

2016 Rare Earth Elements Workshop

Accelerating Rare Earth Element Recovery from U.S. Domestic Sources of Coal and Coal By-Products

August 8-9, 2016

Hosted by: Dr. Cynthia Powell
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Location: National Energy Technology Laboratory
3610 Collins Ferry Road
Morgantown, WV 26505

Time: 12:30 pm – 4:15 pm August 8, 2016
7:30 am – 1:00 pm August 9, 2016

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2016 Rare Earth Elements Workshop

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August 8, 2016

12:30 pm **Registration**

1:00 pm **Welcome**

Dr. Cynthia Powell, *Acting Deputy Director, Science & Technology, National Energy Technology Laboratory*

Opening Remarks

Mr. Regis Conrad, *Director Advanced Energy Systems, Office of Fossil Energy*

1:30 pm **Identifying Program and Industry Challenges**

Dr. Doug Hollett, *Principal Deputy Assistant Secretary, Office of Fossil Energy*

Rare earth elements are incorporated into cell phones, computers, lighting systems, refinery catalysts, battery alloys, neodymium magnets, catalytic converters, Prius engines, satellite communication systems, and so on. In spite of this diversity of products, a number of common challenges exist, and if addressed, accelerated development, recovery, processing technologies and deployment of a wide range of REEs could occur. This session will facilitate discussion on what are the most significant challenges that the technical community is faced with for furthering production of REEs from coal and coal by-products.

2:15 pm **REE Program Initiatives and Accomplishments**

Ms. Mary Anne Alvin, *REE Technology Manager, National Energy Technology Laboratory*

The Rare Earth Elements (REE) Program is focused on developing technologies for the recovery of REEs from Coal and Coal By-Products. The RD&D program consists of process/production technologies, environmental management, sampling, characterization, and analysis, and system integration and optimization for the production of REEs. The program offers a pathway to improve the economics and reduce the environmental impact of a domestic coal-based REE value chain. The development of an economically competitive supply of REEs is essential to maintain our nation's economic growth and national security. Our nation's vast coal resources contain quantities of REEs that offer the potential to reduce our dependence on others for these critical materials

and create new industries in regions where coal plays an important economic role. Recent bench through pilot-scale project accomplishments will be discussed.

2:30pm **Goals of the Rare Earth Elements Program Initiatives**

Dr. Peter Rozelle, *Program Manager, Office of Fossil Energy*

This session will describe the thrusts and new developments in the Department of Energy (DOE), Office of Fossil Energy (FE), with regard to rare earth elements (REEs). This overview will highlight the requirements for the production of REEs from coal-associated sediments.

2:45 pm **Break**

3:00 pm **Potential Rare Earth Ores in the U.S. Coal Measures - What DOE Has Found to Date: How Do We Produce Them?**

Moderators: Dr. Peter Balash, *NETL Economist*, & Dr. Mark McKoy *NETL Geologist*

The purposes of this session are (1) to present DOE findings on high REE assays associated with U.S. coal deposits and (2) gain input from the mining industry on the potential and needs associated with producing these minerals.

The session will begin with a general overview presentation of DOE results, including trends in stratigraphic and geographic locations. Following this, firms engaged in the mining and mineral business will, in turn, be asked to introduce themselves to the audience, and provide a brief indication of their potential to supply the products of interest.

The session will conclude with a general discussion focused on production and technology questions, including those relating to co-producing underclays with coal, recovery of refuse dump materials, and preparation plant tailings.

4:15pm **Conclude Day 1**

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August 9, 2016

7:30 am **Registration**

8:00 am **Welcome and Opening Remarks**

Dr. Angelos Kokkinos, *Director, Office of Advanced Fossil Technology Systems*

8:15 am **Ore Physical Concentration Needs and Challenges**

Moderator: Mr. Morgan Summers, *NETL Chemical Engineer*

This session will begin with a presentation of DOE results relevant to the physical concentration requirements associated with the minerals of interest.

Following this, firms with processing plants or technology offerings relevant to the physical concentration of these ores will be asked to introduce themselves to the group. Included in each case will be a brief discussion of their capabilities. Representatives of organizations with mineral processing research capabilities, such as universities, will also be asked to introduce themselves and provide brief capability discussions.

The session will conclude with a general discussion focused on technology questions, specifically (1) specific research needs for designing flowsheets, notably float sink, liberation studies, laboratory separations work (2) thoughts on plant design (3) potential salable byproducts, and (4) thoughts on permitting.

9:30 am **Mid-Stream (Hydrometallurgy) Challenges**

Moderator: TBD, EERE

This session is focused on the production of a water soluble mixed REE concentrate from the ore (physical) concentrates previously discussed. It will begin with a presentation from DOE on the chemistry of materials that have been found thus far through the program. Of specific interest are mineralogy, major and minor oxide contents, and REE mineralizations that have been found. Items of interest in the subsequent discussions will include the effect of these analyses on leaching reagent consumption and the potential for the recovery of additional salable byproducts through the leaching process.

Following the presentation, representatives of firms with processing plants or technology relevant to turning physical concentrates into water soluble concentrates will be asked to introduce themselves and in each case provide a brief discussion of their capabilities.

The session will conclude with a general discussion focused on technology and logistics questions, specifically (1) current and near-term availability of facilities (2) the potential for production of salable byproducts, and (3) permit and disposal requirements.

10:45 am **Break**

11:00 am **Production of salable REE products**

Moderator: TDB

To begin the discussion, representatives of firms with technologies to produce salable REE products, from water soluble concentrate, will be asked to introduce themselves. Also included in each case will be a brief discussion of each firm's offerings, noting the scale at which the technology has been tested, and the capacity of the next step of scale-up.

A general discussion will then cover feed requirements for each technology (notably purity and undesirable constituents in the feed), and the potential for recovery of salable byproducts from the feed. With respect to the latter, DOE has identified additional valuable elements such as hafnium and yttrium in some materials associated with U.S. coal measures. Also included will be input from the group on management concerns with any wastes generated.

12:15 pm **Next Steps**

Dr. David Mohler, *Deputy Assistant Secretary, Office of Fossil Energy, Clean Coal and Carbon Management*

12:40 pm **Information on Procurement Process**

NETL Procurement Staff: TBD

12:50 pm **Closing Remarks**

Mr. Regis Conrad, *Director Advanced Energy Systems, Office of Fossil Energy*

1:00 pm **Conclude Day 2**