Short Course – Overview & Lessons Learned

David Kosson, Vanderbilt & CRESP

Introduction to Nuclear Chemistry and Fuel Cycle Separations

December 16-18, 2008

Vanderbilt University

Dept. of Civil and Environmental Engineering

CRESP

Course Objective

To provide an introduction to the chemistry and separations processes of importance to entire nuclear fuel cycle.

Targeted Audience:

- Professionals in management, oversight and regulation of nuclear processes and facilities.
- Graduate students in engineering and sciences planning a career focused on nuclear processes.
- As an introduction for professionals that will be engaged in nuclear separations facility design.

Organizing Committee

Raymond G. Wymer, Chair, Vanderbilt University

David S. Kosson, Vice-Chair, Vanderbilt University

Cynthia Atkins-Duffin, Lawrence Livermore National Laboratory

David DePaoli, Oak Ridge National Laboratory

Kathryn Higley, Oregon State University

Terry Todd, Idaho National Laboratory

Steve Krahn and **Mark Gilbertson**, DOE-EM Champions

Course Outline

Introduction	**David S. Kosson, Vanderbilt U.**
Progress in Processing Nuclear Waste	**Mark Gilbertson, DOE**
Nuclear Fuel Cycle Issues	**Frank L. Parker, Vanderbilt U.**
Mining, Milling and Enrichment of U	**C. Hardy, Nuclear Fuel Australia**
Nuclear Radiation	**Robert Sindelar, SRNL**
Reactors and Fuels	**Allan Croff, NRC**
Spent Fuel Recycling	**Robert Jubin, ORNL**
Non-Aqueous Processes	**Mike Goff, INL**

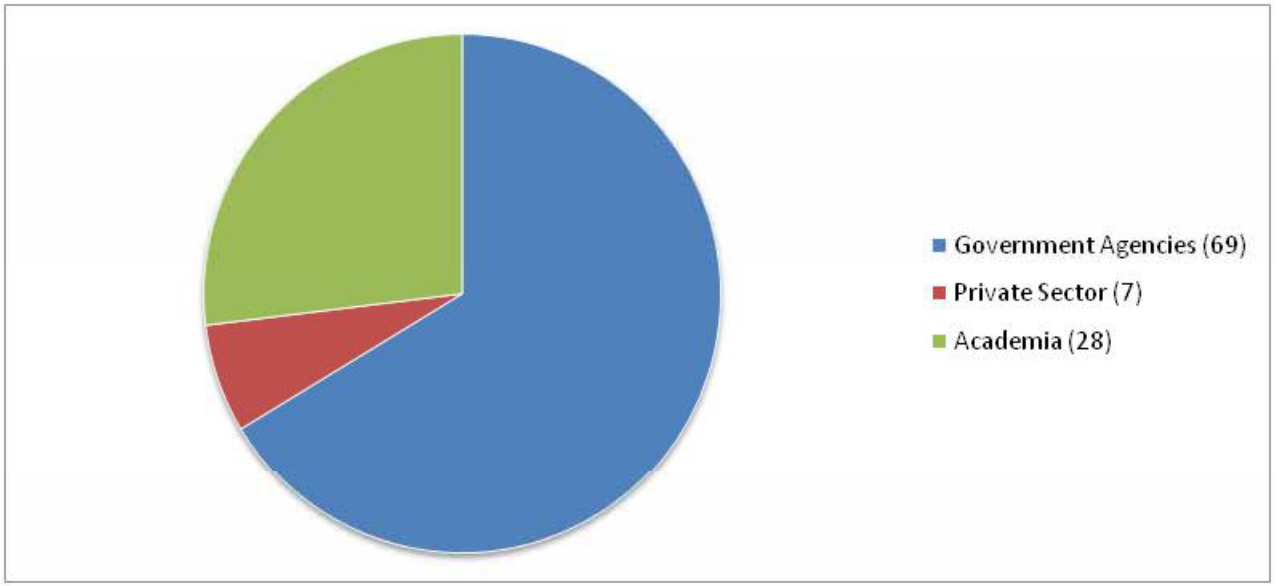
Course Outline *(cont'd.)*

Precipitation/crystallization/sorption	**Gordon Jarvenin, LANL**
Complexation Reactions	**Ray Wymer, Vanderbilt U.**
Separations Equipment	**Jack Law, INL**
Waste Forms	**John Vienna, PNNL**
Environmental Transport	**Kathryn Higley, Oregon State U.**
The Role of Modeling and Simulation	**David dePaoli, ORNL**
Sorbent Development	**Lawrence Tavlarides, Syracuse U.**
Quantifying the Risks	**John Garrick (NWTRB Chairman)**
Nuclear Nonproliferation	**Cynthia Atkins-Duffin, LLNL**

Course Products

- Short course offerings
- Video and PDF of presentations
  - Web site and DVDs
- Monograph
  - Overview chapters with citations

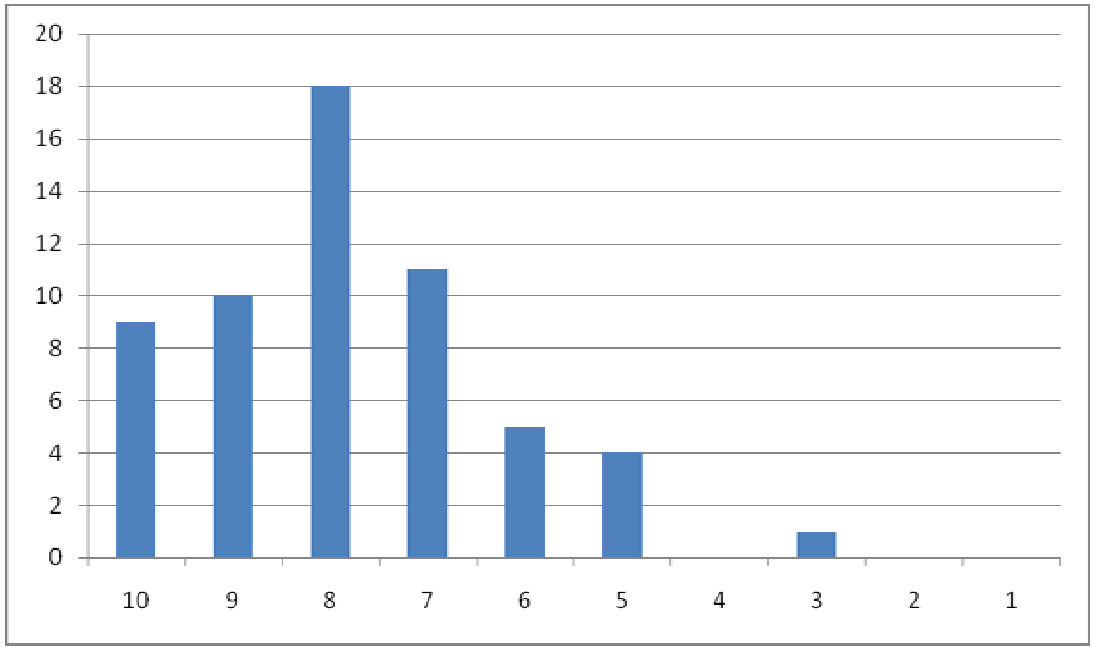
Participants' Affiliations



Affiliation	Number of participants	Percentage of participants
Government agencies	69	66%
Private sector	7	7%
Academia	28	27%

Course Feedback

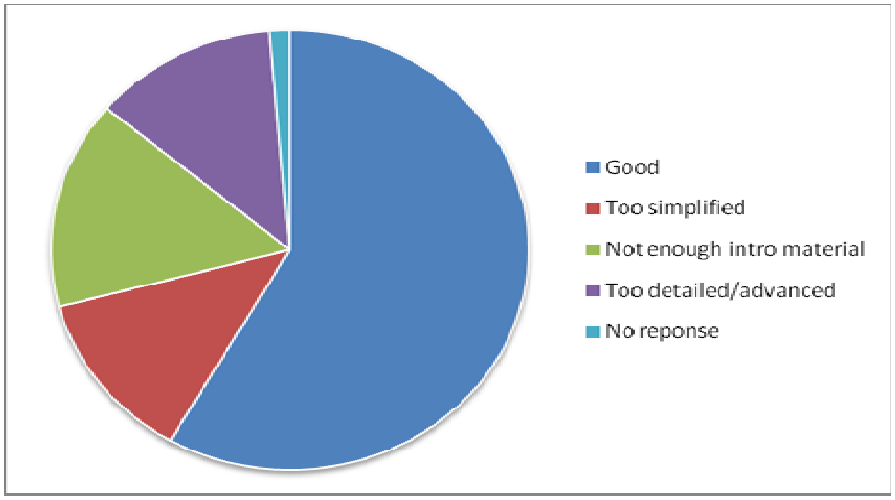
Course Ratings



61 feedback forms received,
10 = “Excellent”; 5 = “OK” ; and 1 = “Poor”

Course Feedback (Cont'd)

Course Content Relative to Backgrounds and Needs



Primary Suggestions

- Improve targeting to audience
- Provide more basic introductory material
- Provide more information on
  - High level waste processing (Tank Wastes)
  - Geologic repositories
  - Regulatory context
- Adjust structure to provide more active dialogue

Revised Approach for Next Offering (Summer 2009)

Introduction to Nuclear Fuel Cycle Chemistry, Separations Processes, and Waste Management

- Day 1 – "Manager's Overview"
  - Intro to fuel cycle separations and waste management*
  - Nuclear fuel cycle and waste management history, organizations and regulations*
  - Milling, mining and enrichment of uranium (Hardy)
  - Fuels and reactors (Croff)
  - Non-proliferation (Atkins-Duffin)
  - Nuclear radiation (Sindelar)
  - Waste management criteria and waste forms (Vienna)

**New or substantially revised*

Revised Approach for Next Offering *(Summer 2009)*

- Days 2 & 3 –
  - Unique chemical properties of elements of interest (Wymer)
  - Aqueous precipitation and crystallization (Jarvenin)
  - Liquid-liquid separations (Law)
  - Non-aqueous processes (Goff)
  - Ion exchange processes*
  - Tank waste, retrieval, transport and storage challenges*
  - Modeling and simulation approaches (dePaoli)

**New or substantially revised*

Revised Approach for Next Offering (Summer 2009)

- Days 2 & 3 (cont'd)–
  - Chemistry in the environment and environmental assessments*
  - Quantifying the risks (Garrick)
  - Geologic repositories*
  - The fuel cycle from back to front (Marra)
  - Transportation*

**New or substantially revised*