Status of Isotope Subcommittee (NSACI) Activities

L. Cardman

11/17/14

Our Charge

- Conduct a new study of the opportunities and priorities for isotope research and production…result(ing) in a Long-Range Strategic Plan for the Office of Science for Nuclear Physics
- Articulate the progress has been made since the last NSACI sub-committee published its recommendations, and the scientific and societal impacts of these accomplishments and ongoing activities
- Identify and prioritize the most compelling opportunities for the DOE Isotope Program to pursue over the next decade and articulate their impacts
- Indicate the resources needed in the timeframe 2016-25 to increase the domestic availability of isotopes appropriate to the DOE Isotope Program portfolio and deemed to be critical to the Nation.

In carrying out the charge, important aspects of the assessment include:

- existing technical capabilities and infrastructure,
- the robustness of current isotope production operations
- R&D of production techniques for research and applied isotopes
- Production of research isotopes, and
- Development of core competencies
- The plan should also consider aspects of the program that are relevant and important to stakeholder communications and the effectiveness in the provision of critical isotopes to the Nation

NSACI Subcommittee Membership

Kelly Beierschmitt	INL	Deputy Lab Director, Nuclear and Laboratory Ops
Roy Brown	Mallinckrodt	Strategic Alliances Director
Carol Burns	LANL	Former Chemistry Division Leader, Nuclear Forensics
Larry Cardman, chair	JLAB	Medium Energy Nuclear Physics
Donald Geesaman, ex officio	ANL	NSAC Chair, 2009 NSACI Chair, and Medium Energy Nuclear Physics
Suzanne Lapi	Wash. U. SL	Asst. Prof. of Radiology, Biochem., and Biomed. Eng.
Saed Mirzadeh	ORNL	Radiochemistry, Nuclear Medicine
Eugene Peterson	LANL	Isotope Production
Lee Riedinger	Tennessee	Low Energy Nuclear Physics
David Robertson	Missouri	Prof., Assoc. Director, Research & Education, MURR
Thomas Ruth	TRIUMF	Isotope Production
David Scheinberg	Memorial Sloan Kettering Cancer Center	Experimental Therapeutics Center Chair
Sally Schwarz	Wash. U., St. L	Director of Pet Radiopharmaceutical Production
Brad Sherrill	MSU	Low Energy Nuclear Physics
Mark Stoyer	LLNL	Nuclear Chemistry-Heavy Elements
Scott Wilbur	University of Washington	Radiation Oncology
Frank Yeager	Eckert and Ziegler	Sources, oil & gas, CORAR Board
Michael Zalutsky	Duke	Radiaton Oncology

Overview

A set of three meetings: September 23 (✓), November 20-21 (later this week); and January 20-21

- **The first (9/23/14) meeting focused on:**
  - Organization,
  - Presentations by the DOE/NP Isotopes Program on how they are organized and how they have worked to meet the recommendations of the 2009 Subcommittee Reports
- **The second (11/20-21/14) meeting will focus on:**
  - Input from Federal Agencies and Commercial Producers
  - Initial preparations for report development)
- **Third (1/20-21/15) meeting will:**
  - Seek input from Professional Societies representing Isotope Users and Producers
  - Have presentations by the DOE isotope production facilities, and a summary presentation of the evolving university-based supplementary facilities, followed by
  - An Executive Session for the Development of the Draft of our Report
- **Requests for Information (and presentations at the meetings) have been sent to**
  - 31 Government Agencies
  - 15 Industrial Producers/Users of Isotopes
  - 28 Professional Societies

NSACI Subcommittee Meeting I, September 23, 2014

Aim: Get broad overview of the program from the perspective of the DOE/NP folk who are managing it

- **At the time of the 2009 NSACI meetings, the program was transitioning to DOE/NP**
- **We want to understand the DOE/NP perspective on the current status, challenges, and near- and long-term goals**
- **Understand how well the program has met the goals set by the 2009 NSACI report**

Agenda:

Topic	Speaker
Introduction	
Welcome	Larry Cardman
Charge from NSAC Chair	Don Geesaman
The DOE/NP Program	
Overview and Perspective	Jehanne Gillo
Isotope R&D	Dennis Phillips
Stable and Accountable Materials	Joel Grimm
Isotope Production Facilities and the National Isotope Development Center	Marc Garland
Isotope Business Office Operations	Mitch Ferren
Customer Interactions and Demand Forecast	Wolfgang Runde
User, Industry and Agency Perspective – Examples	
NIH as a major customer	Tony Sastre

NSACI Meeting II: Agency and Industry Needs is the Focus

Talk	Speaker
Plan for Meeting; Summary of Information Received to Date	Larry Cardman
Presentations by the Agencies on Isotope Needs and Challenges	
NIST	Lisa Karam
DHS and the National Technical Forensic Center	Richard Essex (NBL)
DOE/Office of Nuclear Energy	Richard Reister
DOE/Office of Fusion Energy	Gene Nardella
DOE/Office of Basic Energy Sciences (4 users, 1 to talk)	Lynda Soderholm(ANL)
NNSA	Joel Smith
DOE/NP	Tim Hallman
NSF	Allena Opper
Lunch, Then Presentations by Industry	
Oil and Gas Exploration	Frank Yeager
Council of Radionuclides and Radiopharmaceuticals	Michael Guastella
Association of Energy Service Companies	Eric Rosemann
Zevacor - 70MeV cyclotrons and commercialization of ^{82}Sr	John Zehner
Industrial Producers – Source Production & Equipment Co.	Dennis Chedraui
Braco - supplies ^{82}Sr (from multiple sources including DOE)	Adrian Nunn
Society for Nuclear Medicine (conflict with January dates)	Peter Herskovich
^{99}Mo discussion: Introduction and Background	Don Geesaman
NSAC ^{99}Mo Subcommittee Review/Findings	Tom Ruth

NSACI Meeting II: Day 2

Talk	Speaker
General Summary of plans for the day and for Meeting III (January 20-21)	Larry Cardman
Begin with two presentations that would have been yesterday, but were delayed due to schedule conflicts	
DOE Office of Nuclear Energy – Space and Defense Power Systems	Rebecca Onuschak
DoD	Craig Wuest
Coffee Break	
Executive Session for the remainder of the meeting to discuss our plans for developing the report (closed to the public)	

Meeting III (January 20-21)

- **Presentations by the DOE Isotope Production Sites**
- **Summary of Information Gathered from University Sites**
- **Input from Professional Societies**
- **Resolution of Major Points of our Response to Our Charge in Preparation for the Writing of our report, Which Will Include:**
  - **A Long-Range Strategic Plan for the Isotopes Program of the Office of Science for Nuclear Physics**
  - **The identification and prioritization of the most compelling opportunities for the DOE Isotope Program to pursue over the next decade (and the articulation of their impacts)**
  - **The articulation of the progress made since the last NSACI sub-committee published its recommendations, and the scientific and societal impacts of these accomplishments and ongoing activities**
  - **The Identification of the resources needed in the timeframe 2016-25 to increase the domestic availability of isotopes appropriate to the DOE Isotope Program portfolio and deemed to be critical to the Nation.**

Tentative Timeline

November 20-21: Meeting II (as discussed above)

January 7: List of potential sidebars for each chapter sent by groups to LSC (a title and explanatory few sentences); a list of all will be distributed to the full committee by January 14

January 20-21: Meeting III (as discussed above). Sub-Groups to have draft recommendations ready to present for discussion at our January meeting

February 7: Revised draft of recommendations, reflecting discussions, sent to all for a second round of comments

February 15: Drafts of each chapter sent to LSC by this date

February 21: First draft of entire report assembled from this material (LSC) and sent to committee for review/comment

January 28: Comments to LSC (w/ copies to full committee)

March 7: Interim summary section submitted to NSAC based on first draft plus comments

March 7: Second draft of full report to committee; along with vote for "report is close" or "we need a 4th meeting to resolve the issues"

March 7: Submit draft report to NSAC (may be able to push this to March 14)

NSAC will consider, get back to us if any changes are requested

Questions?

Backup Material

- Draft Outline of our planned Report
- 2009 NSACI Recommendations (both reports)
- List of the 7 DOE production sites and 7 University production sites contacted for input
- List of the 31 Federal Agencies contacted for input
- List of the 28 Professional Societies contacted for input
- List of the 15 Isotope Users and Producers contacted for input

Draft Outline of Report

Executive Summary

- **Brief overview**
- **Recommendations**
  itemized and explained briefly (this includes both research opportunities, and long range plan recommendations; it should also reference what can/should be done at different budget levels)

Chapter 1: Introduction

- **New Charge**
  Background (updated to incorporate reference to 2009 committee and transfer of the program to DOE/NP, and progress made under DOE/NP leadership)
- **Procedures (summarize as before)**

Chapter 2: The DOE Isotopes Program

- **Origins and History**
  Significantly briefer than 2009 Report section – begin with a very very brief history of isotopes at DOE and then focus on the evolution of the program since the 2009 transfer of the program to DOE/NP.
- **Today (2009 to present)**
  High level summary of the evolution of the program since its transfer to DOE/NP, and a summary of our judgment on how well they have done meeting the goals set by the 2009 Long Range Plan

Draft Outline of Report

Chapter 3: Uses of Isotopes

This chapter should include examples in each of the sections of the progress that has been made since the last NSACI sub-committee published its recommendations and the scientific and societal impacts of those accomplishments and ongoing activities pursuing research opportunities in each of the three areas identified.

3.A: Biology, Medicine, and Pharmaceuticals

3.B: Physical Sciences and Engineering

3.C: National Security and Other Applications

Chapter 4: Research Opportunities Using Isotopes

This chapter should include the "compelling research opportunities" identified by our subcommittee in each of the three areas, in the general style of the 2009 "Compelling research opportunities chapters 3, 4, and 5.

3.A: Biology, Medicine, and Pharmaceuticals

3.B: Physical Sciences and Engineering

3.C: National Security and Other Applications

Chapter 5: The Scope and the Scientific/Technical Challenges for the Isotope Program

This chapter should build on Chapter 4 of the 2009 Long Range Plan, focusing on the situation today with comments on what has changed since then and what are the new challenges we have identified

Draft Outline of Report

Chapter 6: Sources of Isotopes for the Nation

This chapter should be an update of the material that was in Chapters 5, 6, 7, and 8 of the 20009 NSACI Long Range Plan.

6.A. Stable Isotopes

6.B. Accelerator Based Isotope Capabilities

6.C. Reactor Based Isotope Capabilities

6.D. Isotope Harvesting from Long-Lived Stockpiles

Chapter 7: Research and Development for Isotope Production

Update of Chapter 9 of the 2009 Long Range Plan, updated to reflect the new R&D for isotope production opportunities we want to support

Chapter 8: Trained Workforce and Education

Update from Chapter 10 of the 2009 Long Range Plan. Any real progress in this area, or is the situation as dire as it was in 2009?

Chapter 9: Program Operations

Update from 2009, identify challenges and opportunities associated with budget levels

9.A. The Program in 2009, Its Evolution Since Then, and Its Status Today

9.B. Evaluation of the Program and Its Evloution since 2009

9.C. Recommendations for Its Continued Enhancement

Draft Outline of Report

Chapter 10: Budget Scenarios

Specifically, identify resources needed in the timeframe 2016-2025 to increase the domestic availability of isotopes appropriate to the DOE Isotope Program portfolio and deemed to be critical to the Nation. We need to identify the budget scenarios for which we will develop justifications and identify consequences if they are not realized.

Chapter 11: Summary of Recommendations for Charge

As before, but our (2015) recommendations

References:

All of the appendices are "boilerplate" and can simply be updates of the 2009 report reflecting any changes

Appendicies:

1: The NSAC Charge

2: Membership of NSAC Isotope Subcommittee

3: Agendas of Meetings I-III of NSACI

4: List of Federal Agencies Contacted by NSACI

5: List of Professional Societies Contacted by NSACI

6: List of Industry Trade Groups Contacted by NSACI

Guidance for the Report

- Level of language must be less technical
- 25-30% of the space should be for graphics
- About 1/3 of the report should be self-contained (usually 1-page) sidebars
- We must present the material fairly, pointing out the issues and justifying our recommendations
- Getting the report completed between our January 20-21(22?) meeting and the February 22nd NSAC deadline will be a significant challenge.

2009 NSAC I Recommendations: Charge I – Research Opportunities

1. **Invest in new production approaches of alpha-emitters with highest priority for ^{225}Ac. Extraction of the thorium parent from ^{233}U is an interim solution that needs to be seriously considered for the short term until other production capacity can become available.**
2. **We recommend investment in coordination of production capabilities and supporting research to facilitate networking among existing accelerators.**
3. **We recommend the creation of a plan and investment in production to meet these research needs for heavy elements.**
4. **We recommend a focused study and R&D to address new or increased production of ^{3}He.**
5. **Research and Development efforts should be conducted to prepare for the reestablishment of a domestic source of mass-separated stable and radioactive research isotopes.**
6. **We recommend that a robust investment be made into the education and training of personnel with expertise to develop new methods in the production, purification, and distribution of stable and radio-active isotopes.**

2009 NSAC I Recommendations: Charge 2 – Long Range Plan

1.1 Maintain a continuous dialogue with all interested federal agencies and commercial isotope customers to forecast and match realistic isotope demand and achievable production capabilities.

1.2 Coordinate production capabilities and supporting research to facilitate networking among existing DOE, commercial, and academic facilities.

1.3 Support a sustained research program in the base budget to enhance the capabilities of the isotope program in the production and supply of isotopes generated from reactors, accelerators, and separators

1.4 Devise processes for the isotope program to better communicate with users, researchers, customers, students, and the public and to seek advice from experts.

1.5 Encourage the use of isotopes for research through reliable availability at affordable prices.

1.6 Increase the robustness and agility of isotope transportation both nationally and internationally.

2009 NSAC I Recommendations: Charge 2 – Long Range Plan

2. Invest in workforce development in a multipronged approach, reaching out to students, post-doctoral fellows, and faculty through professional training, curriculum development, and meeting/workshop participation.

3.1 Construct and operate an electromagnetic isotope separator facility for stable and long-lived radioactive isotopes.

3.2 Construct and operate a variable-energy, high-current, multi-particle accelerator and supporting facilities that have the primary mission of isotope production.

DOE Isotope Production Sites Contacted (Nominally to Present at January Meeting)

Site/Talk Topic	Speaker	Will Talk	Written Material
ORNL (General), to summarize all programs there including Stable isotopes and Y-12	John Krueger	Yes	✓
INL	Debbie Utterbeck	Maybe	To Come
FRIB	Dave Morrissey	Yes	To Come
PNNL	Gert Patello	Yes	To Come
BNL	Phil Pile	Yes	To Come
LANL	Eva Birnbaum	Maybe	To Come
LANL DOE Ac-225 Initiative	Kevin John	Maybe	To Come
SNL	Paul Cloessner	Yes	✓

University Isotope Production Sites Contacted

Site/Talk Topic	Contact Person
University of Washington	Scott Wilbur
Duke University	Neil Petry
Washington University	Suzanne Lapi
University of Wisconsin	Jerry Nickles
University of Missouri (MURR)	David Robertson
Texas A&M	Sherry Yennello
University of California-Davis	Barry Klein
Will also talk with a Canadian University Facility	
TRIUMF's Radioisotope production capacity. (may add Canadian Source)	T. Ruth

Federal Agencies Contacted

Agency	Contact	Will Talk	Written Material
Army Research Lab	Marc Litz		
Air Force Office of Scientific Research	Jeffrey Stefoneck		
Armed Forces Radiobiology Research Institute	Alexandra Miller and Christopher Lissner		
Bureau of Land Management (BLM)	John Hamak	No	✓ (brief)
Defense Logistics Agency	David Pineault	No	
Defense Threat Reduction Agency	Hank Zhu	No	✓
DoD	Craig Wuest	Yes	✓
Department of Agriculture	Kim Green	Maybe	Maybe
DOE/National Nuclear Security Administration	Jeffery Joel Smith	Yes	To Come
DOE Office of Basic Energy Sciences	Jim Rhyne	No (BES Users instead)	
DOE/BES PI	Thomas E Albrecht-Schmitt	No	✓
DOE/BES PI	Lynda Soderholm	Yes	✓
DOE/BES PI	David Shuh	No	To Come
DOE/BES PI	Steven Greenbaum	No	✓

Federal Agencies Contacted

Agency	Contact	Will Talk	Written Material
DOE Office of Biological and Environmental Research	Sharlene Weatherwax	No (happy with how its working)	Maybe? Asked again on 11/6
DOE/Office of Fossil Energy-Oil and Natural Gas	Erika Folio	No	✓
DOE Office of Fusion Energy	Gene Nardella (alternate)	Yes	To come
DOE Office of High Energy Physics	John Boger	No	✓
DOE/Office of Intelligence	Albert Davis	No	✓ (brief)
DOE Office of Nuclear Energy	Richard Reister	Yes	To Come
DOE Office of Nuclear Energy, Office of Space and Defense Power Systems	Rebecca Onuschak	Yes (11/21)	To come (brief)
DOE Office of Nuclear Physics	Tim Hallman	Yes	???
Department of Homeland Security	David Chu	No	ü (Brief)
Department of Homeland Security - National Technical Nuclear Forensics Center	Jeff Morrison	Covered by FBI/NTFC entry below	Part of FBI/NTFC below
Department of State	Sarah Case		

Federal Agencies Contacted

Agency	Contact	Will Talk	Written Material
Department of Transportation	Ken Lord	No (will attend)	no unmet needs
Federal Bureau of Investigation / DHS / National Technical Forensics Center	Richard Essex	Yes	To Come
Food and Drug Administration	Eric Duffy	No response	
National Aeronautics and Space Administration	Leonard Dudzinski or Dominic Benford???	No response	
National Institutes of Health (National Institute of Biomedical Imaging and Bioengineering to cover for all of NIH)	Tony Sastre	Yes (at Meeting I)	
National Institute of Standards and Technology	Lisa Karam	Yes, but…	✓
National Science Foundation Directorate for Mathematical and Physical Sciences	Allena Opper	Yes	To Come
Office of the Director of National Intelligence	Charlie Marineau	No.	No (Minimal needs)
Office of Naval Research	Mike Shlesinger	Not a user	
U. S. Geologic Survey			

Professional Societies Contacted

Professional Society	Contact	Will Talk	Written Material
Academy of Radiology Research	Renee Cruea, MPA, Executive Director	No. Input from SNMMI	No
American Association of Physicists in Medicine	Lynne Fairobent	No response yet	
American Association of Cancer Research	Carlos L. Arteaga, President		
American Chemical Society	use Div. of Nucl. Chem. For contact		
American Chemical Society - Division of Nuclear Chemistry and Technology	Mark Stoyer Paul Mantica	???	
American College of Nuclear Physicians		No Response	
American College of Radiology	William T. Thorwarth, Jr., MD, Chief Executive Officer	No Response	
American Medical Association	Modena Wilson,	No Response	
American Nuclear Society	Robert C. Fine, Executive Director		

Professional Societies Contacted

Professional Society	Contact	Will Talk	Written Material
American Nuclear Society - Division of Isotopes and Radiation	Steven Biegalski	No	✓
American Pharmacists Association - Academy of Pharmaceutical Research and Science (APhA-APRS)	James Owen	She will respond.	
APS – do by division			
American Physical Society - Division of Biological Physics	Wolfgang Losert		
American Physical Society - Division of Material Physics	Laura H. Greene	No	✓ (personal) – more to come from DMS ?
American Physical Society - Division of Nuclear Physics	Ani Aprahamian	Is doing a survey of the DNP and will provide results	
American Society of Clinical Oncology	Allen S. Lichter, MD, FASCO (CEO)	No	To come

Professional Societies Contacted

Professional Society	Contact	Will Talk	Written Material
American Society of Hematology	Martha Liggett, Esq. Executive Director	TBD	
American Society of Nuclear Cardiology	Kathleen Flood, CEO		
American Society of Therapeutic Radiation and Oncology	Laura Thevenot, CEO		
Council on Ionizing Radiation and Standards	Roberto Uribe-Rendon	Yes	To Come
Health Physics Society	Barbara Hamrick, President	Yes (Jan. Meeting)	✓
National Association of Nuclear Pharmacies (NANP)	Jeff Norenburg		
National Organization of Test, Research and Training Reactors	Sean O'Kelly	TBD	Likely
Radiation Research Society	Executive Director: Veronica Haynes		
Radiation Therapy Oncology Group	Walter J. Curran, Jr., MD, Chair (executive committee)		

Professional Societies Contacted

Professional Society	Contact	Will Talk	Written Material
Radiological Society of North America	Linda Bresolin, Asst. Exec. Dir. for Science and Education	No. (an advocacy group)	
Society of Nuclear Medicine	Peter Herscovitch	Yes (November Meeting)	Yes (after 11/20)
Society of Radiopharmaceutical Sciences (SRS)	Albert Windhorst is President, Henry Van Brocklin is President Elect		
United Pharmacy Partners (UPPI)	John Witkowski President		

Isotope Users and Producers Contacted

User/Producer	Contact	Will Talk	Written Material
Association of Energy Service Companies	Kenny Jordan (Eric Rosemann will present)	Yes	
ARRONAX, Nantes, France and a supplier of the program	Dr. Ferid Haddad , Director.		
Braco (supplies 82Sr from multiple sources including DOE)	Adrian Nunn	Yes	
Cambridge Isotopes	Peter Dodwell		
Eckert & Ziegler Vitalea Science (Oil and Gas Exploration)	Frank Yeager (on committee)	Yes	
EPRI (The Energy Power Research Institute)	Tina Taylor	No Response	
GE Healthcare,	Dr. Aaron Bernstein		
Jubilant Draximage	Mr. Martyn Coombs, President		
Linde	Jack Faught	No Response	
Mallinckrodt (Radiopharmaceuticals)	Roy Brown (on committee)		
Perkin Elmer	Lori Murray, Global Business Development leader, Radiotheraputics, Bio-Discovery		

Isotope Users and Producers Contacted

User/Producer	Contact	Will Talk	Written Material
Radiopharmaceuticals (Council of Radionuclides and Radiopharmaceuticals)	Michael Guastella	Yes	
Source Production & Equipment Co., Inc (SPEC)	John Munro	Yes	
Trace Sciences	Darren Brown,		
Zevacor – 70MeV cyclotrons and commercialization of Sr-82	John Zehner	Yes	