CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES

TRIP REPORT

SUBJECT: Attend the course "Introduction to MCNP5"
Project # 20.06002.01.011

DATE/PLACE: June 14–17, 2005, Los Alamos National Laboratory, Los Alamos, New Mexico

AUTHOR: Razvan Nes

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DATE/PLACE: June 14–17, 2005 Los Alamos National Laboratory (LANL),
          Los Alamos, New Mexico

AUTHOR: Razvan Nes

PERSONS PRESENT:

Approximately thirty participants, most of them regular LANL employees or LANL summer students.

BACKGROUND AND PURPOSE OF TRIP:

MCNP is a software approved by the U.S. Nuclear Regulatory Commission (NRC) with applications in areas such as radiation protection and dosimetry, radiation shielding, nuclear criticality safety, decontamination and decommissioning, detector design and analysis, nuclear reactor design, waste storage and disposal, and medical physics and radiotherapy. The purpose of the trip was to receive training in the application of the newly released version of the code, MCNP5, to radiation dose analyses, shielding, and criticality safety.

SUMMARY OF PERTINENT POINTS:

The training course was taught by the code developers, who are specialists from the LANL X-5 Monte Carlo Team. They provided hands-on, step-by-step instruction in proper application of the software using practical examples for each section. Students worked in groups of two per computer. Instructors encouraged students to ask questions during the presentations.

SUMMARY OF ACTIVITIES:

The four-day training course was held from 8:30 a.m. to 4 p.m. daily.

The course covered various aspects of running MCNP5, the physical basis of the models used in the code, and the data libraries currently available. The first two days of the course were dedicated to getting started with MCNP5, particle source modeling, tally overview and MCNP output, statistical analysis, and MCNP geometry modeling options. During the first part of the third day, the discussions shifted to neutron, photon, and electron physics with applications in MCNP5, and MCNP cross-section libraries. Instructors presented what users should consider when choosing a library and introduced the Monte Carlo sampling technique. The second part of the day was dedicated to variance reduction techniques, which play a major role in MCNP calculation accuracy and efficiency. The topics of the last day of the course were criticality, an important safety issue, and parallel processing in MCNP. The last item on the day's schedule was an open discussion, when students had the chance to ask instructors additional questions.

The list of instructors and a course syllabus are presented in the attachment.

CONCLUSIONS:

The course provided good beginner training in application of the code to dose analyses for simplified configurations and simplified radiation sources. Instructors selected various practical examples to demonstrate a wide range of the code capabilities. The course was well structured, taught with even and balanced pace, and the instructors were available for help during class exercises. No complex examples of radiation transport were presented, the purpose of the course being to introduce students to the MCNP code.

PROBLEMS ENCOUNTERED:

None

PENDING ACTIONS:

None

RECOMMENDATIONS:

This training course is recommended for NRC and Center for Nuclear Waste Regulatory Analyses (CNWRA) staffs who seek a beginner course on the MCNP5 code. LANL is offering intermediate and advanced classes for those with beginner-level MCNP experience covering advanced topics such as advanced variance reduction techniques. Attending the introductory and the intermediate/advanced courses would provide staff a good opportunity to extend their knowledge and depth of understanding in this computer code. The course is highly recommended to staff working on radiation protection, decommissioning, dosimetry, and criticality safety.

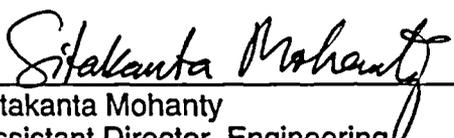**SIGNATURES:**

Razvan Nes
Research Engineer

8/23/05
Date

CONCURRENCE:

James Winterle
Manager, Performance Assessment

8 /23/05
Date

Sitakanta Mohanty
Assistant Director, Engineering
and System Assessment

8/24/2005
Date

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INTRODUCTION
TO
MCNP

X-5 Monte Carlo Team

June 14-17, 2005

mcnp

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Los Alamos

Introduction to MCNP

June 14-17, 2005

Lecturers:

- Forrest Brown   fbrown@lanl.gov
- Jeffrey Bull   jsbull@lanl.gov
- Tim Goorley   jgoorley@lanl.gov
- Russ Mosteller   mosteller@lanl.gov
- Avneet Sood   sooda@lanl.gov
- Jeremy Sweezy   jsweezy@lanl.gov
- Morgan White   morgan@lanl.gov

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Class Schedule

Thursday, June 16

8:30 - 9:45	- Cross-Sections and Physics
9:45 - 10:00	- Break
10:00 - 11:30	- XS and Physics (cont'd)
11:30 - 12:30	- Lunch
12:30 - 14:15	- Variance Reduction Overview
14:15 - 14:30	- Break
14:30 - 16:00	- Variance Reduction (cont'd)

Class Schedule

Friday, June 17

8:30 - 9:45	- Criticality Session
9:45 - 10:00	- Break
10:00 - 11:30	- Criticality (cont'd)
11:30 - 12:30	- Lunch
12:30 - 14:15	- Parallel Processing
14:15 - 14:30	- Break
14:30 - 16:00	- Consultation, Open discussion