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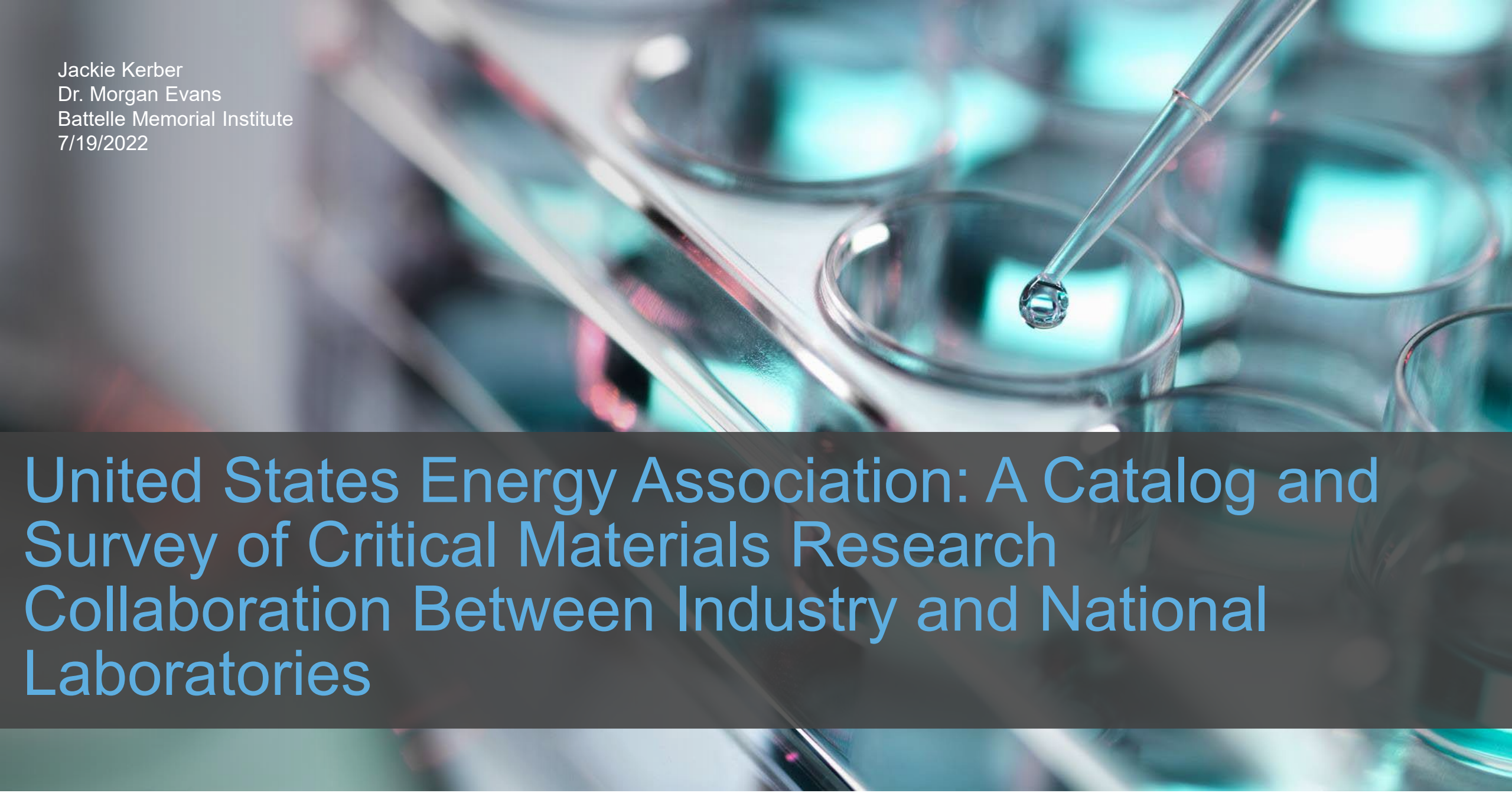

United States Energy Association: A Catalog and Survey of Critical Materials Research Collaboration Between Industry and National Laboratories

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Report Objective

To identify potential barriers of collaboration between stakeholders in critical material research and provide mitigation recommendations

Approach:

1. Catalog National Laboratory critical material research
   - Including the Critical Materials Institute that pulls together researchers from 4 National Laboratories with academic and industry partners.
2. Catalog federal funding towards critical material research
3. Conduct National Laboratory and stakeholder outreach
   - Discussion and survey responses conducted with industry and national laboratories stakeholders on the current efficacy of CM Research collaboration.

Critical Materials Research in the National Laboratories

- National Labs
  - Catalog of scientists, engineers, and project managers doing Critical Materials Research at the national laboratories with their contact information and research interests
  - A list of patents from the past five years coming from national laboratories
- Critical Materials Institute
  - DOE Energy Innovation Hub housed at Ames National Laboratory launched in 2013 to seek innovations in CM research for domestic supply chain security.
  - Catalog of research and currently funded projects (FY20) under the CMI, awards from the DOE's Office of Technology Transitions Technology Commercialization Fund (TCF) and the Small Business Innovation Research (SBIR)/Small Business Technology Transfer (STTR) program, and a member list.

CMI Research Initiatives:

Diversifying Supply
Expanding sources, transformative processes, new uses for co-products

Driving Reuse and Recycling
Learning to use available materials more efficiently by reducing waste in manufacturing and increasing recycling

Developing Substitutes
Synthesizing materials that meet needs but use less critical resources e.g. magnets with reduced rare earth content

Cross-cutting Research
Developing new research tools and forecast what materials might become critical in the future. Sustainability and supply chain analysis are components.

Government Engagement

- Bipartisan, with support spanning across white house administrations
- Government agency support is requiring more of a holistic approach than we have seen in the past.
  - DOE; CM research largely funded by FECM on carbon ore based feedstocks and other funding on CM alternatives through the EERE office.
  - DOD; Large investments in conventional mining for REE and CM through the various office's under the Office of Industrial Policy
  - EPA; hasn't had a lot of funding in recent years but there is still interest in how they can utilize different waste streams to help from a waste perspective as well as REE production
- Congressional support; Bipartisan Infrastructure Bill (BIL) with large investments in Demonstration facilities, USGS mapping, battery recycling, etc.

National Laboratory and Stakeholder outreach

- We asked the National Laboratories and relevant industry stakeholders their perspectives on the collaborative environment for critical materials research.
  1) What is your current impression of the collaboration process with (national laboratories/industry) in the CM space?
  2) Have you collaborated with a (national laboratory/industry) before on CM research? What was that process like, and were there desirable outcomes for your organization?
  3) Are you aware of funding mechanisms for collaborative efforts between industry and national laboratories in CM research? Is the process of securing funding straightforward?
  4) Can you think of any ways the collaborative efforts between industry and national labs could be improved?
  5) What do you believe are important next steps in commercialization of CM technologies?

Response from industry stakeholders

- Main themes
  - Friendly relations but do not often seem to materialize into organized research projects.
    - Industry interests and national laboratories interests are not always aligned
    - National laboratories research focuses should be shaped by identification of buyers/users of downstream technologies and solving issues related to supply-chain issues
    - Not equipped to help industry solve quick issues
  - Difficult to identify the right partners without prior knowledge or working relationships
  - Current funding mechanisms are limited in their ability to incentivize or facilitate collaboration
    - Small businesses may be more amenable than large businesses in collaborating with national laboratories, but funding mechanisms seem to be limited to SBIR/STTR calls
    - Cost share is always a challenge, especially for smaller businesses
    - Industry stakeholders are not always aware of current funding opportunities
  - Existing national laboratories commercialization strategies are lacking

Response from National Laboratory stakeholders

- **Main Themes**
  - The issues industry stakeholders face, and potential solutions the national laboratories could research, are unclear to the national laboratories
  - Industry, generally, does not appear in the national laboratories technologies despite the potential for helpful analytical techniques and R&D advances
  - There are challenges getting members of industry to collaborate with one another
  - National laboratories' collaboration with industry in the battery field appears to be more mature than for other critical materials (examples: Li Bridge, MERF, EcoCar EV challenge)
  - There are user facilities at some national laboratories where industry can do proprietary research
  - The CMI has partner and teaming opportunities at various levels as well as a technology commercialization process where industry can license the IP from the national laboratories
    - The CMI does not issue RFPs but statements of work can be developed for organizations to work with the CMI, and this also allows flexibility for entities to work with the CMI on new issues

Recommendations

1. Project managers commercialization experience should manage the finances of collaborative research
2. Targeted outreach program
3. Successful and documented cooperation with industrial partners should be given the same weight as published scientific papers.
4. Increase Requests-for-information (RFI) efforts
5. Proposal preparation should be short and fast with more programs funding 6-12 month projects with more focused goals
6. Effective mechanisms for linking R&D and commercialization should be considered
7. More open sharing of technology development through key performance indicators without revealing trade secrets
8. Catalog lessons learned from collaborative efforts between national laboratories, academics, and industry in other research areas (e.g., pharmaceuticals, O&G, etc)?
9. DOE could facilitate CRADA-protected consortia for open discussions on technology

Questions?

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