of the CSC and DAC computers were tried without success. Manual scram test signals provided the expected results, functioning properly for all channels.
Troubleshooting began with voltage checks in the CSC, DAC and NM-1000 cabinets, all voltages as expected.
During DOM-32 signal tests on the DAC, channel 22 (PRTST RLY ON) failed to respond to the test signals. No pretest relays energized with the channel 22 signal. The RLY08 card 4 was replaced in the DAC. Retests confirmed no change in the Prestart Check program, with the same failures as noted originally.
The DOM-32 card in the DAC computer was replaced, and all other cards were verified seated properly on the motherboard. The DOM32 test utility was reperformed, with all but 1 relay responding. Further investigation revealed a loose lead in the multi-pin connector on the replaced RLY08 board. The loose lead was corrected.
Several Pretest Checks were run, and passed. Manual Scram Test checks passed. The rod control interlocks, up, and down functions were all tested sat.

What corrective actions are needed to prevent this anomaly from reoccurring in the future:
Inconclusive. This was an equipment failure.

February

Subject: Reactor scram while replacing Command Center alarm reset switch.

Time: 1355, 26 February, 2007.

Reactor conditions prior to the anomaly and what occurred during the anomaly:

Reactor was running at 1.5 MW for radiography.

Background:
When securing the facility on Friday 2/23/07, the Reactor Supervisor (RS) pressed the CSC alarm reset button. It became stuck in the recessed position. The RS was able to manually extract the switch until it was flush with the panel face, but was unable to extract the switch from the panel.
This reset switch was scheduled to be replaced at the end of the shift on Monday 2/26/07. As a preliminary to switch replacement, attempts to remove the lamp and plunger assembly were made. Normally this type of switch easily separates for light bulb replacement and has not been a problem in the past. Numerous attempts were made to mechanically free the switch plunger assembly until it finally was removed from the panel.
A visual inspection of the switch internals showed no damage or obvious problems but the plunger assembly did not operate freely, so the decision was made to replace the plunger assembly. (just like changing the internal light bulbs).
A new entire switch assembly was located and the new plunger assembly was easily and properly removed from its housing, new light bulbs installed and the red/green lens assembly transferred from the old plunger assembly to the new one.
When installing the new plunger assembly, the CSC console momentarily lost power resulting in a reactor scram. The CSC computer then rebooted and all indications restored to normal. The reactor was verified shutdown.
After completing the plunger assembly installation, the reset switch was cycled numerous times and operated properly.

What actions were taken to correct this anomaly:
The switch replacement was completed. CSC and DAC utilities diagnostic test programs were run satisfactorily.

What corrective actions are needed to prevent this anomaly from reoccurring in the future:
All operators have been briefed on this situation.
No light bulbs will be replaced and no switch assemblies will be disassembled on either the CSC console or the Auxiliary console while the reactor is operating.

March

There were two anomaly reports issued during the month of March.

1: Subject: Failure of NPP-1000 during performance of Prestart Checks

Time: 0645 March 19, 2007

Reactor conditions prior to the anomaly and what occurred during the anomaly:
The reactor was shutdown. Operators were preparing to start-up the reactor for normal radiography operations. The Prestart Check failed due to the NPP-1000 Scram tripping below its allowed range (107% vs 108% to 110%).

What actions were taken to correct this anomaly?
Rebooting the CSC and the DAC did not correct the problem. Several unsuccessful attempts were made to adjust the setpoint at the DAC. The NPP-1000 was replaced with a calibrated spare unit. The Prestart Check was completed satisfactorily several times.

The reactor was started up, a calorimetric calibration was performed and the reactor was returned to normal operation.

What corrective actions are needed to prevent this anomaly from reoccurring?
Undetermined

2: Subject: Unusually high readings on CSC display during performance of Start-up Checklist

Time: 0700 March 21, 2007

Reactor conditions prior to the anomaly and what occurred during the anomaly:
The reactor was shutdown. While performing the Scram Test step of the Startup Checklist, it was noted that the Fuel Temperature (FT) #1 Scram occurred at approximately 800°C instead of its normal setting of 750°C.
The Prestart Check showed the trip setting to be normal. The indicated fuel temperatures on the CSC were approximately 75°C, which about double what they normally are. Rebooting the CSC did not correct the situation. It was then noted that not only the fuel temperatures were reading high, but also the Heat Exchanger Inlet and Outlet and Reactor Tank Temperatures, Primary and Secondary Flows and Demin. Outlet Conductivity. Rebooting the DAC and CSC, then powering down and re-energizing both did not correct the situation.

What actions were taken to correct this anomaly?
All of the stated parameters are common to the AI016 #2 circuit card in the DAC. Based on similar past problems with this card, the card was removed and inspected. The terminal contacts were cleaned and the card was re-seated. Upon re-energizing the DAC, all parameters returned to normal.
Retesting was performed satisfactorily on all affected channels. The Prestart Checklist was completed and the reactor was returned to normal operation.

What corrective actions are needed to prevent this anomaly from reoccurring?
All operators were briefed on the anomaly. It was reiterated that extreme caution should be taken when working in the DAC to prevent from disturbing the wiring and seating of components in the cabinet

October

There was one anomaly report issued during the month of October:

Subject: Fuel elements not in expected locations

During the performance of the UCD/MNRC annual maintenance shutdown a fuel inspection was performed to ensure that reactor fuel elements were in their expected locations. The last such inspection was performed when the core was assembled during the 2 MW upgrade procedure. During the performance of this inspection, 2 of the in-core elements (grid positions H-02 and H-10) were found to not match the current database and core maps.
All fuel elements in the reactor tank were visually inspected with the new radiation hardened camera. No other problems with serial numbers were noted.
Fuel element number 10743 was expected to be in location H-10 (element number 10279 was found instead)

Fuel element number 10669 was expected to be in location H-02 (element number 10743 was found instead).
Fuel element number 10279 was expected to be in location Pit E-07 (element number 10669 was found instead).
All required inspections of the lead elements and all the control rods were completed satisfactorily with no issues with serial numbers on these elements.

Preliminary Investigation Results.
After the 2 MW core was assembled, a fuel element failure occurred. During the search for the failed element, many fuel moves were made to attempt to locate and isolate the failed element. During these fuel moves, fuel elements were moved usually one at a time from one position to another or to and from fuel storage racks based solely on the grid position or fuel rack position. The fuel element numbers were not routinely checked due to the constraint of not having a functioning radiation hardened camera and the difficulty in accurately verifying serial numbers from the reactor tank surface using binoculars.
On 10/24/2002, many fuel element moves were made and it is likely that this is when errors were made in either grid element location identification or fuel storage rack position identification. This is the most recent time that fuel elements 10743 and 10669 were handled in the same time frame.
Fuel element 10279 was recorded to be in fuel storage rack position 5-12 on 3/29/01. This element was "transferred" to fuel Pit position E-7 on 10/4/2005 without verifying its serial number.
Indications are that on 10/24/2002, operators made at least one error in core grid position identification and at least one error on fuel storage rack position identification.
Without confirming each fuel element serial number during that large series of fuel moves (between 1999 and 2002), this problem went undiscovered until the acquisition of a suitable radiation hardened underwater camera permitted reliable verification of element serial numbers.
It should be noted that anytime a new fuel element (or one that has not been in core for 3 years), is to be placed in-core, the element is inspected and measured and its serial number is confirmed. This is also true for in-core elements to be repositioned as "Lead Elements".

Corrective Actions:
All in core and in tank fuel element serial numbers have been verified using the new radiation hardened waterproof camera.

Element 10669 was located in Pit position E-7 where 10279 was expected to be.

The serial numbers of all fuel elements involved in future fuel shuffles (i.e. to increase core excess reactivity) will be positively verified utilizing the radiation hardened waterproof camera or equivalent.

Any fuel element to be transferred to the fuel storage pits will have its serial number positively verified.

Update fuel handling procedures and fuel transfer forms to require element serial number verification when moving fuel from one position to another or into or out of core. (not required for lift checks if element remains on fuel handling tool).

All operators will receive additional training emphasizing the need for positive control of each evolution and proper communications at all times.

The Technical Specifications were not violated as a result of this problem. For the "Mixed J" core configuration, these fuel elements were in acceptable locations and at no time was the core or fuel loading such that a safety limit could have been reached or exceeded.

The Facility Director, Safety Committee Chairman, and the NRC have all been notified of this occurrence.

7.3 MAINTENANCE OTHER THAN PREVENTIVE:

January

1. Replaced failed bolts on the Bay 1 shutter drive assembly mounting plate
2. Replaced failing cooling fan inside the CSC computer
3. Performed troubleshooting for failed prestart program. Replaced RLY08-4 circuit board and the DAC DOM32 card in the DAC computer. See anomaly report for additional details.
4. Placed north set of Demineralizer resin bottles on service, secured the south set.

February

1. Replaced both drive belts in EF-3 (Equipment Room ventilation).
2. Relocated and replaced with new programmable thermostats for classroom and conference area
3. While troubleshooting DAC performance problems, performed checks on AIO16 #2 card and ribbon connector. Verified no physical damage to card and to peripheral cards and connectors. Checked card seated properly in motherboard, and that contacts were clean.
4. Adjusted Shim 1 position zero and span settings. Performed rod op checks, drop time 0.38 seconds. Checks sat.
5 Replaced Command Center alarm reset button plunger. See Anomaly report for details
6. Replaced damaged 20 amp fuse set in the Bay CAM power supply.
7. Tightened loose pulley on air pump and retightened the air pump drive belt in an attempt to correct abnormal vibrations/noise on blower for Reactor CAM.
8. Reactor CAM blower (air pump) replaced with new unit. Flow adjustments and flow alarms sat

March

1. Replaced EF-3 (Equipment Room ventilation) HEPA pre-filter due to high differential pressure.
2. Replaced all exit lights with LED fixtures. Installed battery supplied emergency lights at each entrance of the two building annexes.
3. Troubleshot and replaced NPP-1000. See anomaly report for additional details
4. Removed, cleaned and reinstalled DAC AIO-16-2 card, cleaned contacts and reseated. All prestart checks were sat. See anomaly report for additional details
5. Replaced 3 outdoor cameras with color zoom units
6. Installed new upgraded Corby system. All retests sat

April

1. Replaced broken blower drive belt on AC-4 (Bay 2) to correct a loss of airflow indication.

2. AMUWS emergency generator failed auto-start test during the weekly preventative maintenance checks. Replaced failed fuel regulator, performed tune up. Tested sat.
3. AC-2 (Equipment Room) exhibited intermittent operation. Found corroded contactors in smoke detector. Replaced both smoke detectors on the unit. Tested sat.
4. Security system signal error prompted installing new communication equipment. Tested sat. All zones cleared.
5. Replaced AC-13 (Counting Lab/East Annex) condenser, repaired and re-brazed condenser pan drain line..

May

1. Installed new N2 fill system for counting lab detector dewers per FM-III-07-02
2. Repaired loss of air proof signal from the Secondary Cooling Tower by replacing the weather damaged and cracked sensing lines
3. Replaced 2 drive belts on EF-3 (Equipment Room ventilation).
4. Corrected sticking damper operation found during inspection on AC-1 (Reactor Room) intake damper.
5. Replace failed Emergency Light battery for the silicon shed found during maintenance
7. Replaced failed compressor and drier unit on AC-6 (Bay 3).
8. Replaced damaged compressor mainline contacts found during inspections on AC-7 (Bay 2).
9. Replaced damaged compressor mainline contacts found during inspections on AC-9 (Radiography Control Room).

June

1. Troubleshoot and repair load sharing circuit for AC-3 and AC-4 (Bay 1). Replaced 24 volt transformer and grounded the control circuit peanut relay to bring both units on at the same time to cool/heat Bay 1 more evenly.
2. Replaced failed South Access Gate gate control relay, mechanically adjusted the gate and its operating chain to permit smoother operations
3. Replaced EF-3 (Equipment Room ventilation) drive belts
4. Replaced failed printer in the Reactor Room CAM.
5. RadVac failed annual DOP test. New vac on order
6. Installed overhead and door insulation in CAM Room. Painted roof with reflective white to control CAM room temperature.

July

1. EF-1 (Reactor Room ventilation) failed prior to operations. Leveled bedplate, aligned pulleys, replaced drive belts

August

1. Applied sealer to all accessible seams following scheduled cleaning and inspection of the Secondary Cooling Tower.
2. Replaced two drive belts on EF-2 (Radiography Bay ventilation) blower.
3. Replaced Auxiliary Make Up Water System (AMUWS) emergency power generator battery due to low cranking amps.
4. Replaced broken sensing line for flow proof switch on EF-2 (Radiography Bay ventilation) blower with UV resistant tubing
5. Found thermostat mount broken inside Bay 2 while troubleshooting AC-7 (Bay 2) evaporator coil icing. Reoriented t-stat for proper operation, and will investigate replacing all balance t-stats in facility in near future.

6. Installed new Security System shock sensor in new location.
7. UCD Facilities roofers repaired problem areas on roof to stabilize it for the winter. Replacement of roof membrane has been authorized, but no contract bids accepted yet.

September

1. Replaced failed Demineralizer System pool skimmer basket and plate with new.
2. Replaced 6 12VDC UPS batteries due to failure.
3. Replaced both belts on EF-1 (Reactor Room ventilation) blower motor drive.
4. Replaced failed HV-3 (Bay 4 Staging Area ventilation) sump pump and 15 Amp supply fuse.
5. Replaced failed condenser fan motor and starting capacitor on AC-8 (Dark Room and Bay 4 Radiography Control Room).
6. HV-2 (Bay 2 Staging Area) shutdown due to faulty duct smoke detectors. Replaced both duct smoke detectors.
7. Removed the failed Iodine system from fuel pit B, placed it in low level storage.
8. Replaced failed dual condenser coil assembly and both refrigerant filter/driers in AC-3 (Bay 1).

October

1. MNRC completed the annual maintenance shutdown cycle in the month of October. Included in the maintenance are the following reactor related items:

a. A complete inspection of In Tank fuel element serial numbers was performed using the new underwater camera system. Discrepancies were noted, and reported. An Anomaly Report was generated.
b. Annual fuel inspections were performed satisfactorily. No abnormalities were found.
c. Annual Control Rod and Annual Transient Rod inspections were performed.
d. Control Rod Operability checks, Indication Linearity checks, and Scram Times were checked. No problems were found. Measured scram times are as follows

Transient Rod:	0.36 seconds	Shim 3:	0.31 seconds
Shim 1:	0.31 seconds	Shim 4:	0.31 seconds
Shim 2:	0.32 seconds	Regulating Rod:	0.32 seconds

e. Rod Calibration measurements were performed with the following results

Transient Rod:	$2.16	Shim 3:	$2.23
Shim 1:	$2.54	Shim 4:	$2.68
Shim 2:	$2.28	Regulating Rod:	$2.55

f. The Shutdown Margin was calculated at $6.34.
g. A Reactor Power Calorimetric was performed following the calibration and change-out of the NPP-1000, with no adjustments required on either instrument detector.
h. At Power scram testing of both nuclear instrument channels was sat. The NM-1000 channel scrammed at 104%, and the NPP-1000 scrammed at 107%.
i. Emergency Core Cooling System (ECCS) flow verifications were performed satisfactorily and in specification at both the in-tank nozzle (23GPM) and at the ECCS supply header (21.9GPM).

2. Electrically disconnected and removed the Iodine control cabinet.
3. Lift, realign, reinstall Emergency Core Cooling System (ECCS) Chimney assembly to perform fuel inspections and correct a chimney segment misalignment.
4. Disconnect, move, reinstall Emergency Core Cooling System (ECCS) spray nozzle assembly for interference removal for chimney realignment.
5. Changed out expended for fresh Demineralizer System resin bottles.
6. Bench calibrate both NPP modules.
7. Replaced broken latch spring on Stairwell door operating mechanism.
8. Contractor installed a new Security System alarm panel for annex doors.
9. Replaced left foot tube and the interface board in the Equipment Room hand and foot monitor, recalibrated SAT

November

1. Replaced one belt on EF-3 (Equipment Room ventilation).
2. Replaced bulb and photoeye on northwest fence perimeter security light.
3. Replaced failed effluent pump on the dark room sump.
4. Sampled and placed on service the south set of Demineralizer System resin bottles. North set isolated and depressurized
5. Replaced Reactor CAM 20 amp air pump fuse

December

1. Replaced several burned out lamps on the Perimeter Security Lighting units.
2. Isolated AC-5 (Bay 4) heater unit section. Discovered unit had experienced an overpressure condition, buckling AC-5 covers. A new unit, or major overhaul of this unit is deferred until Spring
3. Troubleshot test ramping circuit for Fuel Temperature channel #1.. Unseated and reseated relays and action pack. System functions normally at this time
4. Replaced the He supply bottle.

7.4 Training

January

1. 2 Senior Reactor Operators and the Experiment Coordinator attended training on an NRC inspection audit finding concerning Rad Material shipping.

February

1. One Senior Reactor Operator attended CPR-First Aid training.

2. All Senior Reactor Operators attended training for MNRC-0030-DOC-05 Tag out Procedure Revision 5.
3. All Senior Reactor Operators attended training for MNRC-0005-DOC-09 Document Control Procedure revision 9.
4. All Senior Reactor Operators attended Normal, Abnormal, and Emergency Procedures training.

March

1. Three Senior Reactor Operator sand the radiography group attended training on use of Bay Keys and Soft/Hard Stops for the radiography robots.
2. Three Senior Reactor Operators completed Facility Design and Operating Characteristics training.
3. All Operations and Radiography personnel attended vendor supplied Overhead Crane Operator training, with Operator Certification for all attendees
4. Three Senior Reactor Operators and radiography personnel attended "Following Procedures" training.

April

1. All MNRC personnel attended the annual ALARA, SAFETY, and SECURITY training

May

1. There was no scheduled training held in the month of May

June

1. All licensed operators (5 SROs) successfully completed the Annual Operators Exam.
2. The Experiment Coordinator and an SRO attended FedEx IATA Dangerous Goods Shipping training.
3. An SRO attended Energy Solutions' Advanced Radioactive Materials Shipping training.
4. All licensed operators attended refresher training on OMM-5330 (Nuclear Instruments
5. All licensed operators attended refresher training on OMM-5310 (Control System Console).
6. All licensed operators attended refresher training on OMM-5230 (Data Acquisition Console) and OMM- 5340 (Reactor Protective System).

July

1. All licensed operators (5 SROs) successfully completed the Biennial Radiation Safety Training and Exam.

August

1. All licensed operators (5 SROs) attended training on Revision 8 to the Physical Security Plan.

September

1. Operations, Radiography, and Research personnel attended two sessions of Nuclear Physics/Reactor Theory training.
2. Two Senior Reactor Operators (Reactor Supervisor and Facility Manager) attended the annual TRTR conference in Lincoln City, Oregon.

October

1. Operations and Radiography personnel attended Forklift Requalification training.
2. Senior Reactor Operators attended Technical Specifications training.
3. Operations personnel attended Fuel Handling training prior to fuel movement.
4. Operations, Radiography, and Research personnel attended two sessions of Nuclear Physics/Reactor Theory training.

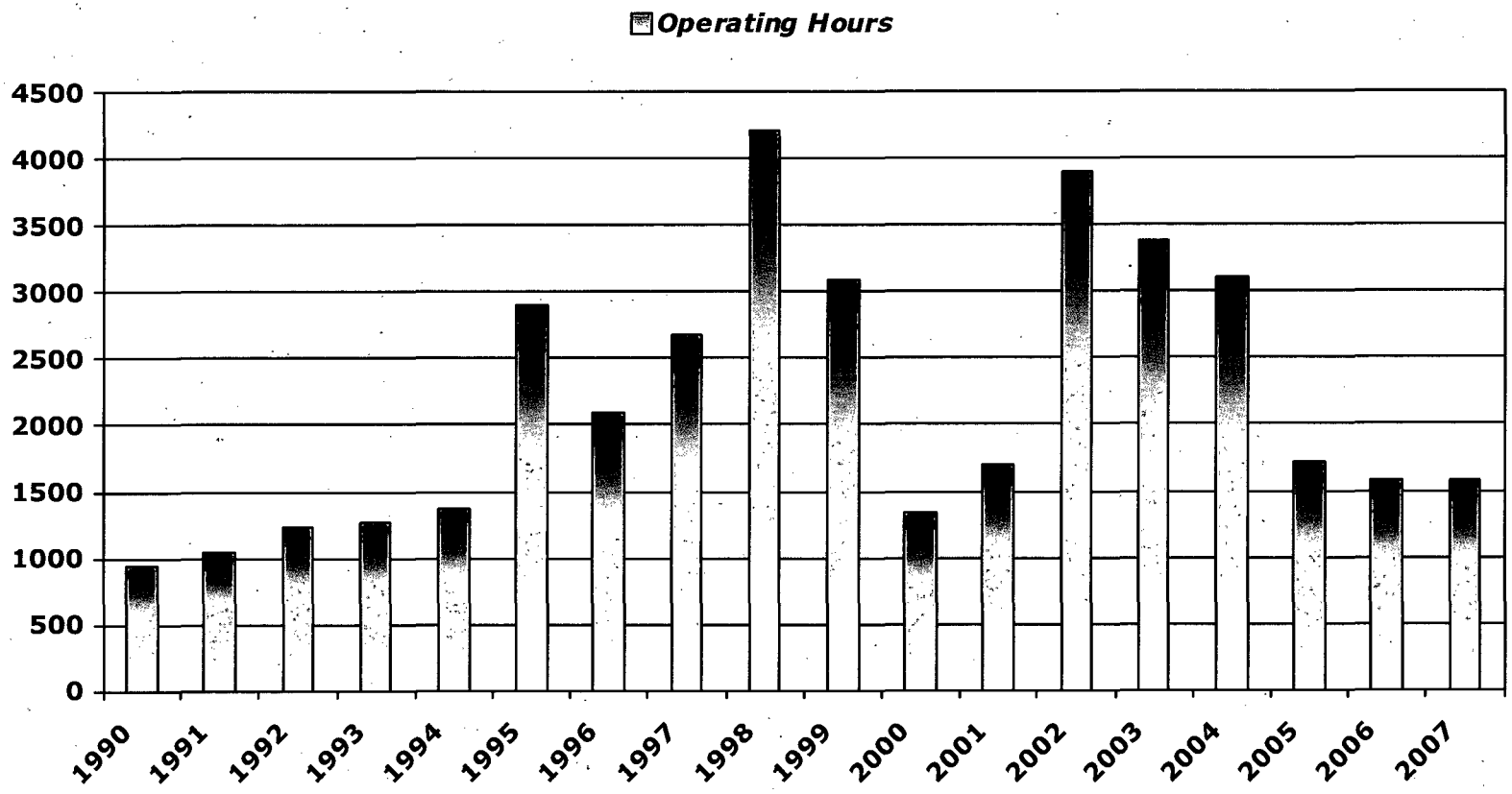
November

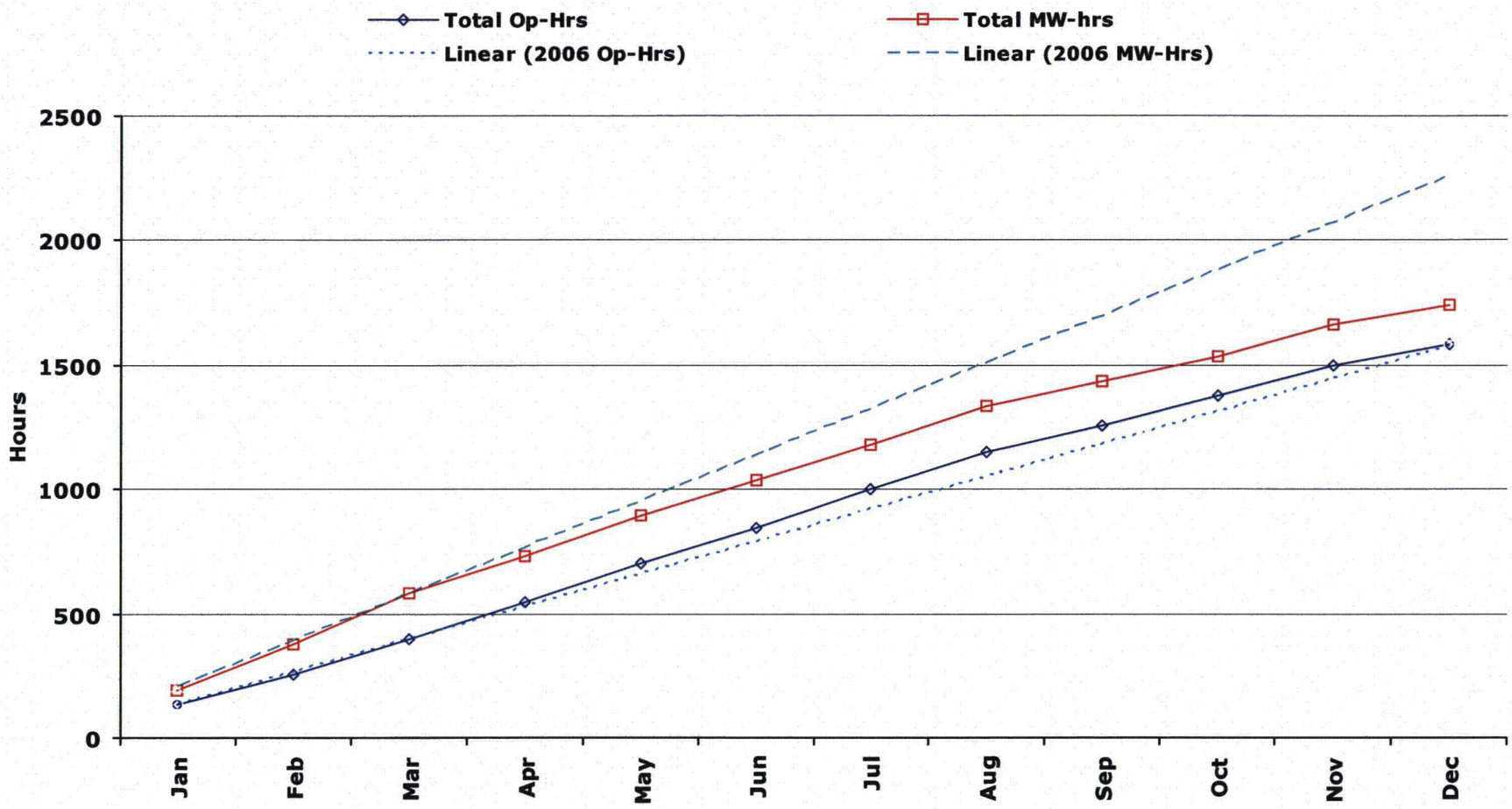
1. Operations, Radiography, and Research personnel attended four sessions of Nuclear Physics/Reactor Theory training.
2. All operators completed biennial medical physicals.

December

1. Operations, Radiography, and Research personnel attended one session of Nuclear Physics/Reactor Theory training.
2. Two spill drills were held for the Annual Emergency Drill exercise.

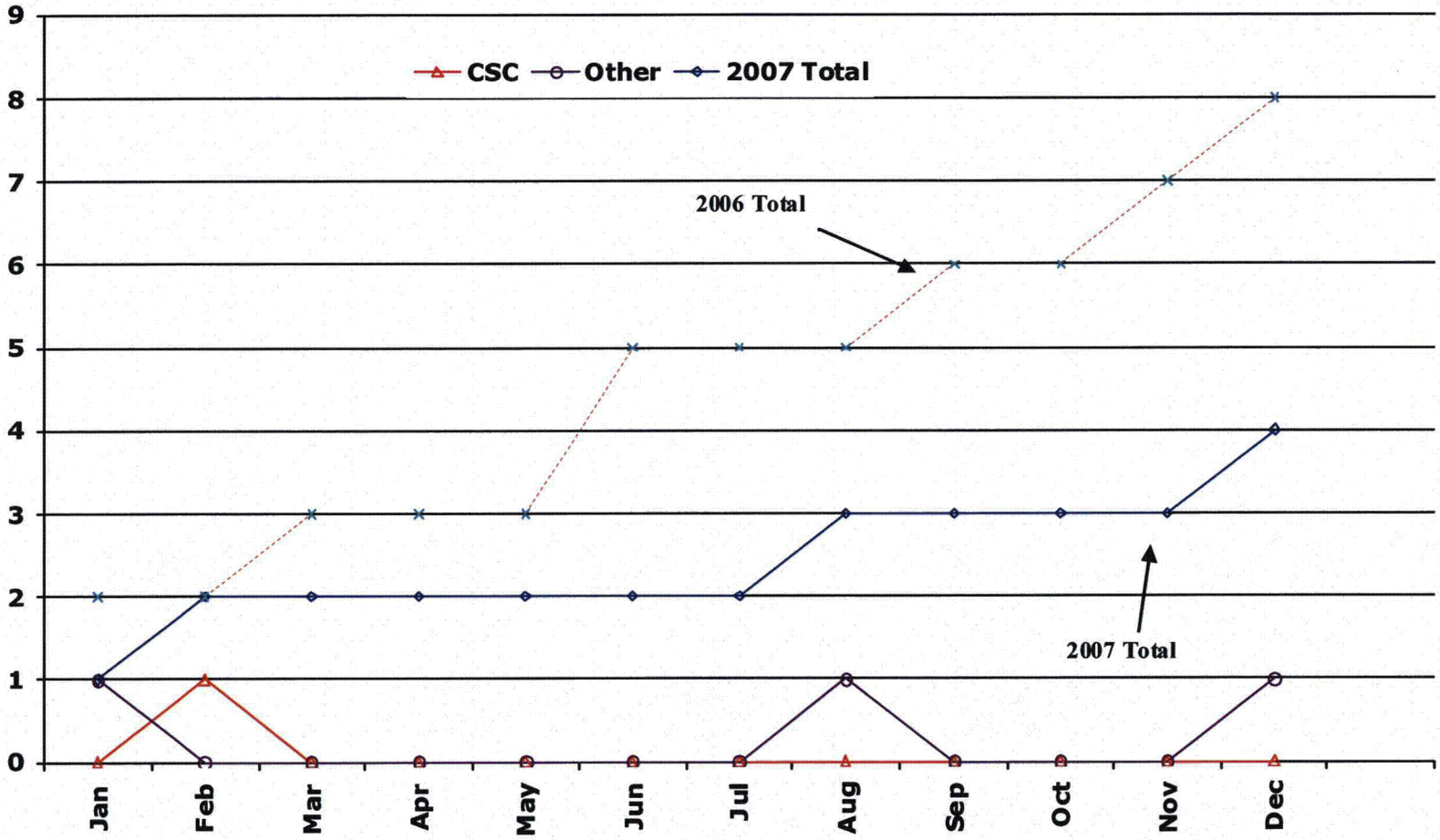
UCD/MNRC Operating History



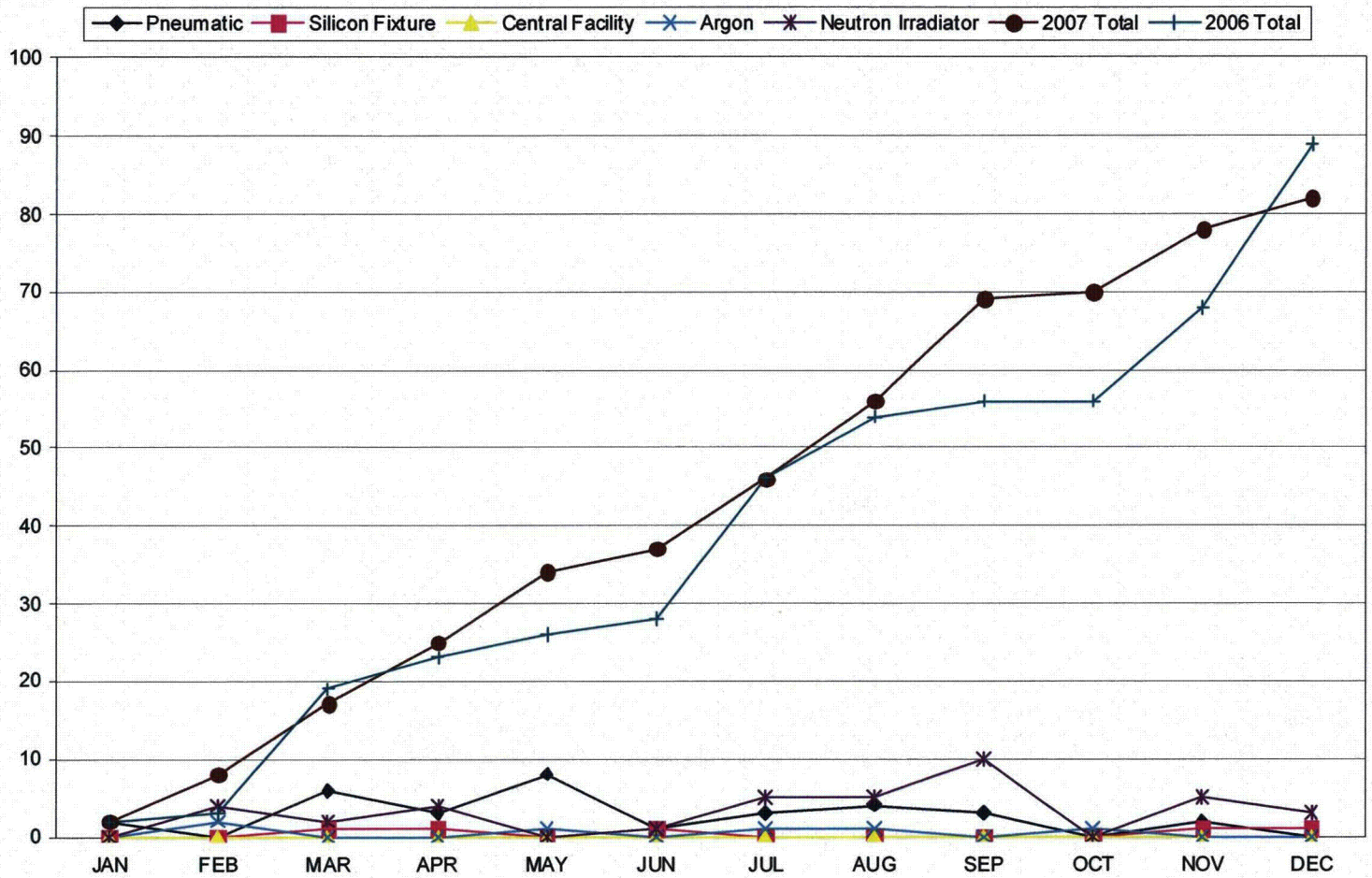


Reactor Hours (2007)

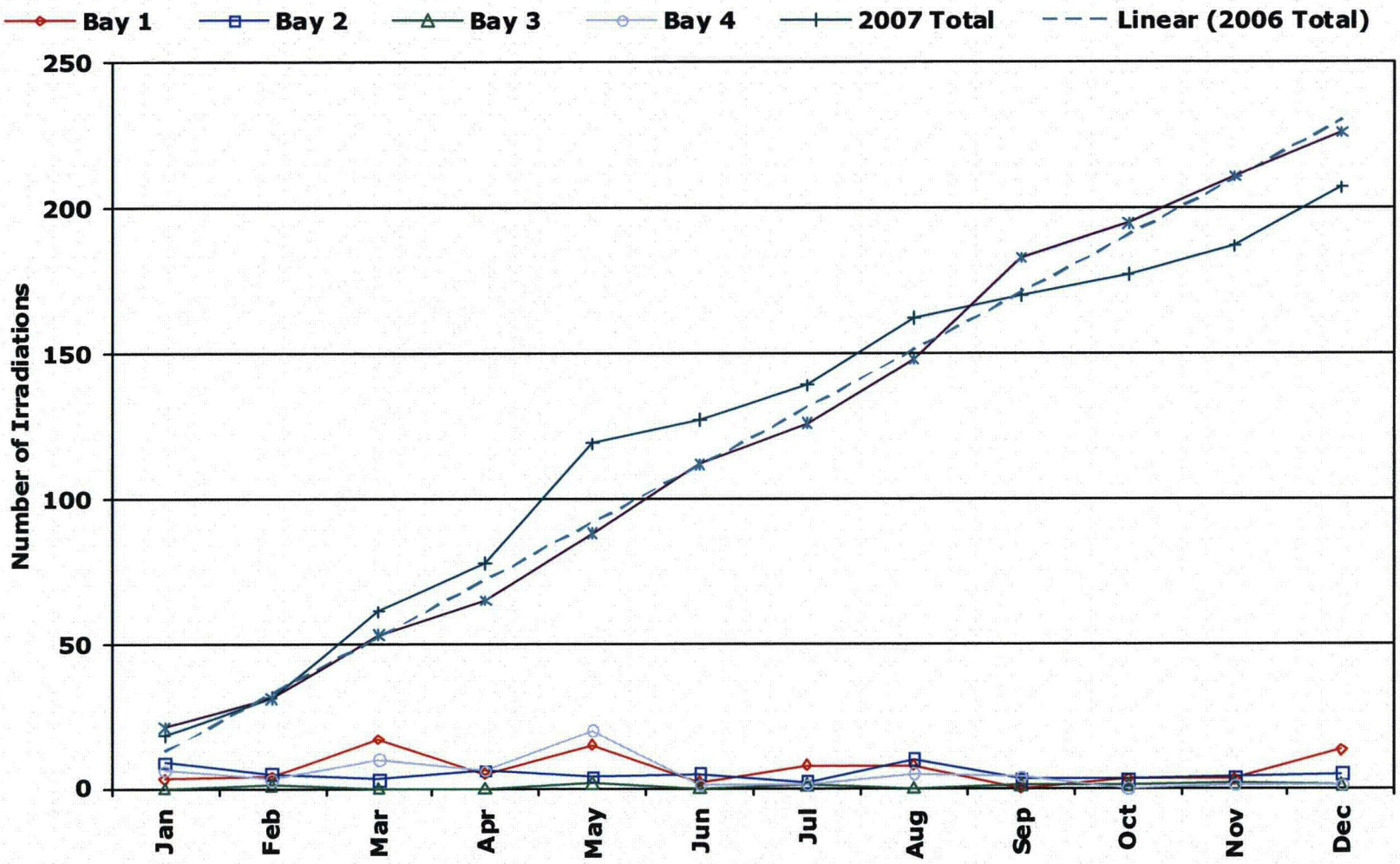
Unscheduled Shutdowns-- Total 2007



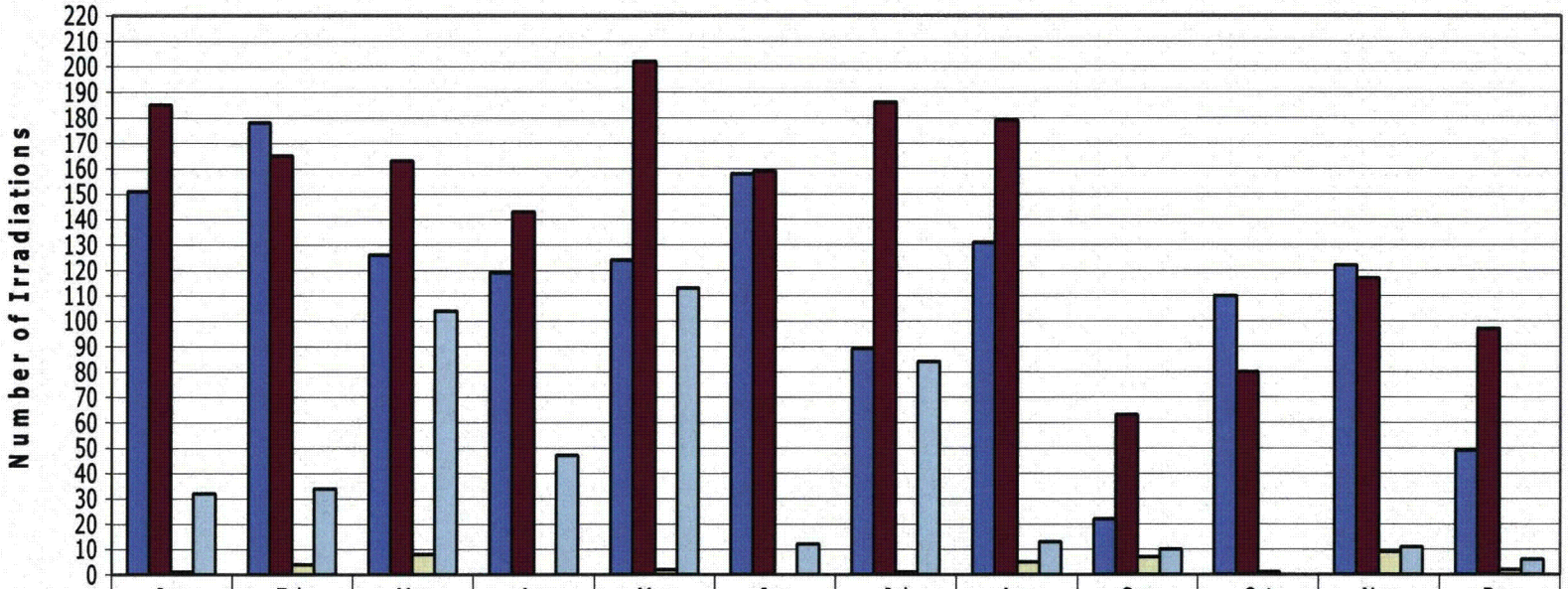
Reactor Tank Irradiation Facilities
Total Number of Irradiations Completed (2007)



Bay Irradiations Completed (2007)



Bay Utilization (Shutter Operations) 2007



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Bay 1	151	178	126	119	124	158	89	131	22	110	122	49
Bay 2	185	165	163	143	202	159	186	179	63	80	117	97
Bay 3	1	4	8	0	2	0	1	5	7	1	9	2
Bay 4	32	34	104	47	113	12	84	13	10	0	11	6

Months

8.0 Radioactive Effluents

A summary of the nature and amount of radioactive effluents released or discharged to the environment beyond the effective control of the MNRC, as measured at or prior to the point of such release or discharge, include the following:

8.1 Liquid Effluents

Liquid effluents released during 2007 are summarized on a monthly basis in Table 1 below.

TABLE 1
2007 SUMMARY OF LIQUID EFFLUENTS

MONTH	TOTAL ACT. RELEASED (Ci)	DETECTABLE RADIO-NUCLIDE(S)	SPECIFIC ACT. OF EACH DETECT-ABLE RADIO-NUCLIDE (uCi/ml)	TOTAL ACT. OF EACH DETECT-ABLE RADIO-NUCLIDE (Ci)	AVG. CONC. OF RAD. MATL. AT POINT OF RELEASE (uCi/ml)	FRACTION OF 10CFR20 LIMIT	TOTAL VOL. OF EFFLUENT WATER (INCLUDING DILUENT) RELEASED (gal)
JAN	0	NONE					
FEB	0	NONE					
MAR	0	NONE					
APR	0	NONE					
MAY	0	NONE					
JUN	0	NONE					
JUL	0	NONE					
AUG	0	NONE					
SEP	0	NONE					
OCT	0	NONE					
NOV	0	NONE					
DEC	0	NONE					

8.2 Airborne Effluents

Airborne radioactivity discharged during 2007 is tabulated in Table 2 below.

TABLE 2
2007 SUMMARY OF AIRBORNE EFFLUENTS

MONTH	TOTAL EST. QUAN. Ar-41 RELEASED (Ci)	EST.MAX AVG. CONC. OF Ar-41 IN UNRESTRICTED AREA (1) (uCi/ml)	FRACTION OF APPLICABLE 10CFR20 Ar-41 CONC. LIMIT FOR UNRESTRICTED AREA (1) (%)	EST. DOSE (2) FROM Ar-41 FOR UNRESTRICTED AREA (1) (mrem)	FRACTION OF APPLICABLE 10CFR20 DOSE LIMIT FOR UNRESTRICTED AREA (1) (%)	TOT. EST. QUANTITY OF ACT. IN PART. FORM WITH HALF-LIFE >8 DAYS (Ci)	AVERAGE CONC. OF PART. ACT. RELEASED WITH HALF-LIFE > 8 DAYS (uCi/ml)
JAN	3.14	5.37E-07	1.7%	8.87E-02	0.89%	NONE	NONE
FEB	2.58	5.04E-07	1.6%	8.07E-02	0.81%	NONE	NONE
MAR	3.22	5.26E-07	1.8%	9.07E-02	0.91%	NONE	NONE
APR	2.10	4.94E-07	1.2%	5.93E-02	0.59%	NONE	NONE
MAY	1.94	5.32E-07	1.1%	5.47E-02	0.55%	NONE	NONE
JUN	2.16	3.47E-07	1.3%	6.63E-02	0.66%	NONE	NONE
JUL	2.26	3.07E-07	1.4%	6.91E-02	0.69%	NONE	NONE
AUG	2.32	3.38E-07	1.4%	7.09E-02	0.71%	NONE	NONE
SEP	1.23	3.12E-07	0.7%	3.77E-02	0.38%	NONE	NONE
OCT	1.47	2.36E-07	0.9%	4.51E-02	0.45%	NONE	NONE
NOV	1.96	3.14E-07	1.2%	6.21E-02	0.62%	NONE	NONE
DEC	1.32	2.12E-07	0.8%	4.05E-02	0.40%	NONE	NONE
TOT	25.72	3.43E-06		0.77		NONE	NONE
AVG	2.14	4.06E-07	1.3%	0.77	0.91%		

(1) This location is 240 meters downwind which is the point of maximum expected concentration based on the worst case atmospheric conditions (see MNRC SAR Chapter 11).

(2) Based on continuous occupancy and the calculation techniques used in Appendix A of the MNRC SAR (Ar-41 at 2.3E-10 uCi/ml continuous for one year equals 1.4 mrem).

8.3 Solid Waste

No waste shipments were made in 2007

TABLE 3
2007 SUMMARY OF SOLID WASTE

TOTAL VOL. (cu. ft.)	TOTAL ACTIVITY (mCi)	DATE OF SHIPMENT	DISPOSITION
0	0	N/A	N/A

9.0 Radiation Exposure

Radiation exposure received by facility operations personnel, facility users, and visitors during 2007 is summarized in Table 4 below.

TABLE 4
2007 SUMMARY OF PERSONNEL RADIATION EXPOSURES

	NUMBER OF INDIVIDUALS	AVERAGE TEDE PER INDIVIDUAL (mrem)	GREATEST INDIVIDUAL TEDE (mrem)	AVERAGE EXTREMITY (mrem)	GREATEST EXTREMITY (mrem)
FACILITY PERSONNEL	12	74	242	257	375
FACILITY USERS	4	1	1	*	*
VISITORS	742 (375[1])	0.5	2	*	*

* Extremity monitoring was not required.
1 = Total number that were monitored for exposure

10.0 Radiation Levels and Levels of Contamination

Radiation levels and levels of contamination observed during routine surveys performed at the MNRC during 2007 are summarized in Table 5 below.

TABLE 5
2007 SUMMARY OF RADIATION LEVELS AND CONTAMINATION LEVELS DURING ROUTINE SURVEYS

	AVERAGE (mrem/hr)	HIGHEST (mrem/hr)	AVERAGE (dpm/100cm^2)	HIGHEST (dpm/100cm^2)
OFFICE SPACES	<0.1	<0.1	<800(1)	<800(1)
REACTOR CONTROL RM	<0.1	<0.1	<800(1)	<800(1)
RADIOGRAPHY CONTROL RM	<0.1	<0.1	<800(1)	<800(1)
COUNTING LAB	<0.1	<0.1	<800(1)	<800(1)
STAGING AREA	<0.1	<0.1	<800(1)	<800(1)
COMPOUND	<0.1	<0.1	<800(1)	<800(1)
EQUIPMENT RM	4.0	390	<800(1)	<800(1)
DEMINERALIZER AREA	16.0	320	<800(1)	<800(1)
REACTOR RM	8.0	74	<800(1)	<800(1)
SILICON STORAGE SHED	<0.1	<0.1	<800(1)	<800(1)
RADIOGRAPHY BAYS	*2.0	*25000	<800(1)	<800(1)

(1) <800 dpm/100 cm^2 = Less than the lower limit of detection for a swipe survey.

- Due to Bay 1 Storage Areas; most other areas and other bays are significantly lower
- Highest reading is one item in storage area, not accessible to personnel

11.0 Environmental Surveys

Environmental surveys performed outside of the MNRC during 2007 are summarized in Tables 6-9 below. The environmental survey program is described in the MNRC Facility Safety Analysis Report.

TABLE 6
2007 SUMMARY OF ENVIRONMENTAL TLD RESULTS
(WITH NATURAL BACKGROUND(1) SUBTRACTED)

	AVERAGE (mrem)	HIGHEST (mrem)
ON BASE (OFF SITE 1-20 & 64)	4	20
ON SITE (SITES 50 – 62 & 65-71)	13	34

(1) Natural background assumed to be the off base (Sites 27-42) average of 29mrem.

TABLE 7
2007 SUMMARY OF RADIOACTIVITY IN WELL WATER

	ALPHA (pCi/l)	BETA (pCi/l)	TRITIUM (pCi/l)	Cs-137 (pCi/l)
AVERAGE	<MDA	<MDA	<MDA	<MDA
HIGHEST	<MDA	3.01	<MDA	<MDA

MDA is the minimum detectable activity at the 95% confidence level.
The MDA range for the analyzed radionuclides (pCi/L).

	MIN	MAX
Alpha	1.24	1.72
Beta	2.87	3.03
Tritium	2.52	3.24
Cs-137	5.9	9.84