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**University of Nevada, Las Vegas Advanced Accelerator  
Applications University Participation Program: Quarterly Report,  
Third Quarter Year 2 (Sept. 2002 to Nov. 2002)**

Anthony Hechanova  
*University of Nevada, Las Vegas*

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Quarterly Report  
Third Quarter Year 2 (Sept. 2002 to Nov. 2002)

University of Nevada, Las Vegas  
Advanced Accelerator Applications  
University Participation Program

October 14, 2002

Prepared by:

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**Director, UNLV AAA UPP  
Harry Reid Center for Environmental Studies  
University of Nevada, Las Vegas**

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## ACRONYMS

A&M	Texas University
AAA	Advanced Accelerator Applications
ADTTA	Accelerator-Driven Transmutation Technology and Applications Conference
AMUSE	Argonne Model for Universal Solvent Extraction
ANL	Argonne National Laboratory
ANRC	Amarillo National Research Center
ANS	American Nuclear Society
BFS	Critical Fast Reactor Facility, Obninsk, Russia
BNL	Brookhaven National Laboratory
COE	UNLV College of Engineering
D&D	Decommissioning and Decontamination
DCC	Dose Conversion Coefficients (refer to UNLV Task 7)
DOE	U.S. Department of Energy
DOE-NE	DOE Office of Nuclear Energy, Science, and Technology
ECE	Electrical and Computer Engineering Department
EENF	Environmental Evaluation Notification Form
FEI	Transmission Electron Microscope Vendor
HRC	Harry Reid Center for Environmental Studies
IEEE	Institute of Electrical and Electronic Engineers
INPE	Institute of Nuclear Power Engineering, Obninsk, Russia
IPPE	Institute of Physics and Power Engineering, Obninsk, Russia
ISTC	International Science and Technology Center
JEOL	Transmission Electron Microscope Vendor
KALLA	Karlsruhe Lead Laboratory, Karlsruhe, Germany
KRI	Khlopin Radium Institute, St. Petersburg, Russia
LANL	Los Alamos National Laboratory
LANSCE	Los Alamos Neutron Science Center
LBE	Lead Bismuth Eutectic
LBNL	Lawrence Berkeley National Laboratory
LEDA	Low Energy Demonstration Accelerator
LLNL	Lawrence Livermore National Laboratory
MCNPX	Monte Carlo Neutron Photon with extremely high-energy libraries code
MINATOM	Ministry of Atomic Energy, Russia
MOU	Memorandum of Understanding
MSE	Material Sciences and Engineering
NEPA	National Environmental Policy Act
NERAC	Nuclear Energy Research Advisory Committee
ORAU	Oak Ridge Association of Universities
PNL	Pacific Northwest Laboratory
QTR	Quarterly Technical Review

R&D	Research and Development
SEM	Scanning Electron Microscope
SMC	Student Mini-Conference
SOW	Statement of Work
TEM	Transmission Electron Microscope
UCB	University of California, Berkeley
UCLA	University of California, Los Angeles
UM	University of Michigan
UNLV	University of Nevada, Las Vegas
UNM	University of New Mexico
UPP	University Participation Program
USC	University of South Carolina
UT	University of Texas
VPR	Vice Provost for Research
WBS	Work Breakdown Sheet
YDRNS	Youth Department of the Russian Nuclear Society

## 1. INTRODUCTION

This Quarterly Report is a primary deliverable from the University of Nevada, Las Vegas (UNLV) Advanced Accelerator Applications (AAA) University Participation Program (UPP) Director to the U.S. Department of Energy (DOE) as described in the UNLV AAA proposal<sup>1</sup> and Statement of Work for the Fourth Quarter<sup>2</sup>.

The UNLV AAA UPP Director implements the program's administration using staff from the Harry Reid Center for Environmental Studies (HRC) to ensure that work conducted under the UNLV AAA UPP meets program objectives. The UNLV AAA program consists of three components: Program Support, Research Infrastructure Augmentation, and Student Research. Further information about the activities and reports discussed in this document can be viewed on the UNLV AAA program's website at <<http://aaa.nevada.edu>>.

### 1.1 Chronology of Events

Sept. 1, 2002	Ning Li adjunct professor
Sept. 1, 2002	Tom Ward international coordinator of Russian programs
Sept. 9, 2002	AFCI Program Conference Call
Sept. 19, 2002	DOE-NE Performance Review and FY03 Program Controls meetings at UNLV
Sept. 30, 2002	UNLV director gives invited presentation at NERAC Meeting in Arlington, VA
Oct. 10, 2002	Perkin Elmer ICP-AES visit and demonstration at UNLV

Mar. 21, 2002	Candidate Interview for ECE Professorship: Dr. Melkonian
Mar. 21, 2002	Task 3 Second Quarter Report submitted to UNLV AAA Director
Mar. 21, 2002	Task 11 First Quarter Report submitted to UNLV AAA Director
Mar. 21, 2002	Task 12 First Quarter Report submitted to UNLV AAA Director
Mar. 24, 2002	Task 4 Third Quarter Report submitted to UNLV AAA Director
Mar. 24, 2002	Task 10 Second Quarter Report submitted to UNLV AAA Director
Mar. 25, 2002	AAA DOE-NE/UNLV Program Conference Call
Mar. 25, 2002	AAA Program Conference Call
Mar. 25-26, 2002	UNLV faculty visit JEOL TEM demonstration facility
Mar. 26, 2002	Task 6 First Quarter Report submitted to UNLV AAA Director
Mar. 27, 2002	Task 1 Third Quarter Report submitted to UNLV AAA Director
Mar. 27, 2002	Task 8 Second Quarter Report submitted to UNLV AAA Director
Mar. 28, 2002	AAA Program Management and Controls Conference Call
Apr. 1, 2002	AAA DOE-NE/UNLV Program Conference Call
Apr. 1, 2002	AAA Program Conference Call
Apr. 2, 2002	AAA Graduate Student Seminars, Criticality during Separations and Neutron Transport in a Target – Tasks 11 and 12
Apr. 5, 2002	Technical presentation and discussion with Congresswoman Berkley's Legislative Director
Apr. 5, 2002	Inaugural meeting of the UNLV Student Section of the American Nuclear Society, speaker David Stahl on the Yucca Mountain Materials Program
Apr. 7, 2002	UNLV March Actual Expenditures submitted to DOE
Apr. 8, 2002	AAA Program Conference Call
Apr. 8, 2002	Physics faculty discussion on potential AAA-sponsored professorships
Apr. 9, 2002	AAA Seminar and faculty meetings, Physics of Radioactive Waste Transmutation, Massimo Salvatores, Argonne National Laboratory
Apr. 11, 2002	UNLV March Actual Expenditures submitted to DOE
Apr. 15, 2002	DOE-NE formally approves the proposals recommended by the UNLV Finance Advisory Committee – six tasks for \$900,937 worth of funding starting summer term 2002
Apr. 16-20, 2002	IYNC 2002 Conference, Daejeon, Korea. Two papers presented by UNLV AAA graduate student and faculty.
Apr. 19, 2002	Task 11 Report distributed: "Fission and Thermal Effects in Curium Separated from Spent Nuclear Fuel"
Apr. 22, 2002	AAA DOE-NE/UNLV Program Conference Call
Apr. 22, 2002	AAA Program Conference Call
Apr. 23, 2002	AAA Graduate Student Seminar, Dose Conversion Coefficients – Task 7
Apr. 24, 2002	UNLV AAA Infrastructure Committee recommends \$150,000 for three items: flow visualization equipment for Task 3, startup package support for new ECE professor, and machining equipment to support a number of AAA tasks
Apr. 25, 2002	AAA Program Management and Controls Conference Call

Apr. 25, 2002	Task 1 distributed two conference papers on Melt Casting of Metallic Fuel Pins to ASME02 and ICAPP02
Apr. 25, 2002	LBE Infrastructure Subcommittee Conference Call
Apr. 26, 2002	Infrastructure Seminar, JEOL TEM representatives
Apr. 29, 2002	AAA DOE-NE/UNLV Program Conference Call
Apr. 29, 2002	AAA Program Conference Call
Apr. 29, 2002	UNLV AAA Program Call for Proposals for Spring 2002 Distributed
Apr. 30, 2002	Task 11 Second Quarter Report submitted to UNLV AAA Director
Apr. 30, 2002	Task 12 Second Quarter Report submitted to UNLV AAA Director
Apr. 30, 2002	UNLV meetings on Accelerator Research with John McGill, General Atomics
Apr. 30, 2002	AAA Graduate Student Seminar, Modeling of Corrosion in LBE Systems – Task 5
May 1, 2002	Kemal Pasamehmetoglu (LANL) visits UNLV to discuss with AAA collaborations with faculty and administrators
May 2, 2002	Task 6 Second Quarter Report submitted to UNLV AAA Director
May 2, 2002	Infrastructure Subcommittee meeting to discuss machining equipment and access policy
May 5-7, 2002	Nikolay Salnikov (INPE President) and Irina Vorobieva (INPE Director of International Affairs) visit UNLV to discuss collaboration with UNLV faculty and administrators.
May 6-8, 2002	Eric Pitcher (LANL) visits UNLV to add MCNPX libraries and help students with modeling
May 7-8, 2002	Ning Li (LANL) visits UNLV to collaborate with students and faculty on tasks related to his AAA area
May 12-16, 2002	UNLV director participates in the Third International Workshop of Utilization and Reliability of High Power Proton Accelerators, Santa Fe, NM
May 17, 2002	LBE Infrastructure Subcommittee on ISTC Target meeting to update progress on Target transport and UNLV acceptance
May 17, 2002	UNLV ANS Student Section holds second meetings, speaker Doug Nousen, Counter Intelligence Officer, Nevada Operations Office
May 24, 2002	AAA Seminar and faculty meetings, IAEA Health Physics Division, Christian Schmitzer, Austrian Research Center
May 28, 2002	ISTC Target arrives at UNLV from LANL
May 28, 2002	Ka-Ngo Leung (LBNL) presents AAA seminar and holds discussions with faculty on Development and Applications of Compact Neutron Generators
Dec. 3-4, 2001	UNLV director visit to Karlsruhe Lead Laboratory, Karlsruhe, Germany
Dec. 12-14, 2001	UNLV administration visit to the Institute for Physics and Power Engineering and Institute for Nuclear Power Engineering, Obninsk, Russia
Mid-December	UNLV students and faculty visit Argonne National Laboratory to discuss Tasks 11 and 12
Mid-December	UNLV students and faculty visit Idaho State University

Dec. 16-18, 2001	UNLV administration visit to Khlopin Radium Institute and St. Petersburg State Institute of Technology, St. Petersburg, Russia
Dec. 17, 2001	UNLV monthly program costs and completion percentage submitted to DOE
Dec. 20, 2001	AAA DOE-NE/UNLV Program Conference Call
Dec. 28, 2001	Infrastructure TEM Subcommittee Meeting, JEOL representatives
Dec. 30, 2001	Russian Trip Synopsis and Participant list submitted to UNLV AAA Director
Dec. 31, 2001	Subcontract Agreement with KRI (Task 6) signed by UNLV and KRI
Dec. 31, 2001	UNLV AAA Third Quarter Report submitted to DOE
Jan. 2, 2002	AAA discussion with UNLV Dept. of Physics Chair
Jan. 2, 2002	AAA discussion with UNLV International Employees Office staff
Jan. 7-8, 2002	UNLV coordinates and hosts DCC (Task 7) Working Group Meeting
Jan. 14-18, 2002	MCNPX Training at UNLV, 13 UNLV faculty and students
Jan. 15, 2002	UNLV monthly program costs and completion percentage submitted to DOE
Jan. 15-16, 2002	UNLV hosts AAA Quarterly Technical Review
Jan. 16, 2002	AAA Student Poster Session
Jan. 17, 2002	Infrastructure Seminar, JEOL TEM representatives
Jan. 17, 2002	UNLV faculty visit LANL to discuss AAA projects
Jan. 22, 2002	Draft NEPA Environmental Evaluation Notification Form for UNLV program submitted to DOE
Jan. 23, 2002	Infrastructure Seminar, Hitachi TEM representatives
Jan. 28, 2002	AAA Program Conference Call
Jan. 29-30, 2002	UNLV director visits LANL to discuss work packages
Jan. 31, 2002	AAA discussion with UNLV Electrical and Computer Engineering Department Chair
Jan. 31, 2002	UNLV Work Packages for FY02 submitted to DOE
Jan. 31, 2002	AAA Invited Seminar at IEEE Nevada Section, William Culbreth
Feb. 1, 2002	First Quarter Statement of Work FY02 submitted to DOE
Feb. 4, 2002	AAA DOE-NE/UNLV Program Conference Call
Feb. 4, 2002	AAA Program Conference Call
Feb. 6, 2002	Infrastructure Seminar, FEI TEM representatives
Feb. 8, 2002	Infrastructure Committee Meeting: discuss TEM path forward
Feb. 11, 2002	AAA DOE-NE/UNLV Program Conference Call
Feb. 11, 2002	AAA Program Conference Call
Feb. 11, 2002	AAA discussion with Frank Avignone (USC), UNLV Dean of the College of Sciences and Department of Physics Chair
Feb. 12, 2002	UNLV monthly program costs and completion percentage submitted to DOE
Feb. 12, 2002	DOE Contracting Office visit to UNLV, meetings and Performance Review Workshop
Feb. 12, 2002	AAA Quarterly Technical Review presentations submitted to DOE for approval to be posted on website (approval received Feb. 15, 2002).
Feb. 12-13, 2002	UNLV hosts AAA University Workshop: UNLV, UCB, UM, UT Austin



Feb. 17, 2002	LBE Steering Committee submits draft research plan to UNLV
Feb. 19, 2002	AAA DOE-NE/UNLV Program Conference Call
Feb. 19, 2002	AAA Program Conference Call
Feb. 19, 2002	Eleven proposals submitted for research starting in Summer 2002 (4 requesting renewal for Year 2 funding and 4 new projects)
Feb. 19, 2002	AAA discussion with UNLV Vice Provost for Research
Feb. 20, 2002	Senator Domenici staff visit to UNLV: Peter Lyons
Feb. 25, 2002	AAA discussion of basic sciences with Frank Avignone
Feb. 25-26, 2002	UNLV director presentation and participation in NERAC subcommittee meeting
Feb. 26, 2002	AAA Seminar, Superconducting Accelerator R&D, John McGill, General Atomics
Feb. 26-27, 2002	General Director of the Khlopin Radium Institute visit to UNLV, Alexander Rimski-Korsakov

## 1.2 Overall Program Schedule

The Fourth Quarter milestones and deliverables for the UNLV AAA University Participation Program are shown in Figures 1 to 3.

Program Support	Second Quarter FY 2001			Third Quarter FY 2001			Fourth Quarter FY 2001		
	June	July	August	September	October	November	December	January	February
National program milestones and deliverables			◆ Third Quarter SOW		◆ Fourth Quarter SOW	◆ Third Qtr Report	◆ First Qtr	◆ SOW FY02	
	◆ First Quarter Report			◆ Second Quarter Report		◆ QTR Presentations submitted for website approval			
			◆ Quarterly Technical Review Presentations, ANL			◆ Quarterly Technical Review Presentations, UNLV			
			◆ DOE-NE/UNLV Program and AAA Conference Calls	◆	◆	◆	◆	◆	◆
					◆ Monthly costs and completion submissions		◆	◆	◆
					◆ NEPA Conf. Call		◆ NEPA Draft EENF	◆	◆ FY02 WBSs
Workshops and Conferences	◆ DOE-NE		◆ ANS SMC AAA Embedded Student Sessions, 14 papers			◆ Quarterly Technical Review		◆ NERAC	
	◆ Thermal Hydraulics		◆ ANS AccApps and ADTTA Conference, 3 papers			◆ DCC Working Group	◆	◆ MCNPX Training	
			◆ AMUSE Training at UNLV	◆	◆ Fuel Workshop			◆ University Workshop	
							◆ Performance Review Workshop		
Visitors to UNLV		◆ ANL Separations Group		◆ DOE-NE and neutrino expert			◆ University of South Carolina (2)	◆	
	◆ LANL Transmuter	◆ ANL Transmuter Group		◆ LANL LEDA			◆ Sen. Domenici's Staff	◆	
	◆ ANL Fuels Group	◆ LANL Acc. Group	◆	◆ LANL MCNPX			◆ General Atomics	◆	
							◆ Khlopin Radium Institute	◆	
							◆ DOE Contracting Office	◆	
UNLV Faculty/Staff Visitations	◆ LANL/LANSCE	◆ ANRC		◆ KRI and St. Petersburg State Institute of Technology	◆	◆ Trip Report: Russia			
	◆ UC Berkeley and LBNL		◆ ANL-West, ISU		◆ IPPE and INPE	◆	◆ Moscow	◆ LANL	
	◆ IPPE	◆ IPPE proposes collaboration			◆ KALLA	◆ ISU	◆ ANL	◆ LANL	
Executive Committee	◆ Decision on ISTC Target		◆ Approval of FY02 budget reallocation	◆					
Finance Advisory Committee and Financial Administration		◆ Recommendations on Fall Proposals		◆ Meeting with DOE and UNLV Finance Officers	◆				
	◆ Meeting with DOE and UNLV Finance Officers								
Graduate Recruiting		◆ Recruiting meeting with YDRNS students		◆ Recruiting Poster at ANS Student Mini-Conference	◆				
						◆ Recruiting meetings in Russia			

Figure 1. Milestones and Deliverables of Program Support for the UNLV AAA University Participation Program through the Fourth Quarter.

Infrastructure Augmentation	Second Quarter FY 2001			Third Quarter FY 2001			Fourth Quarter FY 2001		
	June	July	August	September	October	November	December	January	February
Committee on Infrastructure		MSE Equipment Quotations ♦	MSE User Facility Space Allocation Meeting ♦				Meeting to discuss TEM path forward ♦		
		MSE Equipment Identification ♦		Student Project Requests Considered ♦				VPR meeting ♦	
Administrative Meetings	Administrators (7): Meeting with Chemistry Dept ♦	Sciences ♦♦ HRC ♦ COE ♦	COE ♦	Physics ♦			Electrical and Computer Engineering ♦		
		Eng Faculty ♦		Civil and Constr. Profs. ♦			Physics ♦		
		Civil and Env. Engineering Profs. ♦		Int'l Programs ♦	Math Profs. ♦			International Employees Office ♦	
New Equipment & Facilities		VPR officially requests ISTC Target ♦							
		Equipment Identified and Priced ♦							
		HRC Space Allocation Meeting ♦				Mechanical Engineering Space Meeting ♦			
LBE Loop Steering Comm			Initiation ♦						
			Draft Research Plan Submitted ♦					Draft Research Plan Submitted ♦	
			International Advisory Committee on LBE Research at UNLV initiated ♦						
Infrastructure TEM Subcommittee						Meeting with JEOL representatives ♦	Seminar, FEI ♦		
							Seminar, JEOL ♦ ♦ Seminar, Hitachi ♦		
							Presentation to Infrastructure Committee ♦		
New Hires		Scientist A Interview ♦			Scientist A Position Offered ♦				
		Scientist C Position Filled ♦			Scientist A Interview ♦		Scientist A Position Filled ♦		
		Scientist B Interview ♦		Scientist A Position Accepted ♦					

Figure 2. Milestones and Deliverables of Research Infrastructure Augmentation for the UNLV AAA University Participation Program through the Fourth Quarter.

Student Research	Second Quarter FY 2001			Third Quarter FY 2001			Fourth Quarter FY 2001		
	June	July	August	September	October	November	December	January	February
Program Publicity	◆	◆ UNLV Public Relations Meetings (2) ◆ MOU Signing between DOE-NE and UNLV Display at Pahrump Harvest Festival		◆ Chemistry Dept Seminar			◆ Former NV Gov List gives ANS Conf Banquet Speech ◆ Class Lecture ◆ ANS Reno Conf Article Beller keynote at ANS SMC ◆		
Proposal Process		◆ Draft proposals submitted for Fall		◆ Final Proposals submitted for Fall ◆ Proposals Approved		◆ Call for Proposals ◆			◆ Draft proposals submitted for Summer ◆
AAA Seminar Series	◆ Meyer	◆ Hechanova	◆ Beller	◆ Laidler		◆ Zaugg			◆ Culbreth ◆ McGill ◆
Research Tasks milestones and deliverables		Fall Tasks Start ◆ ◆ Summer Task Presentations to DOE-NE		Task 1 Seminar ◆	◆ Task 2 Seminar		Task 9 Seminar ◆		
Task Quarterly Reports	Task 2 First Quarter ◆			Task 3 Seminar ◆	◆ Task 6 Draft Subcontract with KRI				
		Task 1 First Quarter ◆ ◆ Task 4 First Quarter		◆ Task 3 First Quarter		◆ Task 2 Second Quarter			◆ Task 4 Second Quarter
					Task 10 First Quarter ◆	◆ Task 7 First Quarter			

Figure 3. Milestones and Deliverables of Student Research Tasks for the UNLV AAA University Participation Program through the Fourth Quarter.

## 2. PROGRAM SUPPORT

The primary deliverables for the Program Support component are quarterly and annual reports. These reports will detail the progress on each administrative task and the milestones and deliverables generated during the appropriate period. Other than this report, the only other documents provided to DOE this quarter are the following:

- UNLV AAA University Participation Program Third Quarter Report, December 31, 2001.
- UNLV AAA University Participation Program Statement of Work for the First Quarter, FY02, February 1, 2002.
- AAA Quarterly Technical Review presentations, February 12, 2002, for approval to be posted on website.

The following are the individuals involved in the day-to-day administration of the UNLV AAA UPP during the Fourth Quarter.

UNLV AAA UPP Executive Committee:

Anthony Hechanova	Director
Gary Cerefice	Deputy Director (Harry Reid Center for Environmental Studies)
Malcolm Nicol	Deputy Director (College of Sciences)
William Culbreth	Deputy Director (College of Engineering)

UNLV Student Support Staff:

Christina Crossan	Undergraduate, Health Physics Department
Demian Gitnacht	Undergraduate, Health Physics Department
Ingrid James	Undergraduate, School of Social Work

UNLV AAA UPP Affiliates:

Pattie Baldwin (HRC)	Director of Finance
Denis Beller (LANL)	AAA UPP Intercollegiate Programs Coordinator
Ning Li (LANL)	AAA UPP International Programs Coordinator
Thomas Ward (DOE)	Senior Science Adviser
Elizabeth Johnson (HRC)	Technical Writer
John Knoten (HRC)	Webmaster

### 2.1 UNLV AAA UPP Meetings and Committees

This section describes the motions of committees that were active during the Fourth Quarter.

### **Administrative Committee:**

Dr. Anthony Hechanova, Chair  
Dr. Stephen Rice (Vice Provost for Research)  
Dr. Frederick Bachhuber (Dean, College of Sciences)  
Dr. Kenneth Fridley (Associate Dean for Research and Information Technology, College of Engineering)  
Prof. James Selser (Chair, Department of Physics)

The Administrative Committee traveled to Obninsk, Moscow, and St. Petersburg, Russia from December 12-18, 2001 to meet with a number of laboratory heads, faculty, and scientists from the nuclear community and discuss at the administrative level the potential for collaboration (both academic and research). See Section 2.2 for a trip summary.

### **Infrastructure Committee:**

Dr. Anthony Hechanova, Chair  
Dr. Gary Cerefice (Harry Reid Center, Point of Contact)  
Prof. Malcolm Nicol (College of Sciences, Point of Contact)  
Prof. William Culbreth (College of Engineering, Point of Contact)  
Prof. Dennis Lindle (College of Sciences, Interface Science Program)  
Prof. Allen Johnson (College of Sciences, Chemistry)  
Prof. Brendan O'Toole (College of Engineering, Mechanical Engineering)  
Prof. Robert A. Schill, Jr. (College of Engineering, Electrical Engineering)  
Prof. Laxmi Gewali (College of Engineering, Computer Science)  
Mark Pippenger (College of Engineering, Electronics Technician)

The Infrastructure Committee is responsible to advise the Executive and Finance Committees on matters related to the development of user laboratories and the hiring of AAA faculty and staff. During the Fourth Quarter two major infrastructure issues were addressed. The first was the ongoing development of a Transmission Electron Microscopy (TEM) User Facility. The second was the status of AAA faculty/staff additions.

Dr. Longzhou Ma began his appointment in December 2001 as a new AAA hire with initial primary responsibilities to design, procure, and implement the facility. Dr. Ma arranged a number of meetings with three major TEM vendors (Hitachi, JEOL, and FEI) and seminars were arranged for the Infrastructure Committee and campus community. The Infrastructure Committee met on February 8, 2002, after the seminars and initial contact with each vendor. The specifications of the various products were discussed in detail and a TEM Infrastructure Subcommittee (Dr. Ma, Prof. Johnson, and Prof. Venkat) was established to see demonstrations of the candidate products and provide recommendations to the Committee.

Regarding AAA faculty/staff additions, there was still no reply from the offer made for the Actinide

Chemistry faculty position in the College of Sciences (Research Scientist B in the UNLV AAA proposal<sup>1</sup>). A new proposal was made to the Committee to hire a technician to help operate the Material Performance Laboratory that is co-funded by the AAA. This proposal was not accepted as an appropriate step at this time while the committee reconsiders the role that “operational” support should play in using infrastructure augmentation funds.

**LBE Loop Steering Committee  
Subcommittee to Develop a Research Plan**

Prof. Samir Moujaes, Chair (College of Engineering, Department of Mechanical Engineering)  
Dr. Gary Cerefice (Harry Reid Center)  
Prof. John Farley (College of Sciences, Physics Department)

The LBE Loop Steering Committee established a subcommittee to develop (in collaboration with potential collaborators) a research plan to help in the design of the facility. The LBE Loop Subcommittee submitted a second draft of a research plan that is provided in further detail in Section 3.2.

**Other Committees:**

Conference Committee: Anthony Hechanova (Chair) and Kathy Lauckner (Co-Chair) helped to facilitate the following national meetings held at UNLV: the DCC Working Group meeting (January 7-8, 2002), the AAA Quarterly Technical Review (January 15-16, 2002), and the University Workshop (February 12-13, 2002).

Finance Oversight: HRC Finance Director Patricia Baldwin, HRC Grants and Contract Expert Leisa Rodriguez, and Anthony Hechanova met on February 12, 2002 with DOE Albuquerque Office contract officers Sam Espinosa, Melissa Thomas, and Frank Newman to discuss matters related to new management requirements for all DOE grants.

Information Management Committee: Anthony Hechanova (Chair), Gary Cerefice, and John Knoten. Weekly meetings were held to maintain and update the UNLV AAA UPP website at <<http://aaa.nevada.edu>> and the AAA library.

**Search Committees:**

- Research Scientist B, College of Sciences (Dean Frederick Bachhuber, Point of Contact) – A formal offer has been made to the top candidate that includes equipment and facilities made available by the UNLV AAA Program. The offer has not yet been accepted nor rejected.
- Research Scientist D, Department of Geosciences (Rod Metcalf, Dept. Chair, Point of Contact) – The position is open and the search is ongoing.

## 2.2 Workshops, Conferences, and Collaboration Meetings

### **Administrative Committee Visit, December 12-18, 2001, Obninsk, Moscow, and St. Petersburg, Russia**

The following excerpts from the synopsis<sup>3</sup> provided by Stephen Rice, Vice Provost for Research, summarize the trip:

December 12-14, 2001: formal meetings in Obninsk with the Institute of Nuclear Power Engineering (INPE) and its sister “national laboratory,” the Institute of Physics and Power Engineering (IPPE). At INPE we were hosted by Rector Nikolay Salnikov, Deputy Rector Yury Volkov, and International Relations Expert Irina Vorobieva. At IPPE we met with Deputy Director Vladimir Poplavski, Director of the Nuclear Power Plant Dept. Anatoli Tsiboulia, and BFS Reactor Facility Head Igor Matveenko, among many others.

IPPE and INPE are known for their development of nuclear reactors for submarines, for space, and for domestic energy. This university/national laboratory center remains the Russian leader in nuclear science and engineering, and deals not only with reactors and power plants, but also with radiation effects on materials, agricultural crops and even patients; this center developed liquid metal cooling technology and works with several countries in addition to the U.S. (where their partners include LANL, ANL, and LLNL). Specifically, IPPE constructed the lead bismuth eutectic (LBE) loop (with international funding that included significant contributions from DOE) that is being sent to UNLV. We discussed UNLV collaboration on (1) data and information exchange on the LBE loop/target/cooling technology; and (2) LBE loop experimental and research designs. Such collaborations would build upon the Russian scientists’ first hand knowledge of the LBE system that they designed. Between formal meetings and presentations, our team toured nuclear reactor facilities that can be used by UNLV faculty and students.

In our formal meetings with IPPE officials, we developed an umbrella agreement under which we would negotiate future specific tasks (e.g., fuels, transmutation, LBE) consistent with DOE’s national program objectives. Between formal meetings, both in Obninsk and Moscow, the team met with Russian students from a variety of technical universities and institutes to share information on graduate programs at UNLV.

Upon arriving in St Petersburg, we lost Ken Fridley but were joined by Senior Science Adviser (to DOE) Tom Ward. Dr. Ward collaborates with scientists at the Khlopin Radium Institute (KRI) where we met with the Director General Alexander Rimski-Korsakov. The foci for KRI are environmental remediation, D&D, reprocessing, and the production of medical isotopes. We discussed the Neutron Multiplicity Experiment and Detector that involves collaborative work with the Finland, BNL (George Green) and UNLV (Carter Hull, Task 6), specifically, the agreement for shipment of the detector system to UNLV (export license, insurance, calibration source, and draft



contract). Because of the need to begin this work promptly in 2002, we negotiated specifics and agreed upon a draft version of the contract to bring back to UNLV for review and execution. The group heard a presentation from Professor Boris Burakov and Deputy Director Eugeniy Anderson. Dr. Rimski-Korsakov will visit Tucson at the end of February and we will invite him to UNLV at that time.

Also in St Petersburg we toured the MINATOM State Regional Education Center (one of five such public education centers in Russia) and met with Rector Yury Lisnenko and his International Programs Coordinator Marina Labyntseva. We learned that this center has a focus as a conference site and suggested collaboration with UNLV's hotel college. Already in progress is work with Duke and UCLA but the Rector was excited with our potential. They currently run a "summer law school" and several courses in business/entrepreneurism and they are keenly interested in developing a joint program with UNLV in radioactive waste. This center operates as a consortium of Russian institutions each of which does a different "piece" of nuclear science and engineering and noted that this "national consortium" is precisely what DOE wants to establish in the U.S. with UNLV as lead. The Rector offered to arrange a program for U.S. officials to visit Russian institutions and vice versa. The team also visited the St. Petersburg State Institute of Technology, meeting with the Head of the Radiochemistry unit, Alexander Nechaev and with Anatoli Tarasov, of the St. Petersburg State Technical University. The latter trains engineers and the former scientists. Both schools offer good potential for students continuing their studies at UNLV.

**MCNPX Code Training Workshop, January 14-18, Las Vegas, Nevada** – The purpose of the workshop was for LANL experts to train students (included 13 UNLV students and staff) who are using the MCNPX code in their research or who have a general interest in learning the code.

**AAA Quarterly Technical Review, January 15-16, Las Vegas, Nevada** – The purpose of the meeting was to bring research coordinators from across the national program to a central location and provide progress reports to DOE-NE and national project directors. University participants were also invited and a student poster session attracted 18 posters, four students were invited to give oral posters.

**Research collaboration meetings** are encouraged and arranged to help enhance communication networking and develop collaborative graduate student research projects. In addition to the above, research collaboration meetings were held between UNLV faculty and the following groups:

- Karlsruhe Lead Laboratory (KALLA): December 3-4, 2001, visit to KALLA by Anthony Hechanova
- Argonne National Laboratory Separations Group: mid-December, visit to ANL by W. Culbreth, D. Lowe, and E. Bakker, UNLV Department of Mechanical Engineering faculty and students
- Idaho State University Idaho Accelerator Center: mid-December, visit to ISU by W. Culbreth and Suresh Sadenini, UNLV Department of Mechanical Engineering faculty and student, for meeting with Frank Harmon
- Los Alamos National Laboratory Transmutation Sciences Group: January 17, visit to LANL

- by Yingtao Jiang and Bingmei Fu, UNLV Department of Mechanical Engineering
- University of California, Berkeley: February 12, 2002, visit to UNLV by Per Peterson and Ehud Greenspan
  - Senator Peter Domenici's Staff: February 20, 2002, visit to UNLV by Peter Lyons
  - Neutrino/basic nuclear sciences: February 25, 2002, visit to UNLV by Frank Avignone, University of South Carolina
  - DOE-NE and UNLV Directors' Conference Calls: December 20; January 28; and February 4, 11, and 19, telephone conferencing between John Herczeg and staff and Anthony Hechanova

### **2.3 UNLV AAA UPP Website, Information Management, and Seminars**

The UNLV AAA UPP website <<http://aaa.nevada.edu>> was maintained in the Fourth Quarter by HRC student webmaster John Knoten. This website contains relevant information for internal UNLV communications, networking with outside groups, and for general public access. A library housed at the HRC was maintained that contains materials supplied by the national laboratories and other sources related to the AAA.

The following seminars were presented during the Fourth Quarter:

- “UNLV Advanced Accelerator Applications University Participation Program,” Anthony Hechanova, December 4, 2001, Karlsruhe, Germany; December 13, 2001, Obninsk, Russia; January 16, 2002, AAA Quarterly Technical Review, UNLV; February 13, 2002, University Workshop, UNLV; and, February 26, 2002, NERAC Subcommittee, Washington, DC.
- “Corrosion of Steels from Lead Bismuth Eutectic,” Daniel Koury, UNLV Physics Department, AAA Student Oral Poster, January 16, 2002.
- “Determination of Dose Coefficients for Radionuclides Produced in Spallation Neutron Sources,” John Shanahan, UNLV Health Physics Department, AAA Student Oral Poster, January 16, 2002.
- “Neutron Multiplicity Measurements of AAA Target/Blanket Materials,” Steven Curtis, UNLV Harry Reid Center for Environmental Studies, AAA Student Oral Poster, January 16, 2002.
- Infrastructure Seminars on Transmission Electron Microscopes: January 17, 2002, JEOL; January 23, 2002, Hitachi; and, February 6, 2002, FEI.
- “Alternative Treatment of High-Level Waste,” William Culbreth, IEEE Nevada Section invited seminar, UNLV, January 31, 2002.
- “Superconducting Accelerator Research and Development,” John McGill, General Atomics, February 26, 2002.

### **3. RESEARCH INFRASTRUCTURE AUGMENTATION**

The goal of the Research Infrastructure Augmentation component of the UNLV AAA UPP is to augment the research staff and facilities at UNLV to increase the ability of the university to perform

AAA research. The following sections describe progress made in infrastructure augmentation.

### 3.1 New Hires

Research Scientist A, Harry Reid Center — Dr. Longzhou Ma began his appointment on December 1, 2001. All of Dr. Ma's time will be devoted to AAA and his principal responsibilities will be the design, development, and establishment of a Transmission Electron Microscopy User Facility.

Research Scientist B, College of Sciences — The search committee has completed their process and their top candidate was offered a faculty position. The position was not yet filled by the end of the Fourth Quarter.

Research Scientist C, College of Engineering — Dr. Ajit Roy began his appointment on July 1, 2001. Half of Dr. Roy's time will be devoted to AAA and he will be a principal involved in developing a Materials Performance User Facility.

Research Scientist D, Department of Geosciences and Harry Reid Center — The search committee for a SEM technician is ongoing. The position has not yet been filled by the end of the Fourth Quarter.

### 3.2 New Equipment and Facilities

Four new user facilities are under development in the Fourth Quarter.

**Materials Performance User Facility:** This facility is under development in existing space in the College of Engineering complex and utilizes auxiliary laboratory space at the Harry Reid Center until completion of the Engineering facility. About \$230,000 of equipment for AAA tasks is being set up in the facility, which is expected to be complete by mid-year 2002.

**Transmission Electron Microscopy (TEM) User Facility:** This facility is to be built in existing space at the Harry Reid Center. The first step in the development of the facility was to hire a TEM expert, Dr. Longzhou Ma (Research Scientist A, see Section 3.1) to aid in the selection of a TEM, and the design, development, and operation of the new TEM User Facility. During the Fourth Quarter, a number of TEM vendors have been meeting with UNLV faculty and staff to determine the most appropriate system for UNLV's infrastructure needs.

**Lead Bismuth Eutectic Loop User Facility:** The LBE Loop Steering Committee established a Subcommittee to develop (with input from potential collaborators) a research plan to help determine the context for the design of the facility. The current path forward is to set up the ISTC Target as an experimental loop in the College of Engineering Complex while a permanent and tailor-made facility is designed and developed as part of the Harry Reid Center for Environmental Studies. The LBE Loop Subcommittee submitted a second draft of a research plan<sup>4</sup> after discussions with potential collaborators. The following are excerpts from Prof. Moujaes' proposed plan:

At this point we are in contact with our Russian counterparts from the IPPE and with other European research laboratories and LANL who have familiarity with operating LBE loops to help coin a reasonably effective experimental plan at UNLV that would compliment the efforts going on elsewhere and give us at UNLV a certain niche in some of the emerging areas of research relevant to the LBE technology.

It has been decided that since the funding for the target is not available for future research using this loop that the experimental/simulation efforts regarding this loop be more tailored towards two areas: thermal-hydraulics of LBE flows and material science studies.

The installation of the loop will entail a lot of front-end preparation for the proper alignment of the loop in the Laboratory as well as extensive safety checks that need to be performed. This will probably involve the safety department of UNLV plus any other state entities such as the fire marshal. Earlier work and planning has already been done for the safety issues for this type of loop as reported by LANL<sup>5</sup> and we will closely adopt their approach as appropriate.

Tests of different durations will be conducted in the loop with material corrosion testing probably being of longest duration while the thermal-hydraulics testing being the shorter time wise of the two types of testing. Hence it would seem logical to start on these shorter duration tests to make sure the loop is in good and stable operation before embarking on any long-term corrosion test.

Some basic experimental research tasks are identified below based on preliminary discussions and a document on research activities in the U.S.<sup>6</sup> See the plan<sup>4</sup> for more complete descriptions. These tasks are not necessarily suggested in any particular order at this point but will be fine tuned through discussions with LANL and international partners as their participation is very crucial in this effort.

- Task 1: Determine the flow pump-system characteristics
- Task 2: Determine the natural flow characteristics of the loop
- Task 3: Determine of localized flow conditions in target plate geometries – thermal-hydraulic considerations
- Task 4: Test new instrumentation used in determining data of several localized variables for the LBE application
- Task 5: Determine kinetics of the dissolution/deposition process as a function of temperature, flow velocity, dissolved metal concentration and the oxygen potential of the system<sup>6</sup>
- Task 6: Determine the kinetics of film formation in the presence of oxygen<sup>6</sup>
- Task 7: Determine the kinetics of transport of metal through any surface film<sup>6</sup>
- Task 8: Determine the role of alloy chemistry on the above three items<sup>6</sup>

The time line schedule (see table below) will be carried out in about three years. Again the three years is somewhat tentative at this point and the duration could be lengthened or shortened as needs arise.

Qrtr → task↓	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>
	2002	2002	2002	2003	2003	2003	2003	2004	2004	2004	2004	2005	2005	2005
Install														
Safety														
Task1														
Task2														
Task3														
Task4														
Task5														
Task6														
Task7														
Task8														

**Materials Characterization Facility:** The UNLV AAA program at the recommendation of the Infrastructure Committee will financially assist in the maintenance of an already existing facility within the College of Sciences that contains optical microscopes and a Scanning Electron Microscopy (SEM) through taking over the payment of service contracts. In addition, the UNLV AAA Program's fourth new hire (referred to as Research Scientist D in the UNLV AAA UPP proposal<sup>1</sup>) will be cost-shared with the Geosciences Department and will include responsibilities as a technician for the SEM and TEM facilities.

#### 4. RESEARCH PROJECTS

The Student Research component is the core of the UNLV AAA UPP with steadily increasing funds as the program evolves and capability expands.

##### 4.1 Student Research Tasks

The following 12 tasks comprise the student research component of the UNLV AAA University Participation Program. 4 tasks began in the summer term 2001 and 8 tasks began in the fall term 2001. The Second Quarter progress reports from the 4 tasks that started in the summer and the First Quarter progress reports from the 8 tasks that started in the fall are included as appendices. All research groups appear to be presenting adequate progress as evidenced by a healthy representation at the ANS Student Mini-Conference, AAA Quarterly Technical Review Student Poster Session, presentations at seminars, and good communication with program coordinators and national project partners.

<b>Task</b>	<b>Title</b>	<b>UNLV Department National Collaborator Annual Cost (# of Students)</b>	<b>Technical Area</b>
1	Design and Analysis for Melt Casting Metallic Fuel Pins Incorporating Volatile Actinides	Mechanical Engineering Dept Argonne National Laboratory \$141k (2 Grads)	Fuels
2	Modeling, Fabrication, and Optimization of Niobium Cavities	Electrical & Comp Eng Dept Los Alamos National Lab \$161k (3 Grads)	Accelerator
3	Experimental Investigation of Steel Corrosion in Lead Bismuth Eutectic: Characterization, Species Identification, and Chemical Reactions	Physics Department Los Alamos National Lab \$190k (2 Grads)	Transmuter
4	Hydrogen-Induced Embrittlement of Candidate Target Materials for Applications in Spallation-Neutron-Target Systems	Mechanical Engineering Dept Los Alamos National Lab \$146k (2 Grads)	Target
5	Modeling Corrosion in Oxygen Controlled LBE Systems with Coupling of Chemical Kinetics and Hydrodynamics	Mechanical Engineering Dept Los Alamos National Lab \$109k (2 Grads)	Transmuter
6	Neutron Multiplicity Measurements for AAA Target/Blanket Materials	Harry Reid Center Los Alamos National Lab \$140k (1 Grad)	Transmuter
7	Develop Dose Conversion Coefficients for Radionuclides Produced in Spallation Neutron Sources	Health Physics Department Los Alamos National Lab \$160k (2 Grads)	System Integration
8	Development of a Systems Engineering Model of the Chemical Separations Process	Mechanical Engineering Dept Argonne National Laboratory \$150k (2 Grads)	Separations
9	Design and Evaluation of Processes for Fuel Fabrication	Mechanical Engineering Dept Argonne National Laboratory \$87k (1 Grad)	Fuels
10	Development of a Mechanistic Understanding of High-Temperature Deformation of Alloy EP-823 for Transmutation Applications	Mechanical Engineering Dept Los Alamos National Lab \$99k (1 Grad)	Target
11	Nuclear Criticality Analyses of Separations Processes for the Transmutation Fuel Cycle	Physics and Mech Eng Dept Argonne National Laboratory \$110k (2 Grads)	Separations
12	Radiation Transport Modeling of Beam-Target Experiments for the AAA Project	Mechanical Engineering Dept Argonne National Laboratory \$110k (2 Grads)	Transmuter

## 4.2 Student Recruitment

Graduate student recruitment efforts were initiated early in the UNLV AAA program to fulfill the mission to attract topnotch students in the sciences and engineering. The UNLV AAA program is integrating with UNLV's recruiting efforts in the Colleges of Sciences and Engineering.

In the Fourth Quarter, the Administrative Committee took advantage of a number of opportunities to recruit students during their trip to Russia. They met with students from the Institute for Nuclear Power Engineering, Moscow State University, St. Petersburg State Institute of Technology, and St. Petersburg State Technical University.

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