Introduction to the Radiation Measurements Cross Calibration (RMCC) Project

Dr. Faraj Ghanbari
RMCC Project Leader
Distinguished Member of Technical Staff
Sixth Radiation Measurements Cross Calibration Workshop
Amman, Jordan // Monday, 13 June 2011

Relationship of Sandia National Laboratories to U.S. Government
Four Mission Areas

- Nuclear Weapons
- Defense Systems and Assessments
- Energy, Resources, and Nonproliferation
- Homeland Security and Defense

Helping our nation secure a peaceful and free world through technology

Highly Skilled Workforce

- More than 8,600 full-time employees
- More than 1,500 PhDs
- More than 2,700 MS/MAs
- 2,200 on-site contractors

- Mechanical Engineering - 16%
- Electrical Engineering - 22%
- Other Engineering - 15%
- Other Science - 6%
- Physics - 6%
- Chemistry - 8%
- Math - 2%
- Computing - 16%
- Other Fields - 6%
Distributed Facilities to Meet National Needs

- Albuquerque, New Mexico
- Tonopah Test Range, Nevada
- Kauai Test Facility, Hawaii
- Livermore, California
- Yucca Mountain, Nevada
- WIPP, New Mexico
- Pantex, Texas

Global Security Programs

Creating sustainable technology-based system solutions through international cooperation to reduce the threat of WMD proliferation and terrorism

Program Focus Areas
- Nuclear/Radiological Threats
- Biological Threats
- Global Security Engagement

- Sandia Science & Technology Base
- International Business Infrastructure
- Cooperative Monitoring Centers
- Capabilities
Cooperative Programs
Enabling International Technical Cooperation on Critical Security Issues

Technology integration and operation

Technology training courses and workshops

Technology testing and demonstration

Technical collaborations and experiments

Visiting scholars program, research, and analysis

Example of a Cooperative Project on Radiation Measurements
Central Asia – Navruz Project
Sampling Locations

- Zeravshan River sampling location near Samarkand, Uzbekistan
- Water sampling on Chirchik River
- Flow discharge measurements, Chirchik River
- The Nurek Reservoir, Tajikistan
- Naryn River near the town of Tash-Kumyr, Kyrgyzstan
- Vahsh River, Lower Nurek, Tajikistan

Preliminary Results, Cs-137

Example of Calibration Issues

- TJ-01/Spring
- TJ-01/Fall

Sites:
- Bottom Sediment
- Soil
- Vegetation
Results of Water Sample Analyses

Gross Beta Activity in water samples along the Syr Darya river

Lessons Learned from Navruz and at SNL

• Inter-laboratory cross calibration is critical for generating meaningful data
• Cooperation on the Navruz project has led to a network of scientists in Central Asia who are addressing a number of important regional issues
• Independent performance testing programs are vital management tools to ensure quality data
• Regional support is critical to project success
Middle East Program

- **Gulf Nuclear Energy Infrastructure Institute, UAE**
  - Training the next generation of nuclear energy leaders
- **Middle East Scientific Institute for Security (MESIS) (Formerly CMC)-Amman, Jordan**
  - Sister center to CMC in Albuquerque; Providing indigenous solutions to local problems
- **Technical Collaborations**
  - Middle East Disease Surveillance
  - Radiological Source Security
  - Natural Resources Studies
  - Water Security
  - Border Cooperation
  - Radiation Measurements Standards
  - Energy Security and the Role of Nuclear Energy
  - Nuclear safeguards capacity building

GNEII Letter of Intent Signing
March 2010

Radiation Measurements Cross Calibration (RMCC) Project – The Motivation

- All countries in the Middle East have radiation measurement capabilities associated with:
  - Power and research reactors
  - Radioactive sources in medicine, commerce, industry
  - Responding to accidental or intentional radiation releases
  - Environment, health and safety
  - Detecting the presence of radioactive sources
  - Preventing the illicit use of radiological materials
  - Disposing of radioactive sources
- Improving and standardizing nuclear monitoring and measurement capabilities in the Middle East are essential elements of developing an approach to such concerns
The First Step

- As a first step, develop a set of internationally recognized standards for laboratory radiation measurements in the Middle East

- The project consists of
  - Signup for the DOE proficiency testing program (MAPEP)
  - Receive test samples
  - Analyze and report
  - Follow-up with regional workshops to discuss the results and identify technical assistance needs
  - Participate in targeted studies by the IAEA labs in Seibersdorf

First RMCC Workshop

- Co-hosted by the Kuwait Institute for Scientific Research (KISR), October 4-6, 2004

- Participation from Kuwait, Saudi Arabia, Qatar, UAE, Bahrain, Oman, and Jordan
Second RMCC Workshop

• Co-hosted by the Supreme Council for the Environment and Natural Reserves (SCENR), Doha, Qatar, November 2005

• Participation from Kuwait, Saudi Arabia, Bahrain, Qatar, UAE, Oman, Jordan, and Yemen

Third RMCC Workshop

• Co-hosted by the Ministry of Regional Municipalities, Environment and Water Resources (MRMEWR), Muscat, Oman, April 2007

• Participation from Kuwait, Bahrain, Iraq, Qatar, Oman, Jordan, and Yemen
Fourth RMCC Workshop

- Co-hosted by the University of Bahrain and the Marine Emergency Mutual Aid Centre (MEMAC), Kingdom of Bahrain, March 2008;

- Participation from Kuwait, Saudi Arabia, Bahrain, Qatar, Oman, UAE, and Jordan

2008 RMCC Workshop Results

- First event hosted by the region
- Discussed MAPEP Results
- Lectures on radiochemistry techniques
- Reviewed Radiological Issues, Laboratory Quality Assurance and Quality Control
- Improved communications: email server and web site
- Discussed regional ownership (GCC / AAEA)
Fifth RMCC Workshop

- Co-hosted by The Qatar University and The Qatar Petroleum (QP)
- Discussed NORM for the first time at RMCC
- First participation by France, Tunisia, and Morocco
- Lectures on radiation protection and Environmental Monitoring at Commercial Nuclear Power Plant
- Laboratory Quality Assurance and Quality Control

Largest participation to date - 91

Future Plans:
- Continue communications: email server and web site
- RMCC-VI, 2011, host Jordan
- RMCC-VII, 2012, Morocco

Action Item:
- Creation of RMCC Advisory Council
  - Identify gaps and recommend future actions
MAPEP Results at SNL
(example of an under control process)

CO-57 in Soil by GS

<table>
<thead>
<tr>
<th>Date</th>
<th>0.25</th>
<th>0.50</th>
<th>0.75</th>
<th>1.00</th>
<th>1.25</th>
<th>1.50</th>
<th>1.75</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan-04</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>May-05</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oct-06</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feb-08</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jul-09</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nov-10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Problem caused by the self absorption of alpha particles in the filter.

CS-137 in Soil by Gamma Spectroscopy

<table>
<thead>
<tr>
<th>Date</th>
<th>0.25</th>
<th>0.50</th>
<th>0.75</th>
<th>1.00</th>
<th>1.25</th>
<th>1.50</th>
<th>1.75</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan-04</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>May-05</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oct-06</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feb-08</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jul-09</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nov-10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Problem solved by using a different technique.

MAPEP Results at SNL (Problem Case)

Gross Alpha GRF Filter by GPC

<table>
<thead>
<tr>
<th>Date</th>
<th>0.25</th>
<th>0.50</th>
<th>0.75</th>
<th>1.00</th>
<th>1.25</th>
<th>1.50</th>
<th>1.75</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan-04</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>May-05</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oct-06</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feb-08</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jul-09</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nov-10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Gross Alpha GRF Filter by LSC

<table>
<thead>
<tr>
<th>Date</th>
<th>0.25</th>
<th>0.50</th>
<th>0.75</th>
<th>1.00</th>
<th>1.25</th>
<th>1.50</th>
<th>1.75</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan-04</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>May-05</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oct-06</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feb-08</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jul-09</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nov-10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
MAPEP Results at SNL (Gross Alpha/Beta in Water)

High level of solids in the water sample

The RMCC Project Benefits

- Increased confidence in data quality across the region
- Availability of a network of qualified labs for radiological measurements
  - Build up the capacity in the region to produce reliable radiological data
- Improved scientist-to-scientist communication
  - Provides a mechanism for sharing of agreed upon information
  - Enables scientists in the region to work cooperatively to create indigenous solutions to the problems in the region
  - Fosters the development of a network of scientific experts in the region
- Training Opportunities
  - Austria – The IAEA Labs in Seibersdorf
  - Germany – Federal Bureau for Radiation Protection
  - USA – Sandia National Laboratories
  - Regional Opportunities
- Next?
  - Regional Ownership – Form an Advisory Council
The RMCC Future?

• Next Annual Workshop Organizer?
• Regional Ownership – Form an Advisory Council
  – GCC
  – Arab League
• A Professional Society
  – Middle East Radiological Society?

Future is in your wise hands.