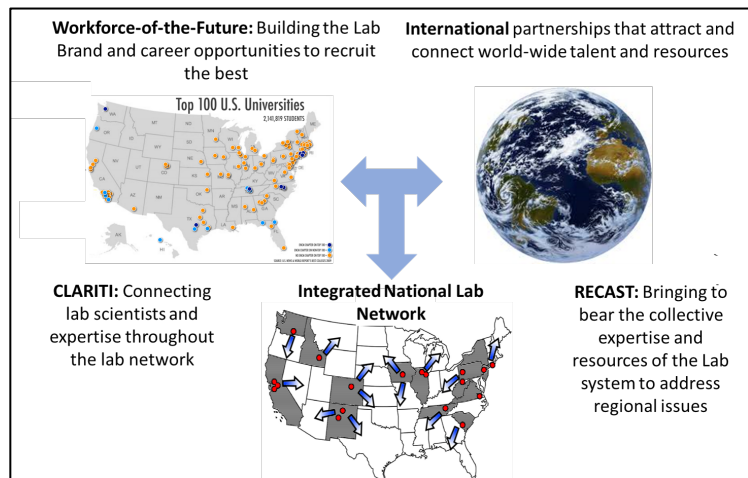


# Oppenheimer Science and Energy Leadership Program

## 2017 Oppenheimer Science and Energy Leadership Program Think Piece Ideas

**Team Summary:** The inaugural Oppenheimer Science and Energy Leadership Program (OSELP) cohort was an experiment—one in which we were honored to participate. Even though we are “insiders” who might be expected to be familiar with the DOE’s national laboratories, we collectively were stunned and inspired by the scope and impact of the national laboratory system—it is truly a national treasure. In his 1944 letter to President Franklin D. Roosevelt, head of the wartime Office of Scientific Research and Development Vannevar Bush advocated a government role in scientific research writing, “Scientific progress is one essential key to our security as a nation, to our better health, to more jobs, to a higher standard of living, and to our cultural progress.” We not only got to understand the opportunities and challenges facing the DOE national laboratories, but we also saw the tremendous promise of the future. In the attached think pieces, we focus on four emergent themes that we extracted from our diverse personal backgrounds, conversations with leaders during our site visits to the laboratories and government, and our interactions with external DOE partners. Our focus on the future of the DOE has us looking for opportunities to improve the efficacy and competitiveness of the workforce, clarify the role and place for international collaboration, position the national laboratories as regional resources, and celebrate the laboratories as science and innovation hubs connected through shared research and development.

Maintaining the competitiveness of American science and solving future complex science and technology challenges requires having the best scientists and engineers in the world, and harnessing their potential as a cohesive DOE scientific workforce. A survey of the DOE Early Career Award winners at national laboratories and universities revealed that the national laboratory system provides many of the job attributes most attractive to these talented scientists, although issues such as fragmentation of effort warrant attention.



DOE research and development cut across fundamental science, pre-commercial activities, and closely held national security innovations. The impacts are both global and regional. A clear, consistent approach to international scientific and technical engagement will empower DOE and help keep the labs a preferred employer for top talent. Next, in the aftermath of Katrina, Sandy, and other national disasters, the national laboratories helped devastated regions recover their energy systems. The role of the national laboratories in emergency preparedness and response should be nurtured and advanced to further deliver value to the American taxpayer and to attract workers who are inspired by the opportunity for powerful, local impact. Finally, we can greatly increase connectivity in the national laboratory system by developing and deploying knowledge management tools to visualize productive connections and existing topical networks between national laboratory scientists, while facilitating new, high-value relationships between the labs that foster creative thinking at the forefront of science and engineering.

**Cohort (alphabetical):** Charles Black (BNL), Johny Green (NREL), Nancy Haegel (NREL), Michael Jaworski (PPPL), Amy Marschlok (Stony Brook University), Robert McQueeney (Ames), Lia Meringa (SLAC), Timothy Meyer (FNAL), Trent Northen (LBNL), Daniel Schwartz (UW), Daniel Sinars (SNL), Dawn Wellman (PNNL), Michael Willardson (SLAC), and Howard Yuh (PPPL).

## Oppenheimer Science and Energy Leadership Program

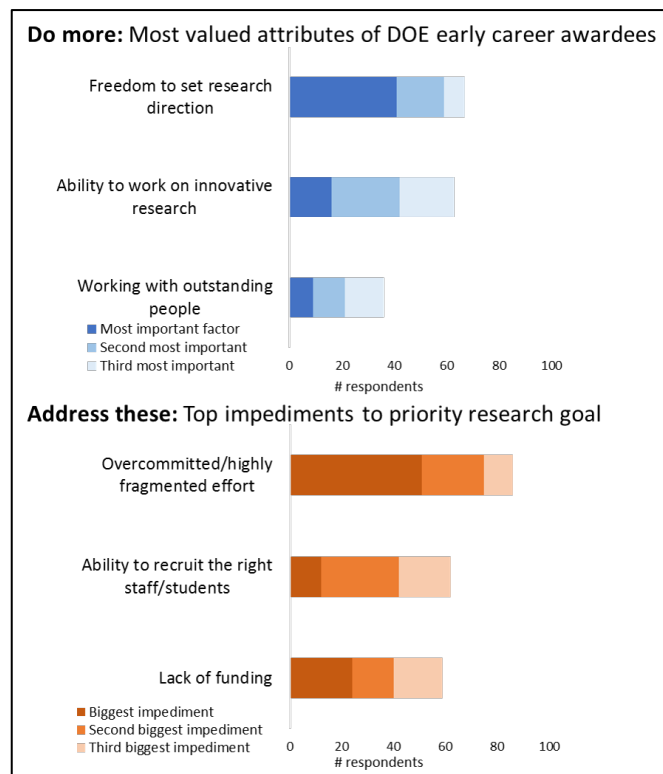
### Workforce of the Future: Attracting and Retaining DOE's Research & Development Workforce of the Future

**Summary:** The OSELP enabled diverse representatives of the national laboratory system to meet with members of the research and development workforce of multiple institutions in academia, the national laboratories, and industry. Since people are the lifeblood of any great organization, we sought to understand how the DOE could develop and deploy a strategy to better attract and retain a high-performing workforce in the future. A survey of DOE Early Career Award winners suggests broad job satisfaction among this elite and influential group (more than 75% report job satisfaction in the 71%–100% range), and also identified some ways that we may be able to improve their satisfaction even further.

**Motivation:** Today, the role of the national laboratories has evolved to encompass a diverse set of missions addressing important fundamental science, energy, environmental, and national security challenges and stewarding unique engineering resources and scientific user facilities. Vital to these critical roles is the ability of DOE laboratory scientists and engineers to perform research and development in support of the primary missions. This is typically accomplished through large, long-term, multidisciplinary projects as well as high-risk, potentially high-reward scientific research. In some areas staff are also called upon for time-sensitive response and expertise in support of critical national needs. We seek to understand what the primary factors are in attracting and retaining the best scientists and engineers to work in the national laboratory environment.

**Study:** To gain quantitative information on the values of the next generation of leaders, we designed a survey of DOE Early Career Award winners that was conducted by the University of Washington:

- Ninety-eight respondents (out of 450); one-third female.
- Fifty percent of respondents were in their 30s
- Half work at national laboratories (the remainder work in academia).
- More than 75% reported job satisfaction in the 71%–100% range.
- The important factors initially attracting them to their current positions were “the ability to work on innovative research” and “the freedom to set research direction.” These remain important values for retaining them in their present positions.
- While we stress that job satisfaction is high among the respondents, they were also asked what they felt were the top impediments to achieving their top-priority research goals. The overwhelming top concern was an over-commitment of their time and focus caused by fragmentation of their effort among multiple projects. The two other major concerns were a lack of funding and the ability to recruit the right staff/students to support their research.



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- When asked what would motivate them to leave their present position, the top interests were (1) the ability to lead a high impact project, (2) the ability to obtain tenure or funding stability, and (3) the ability to improve their quality of life.

**Findings:** Perhaps not surprisingly for a group of award-winning, high-performing research and development scientists, the ability to work on innovative research and the freedom to set their own research direction were of great importance. Our own experiences and observations suggest that with increasing diverse research and funding streams, national laboratory scientists are challenged in having to juggle multiple, matrixed, short-term programs. We believe that this model can limit the ability to significantly engage in and conduct coordinated research that is critical to national interests. While smaller, specific research grants offer greater cost accountability and project tracking, this model can significantly reduce the overall efficiency and effectiveness of the individual staff members and their programs through increased administrative use of resources and time in ramping up and closing out small fragmented projects.

**Possible Recommendations:** We propose the following examples of ideas to attract and retain a future diverse workforce composed of the world's best and brightest scientists to the DOE national laboratories, while increasing job commitment and security and quality of life.

1. **Recruitment (getting the best):** The laboratories would benefit from developing better branding and messaging across the labs that highlight the innovative research and amazing career opportunities at the national laboratories. During our site visits, our leadership cohort was exposed to many previously unknown, eye-opening resources that engendered a sense of pride in being part of the DOE national laboratory complex. The DOE labs do breakthrough research, have unique facilities, and serve the national interest. These themes coupled with most attractive job attributes identified in the Early Career Award winner survey should be emphasized in recruiting efforts.
2. **Retention (keeping the best):** Our observations and the survey indicate fragmentation and funding are significant concerns. While there may be practical accountability reasons for the DOE to create more numerous, short-duration, small-scale projects, these contribute to the above concerns. We encourage lab leadership and DOE headquarters, where possible, to continue to develop large programs that provide longer-term funding for career scientists. The 50/50 model (time split between supporting users and performing facility relevant science) of many of the DOE Nanoscale Science Research Centers and scientific user facilities is an exemplar that offers highly appealing, stable, long-term positions that also push scientists to the cutting edge by pursuing highly innovative research programs.

DOE's strengths are the combination of dynamic, large-scale team science and engineering, a work environment of shared commitment, and the ability to work with the best and the brightest in service to the peace and prosperity of the nation and the world. We believe that these could be further strengthened through relatively minor modifications to the recruiting message and the way that funding for research and labor is handled, ensuring the attraction and retention of our future research and development workforce. This broad theme would be worthy of the attention of future OSELP cohorts and the national laboratories' directors.

**Principal Contributors:** Nancy Haegel (NREL), Trent Northen (LBNL), Daniel Schwartz (UW), Dawn Wellman (PNNL), Johnney Green (NREL), and Daniel Sinars (SNL)

## Oppenheimer Science and Energy Leadership Program

### CLARITI: Creating Links across Research Institutions for Teaming Intelligently

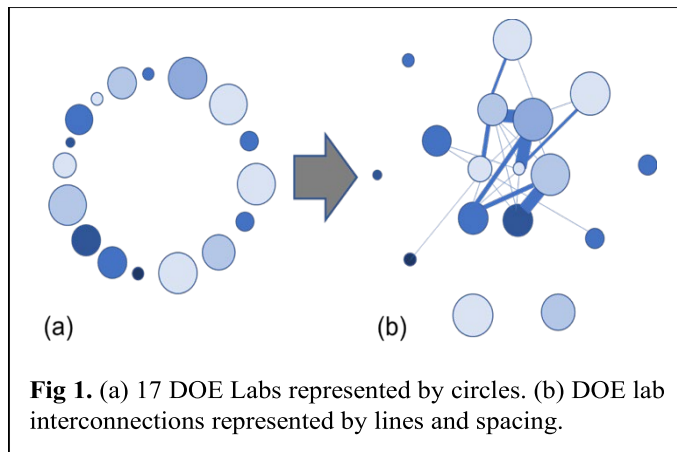
#### A Data-driven Network Visualization Effort for Building the Best Science Teams

**Summary:** Maintaining the preeminence of American science and solving ever-more-complex science and technology challenges require harnessing the full potential of a cohesive, unequaled DOE scientific workforce. While today we have many of the world’s best scientists and best scientific facilities, this could be enhanced by creating new formative methods for lab scientists to identify existing communities of practice, congregate peer groups, and efficiently assemble complementary technical capabilities in pursuit of grand science challenges. *We recommend that the labs, in partnership with DOE and the Office of Scientific and Technical Information (OSTI), implement methods of modern data analytics to gain more value from existing repositories of technical information. Developing and deploying a data-driven instrument to visualize productive scientific interconnections within the national laboratory system will allow lab scientists to identify existing networks in topical areas, locate complementary expertise, foster new high-value relationships, and ultimately build the best teams for tackling tomorrow’s scientific challenges.*

**Challenge:** The forefront scientific facilities and vast, diverse human expertise within the national laboratory system are matchless national assets. However, with limited means for interrogating professional networks within the DOE system, it is difficult for scientists to identify and interact with others outside their immediate spheres of influence. A better, data-driven methodology for assembling teams with complementary expertise is desirable for most effectively tackling present and future multidisciplinary, complex grand science challenges.

**Why now?** It is appropriate and timely to develop a tool for visualizing the DOE science network. Modern databases (e.g., Web of Science, OSTI SciTech Connect) are already aggregating the essential information. Beyond mere curation, fuller analysis of these large data sets — particularly network analysis of the DOE scientific community — can provide significant additional value. Future cross-lab initiatives, similar to the Grid Modernization initiative, will benefit from an improved instrument for building teams. Clearly, improving the frequency and effectiveness of collaborations will improve our laboratories.

**Proposed Scope:** The proposed project would create a transformative method for identifying communities of practice within the DOE labs, cultivating new relationships, and strengthening collaborative teams. One specific deliverable would be an intuitive interface for visualizing the entire DOE scientific complex that illuminates network interconnections according to user-supplied search criteria (e.g., Figure 1). Critical distinguishing aspects of this instrument are that it must be highly visual, easy to use, and dynamically updated without relying on input from participants. The labs and OSTI are natural partners for this project, which can leverage the significant resource of SciTech Connect—a repository for DOE-funded publications, patents, conference proceedings, and internal reports spanning more than 70+ years. Since OSTI continuously collects and curates such information, the raw information needed to visualize the DOE complex from a network





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perspective is always up to date, requiring no additional investment by individual researchers.

From the OSTI database and user-supplied search criteria, the proposed tool will render visual representations of productive connections between DOE scientists—i.e., relationships that have generated measurable outputs captured by OSTI (papers, patents, reports). The tool will facilitate quick views of existing collaborative networks in topical areas of interest. Importantly, network visualizations can be created from any database input or combine information from multiple sources. We believe it would be feasible to make significant progress toward an impactful visualization product within two years, at an effort of 1–2 FTE per year, with further evolution/improvement over time, upon use.

**Impact:** DOE lab scientists will reap immediate benefits from a tool that allows them to identify existing networks in topical areas; locate colleagues with complementary expertise; and identify points of contact to foster new, high-value relationships. This contrasts with typical *ad hoc* team building, which is serendipitous and relies on existing connections to identify the correct people.

The tool will allow researchers to gather network information in an intuitive straightforward way for the first time. It will display the evolution of networks over time, to visualize the impacts of DOE initiatives or changing program focus. A key feature will be visualizing connections at different scales, from a coarse view of interconnections between the 17 DOE labs to detailed views of connections at the individual investigator level. The project would be carried out in consultation with the DOE Institutional Review Board to identify and address potential privacy issues. The tool will also provide information to diverse stakeholders to inform their decisions:

- Young investigators, for identifying potential mentors and career pathways
- Laboratory leadership, for planning strategic growth within their divisions
- DOE Program Managers, for evaluating portfolios, assessing core competencies, or seeking expertise for Red Teams, advisory groups, workshop panels, etc.
- External customers (e.g., industry partners, other funding agencies, academic scientists), for locating DOE subject matter experts.

A more highly integrated network of DOE lab scientists and capabilities is essential for maintaining the primacy of American science. The proposed project supports this goal by enhancing the ability of DOE scientists to work together. Better illuminating the DOE science network will also help attract and retain the best young scientific talent. An efficient means of finding DOE technical expertise will aid efforts to connect regional stakeholders to address local issues. Future expansions in the scope of such network analysis can include international partnerships, as well as visualizations of relationships among the labs, academia, and industry.

**Follow-on Opportunities:** A crucial aspect of future scientific research will be efficient and effective collaboration. A tool for visualizing the DOE science network will facilitate new connections and encourage better teaming within the lab system. Also in support of this objective, we recommend that the DOE explore new mechanisms for supporting low-barrier cross-lab seed projects and mini-sabbaticals, especially in topical areas where network analysis indicates strategically important opportunities. We also strongly support incorporating short-term, cross-lab assignments into lab leadership trainings. Fostering cross-lab communities of practice will seed topics for future Basic Research Needs Workshops, Grand Challenges, and Big Ideas topics—positioning the DOE labs to lead American science in solving the nation’s biggest future challenges.

**Principal Contributors:** Charles Black (BNL) and Amy Marschilok (Stony Brook University)

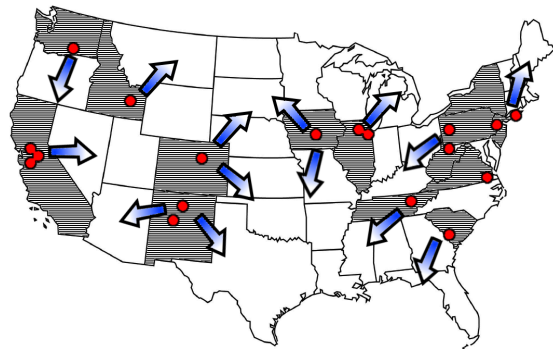
## Oppenheimer Science and Energy Leadership Program

### RECAST: Regional Energy Centers for Adaptation and Sustainable Transition

#### Utilizing Lab Extensions to Continuously Renew our Energy Services

**Summary:** The national laboratories are part of an existing investment that is already distributed regionally across the United States. Efforts already exist at each laboratory to serve local communities and their home states, but there is an opportunity for greater engagement from all of the laboratories to serve broader regional interests—existing efforts typically end at the home-state line. We believe the community relations office of each national laboratory can be expanded into to a Regional Energy Center for Adaptation and Sustainable Transition (RECAST) office, which will provide outreach and expert information on regional issues in energy security, adaptation, and sustainability by bringing to bear the expertise and resources of the entire laboratory network to address specific regional issues. These entities would operate much like USDA extension offices, but would be focused on energy-related issues. A specific mission of the RECAST offices will be to integrate expertise and resources across the DOE lab system and bring access to the entire DOE laboratory complex to each region. Expansion in this way will increase the impact of the work of the DOE by also serving those states that do not host a national laboratory already.

**Motivation:** The impact of the labs to the public they serve is most apparent when the labs are closely tied to the economy and well-being of their local communities. The impacts Sandia and Los Alamos National Laboratories are having on the economic and social well-being of New Mexico are truly inspiring in making staff expertise available to small businesses, promoting local businesses, and driving local economies. Each lab in the DOE complex can show similar stories of impacts in their local communities. Why can similar success not be achieved for each state of the Union through this network of laboratories? While there are already a wide range of activities at each of the laboratories that connect it to the local community, we see an opportunity to expand these activities and make evident that the work accomplished at the laboratories and the mission of the DOE directly benefits the public. Broader engagement with communities builds public support and improves the ability of the laboratories to carry out the DOE's mission of ensuring U.S. economic prosperity. Given the rapidly changing energy landscape, now is the time to start building these relationships and prepare solutions for future energy production and utilization that can be adapted to local needs.



**While the profile of each of these centers will of course be different, they need to provide two key functions:**

*Resilience of energy infrastructure to extreme events.* Hurricane Sandy and other extreme events exposed weaknesses and risks in the national energy infrastructure, which is deeply tied to local economies, and DOE has begun addressing the responses to acute events through the DOE's Infrastructure Security and Energy Restoration Division. In addition to responding to acute events, though, the DOE, through the RECAST network, could provide technical expertise on questions of how to improve infrastructure to lessen the adverse impacts of such acute events. Often lacking the resources of larger entities, local communities and smaller businesses do not usually have the best information available regarding topics such as best practices for efficient building construction, intelligent water and land management, and response plans for environmental emergencies.

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*Adaptation to changing energy technologies, markets, and climate.* Advanced and disruptive energy technologies and other economic and environmental changes carry a wide range of impacts, not all of which are perceived positively by the public. Changing precipitation and temperature conditions, for instance, will have an impact on a region's growing seasons, and improved natural gas availability stresses competing thermal energy sources. There is a need for the DOE labs to serve as regional centers of expertise to provide the best information and projections for future energy-related industries and technologies so that local economies can adapt with minimal social impact.

The national laboratories are regionally distributed, which is an advantage as the distribution of natural resources, changing environmental conditions, and industries is not uniform across the United States — multiple RECAST offices need not necessarily duplicate expertise or efforts. The DOE national laboratories are also a natural partner for a region's businesses through industrial partnerships through technology transfer and strategic partnership plans. In many instances, though, the community relations offices' work ends at the state line. The expertise at the laboratories and experience of already-operating community relations offices place them in a unique position to provide valuable services in an apparent gap area.

There are already efforts ongoing in the national laboratory complex to help address adaptation and sustainability and promote technology transfer. The Grid Modernization initiative includes several activities to improve resiliency against acute impacts. Long-term planning and transitions can also be aided by laboratories and specialized capabilities within the DOE complex. For instance, the national labs are home to specialists who analyze energy and water utilization to help develop adaptation plans based on the best available science. Such plans could be augmented by improved, higher-fidelity local climate modeling. To take advantage of expertise and resources throughout the national laboratory complex, representatives in the RECAST network would meet regularly to update and inform each other about regional challenges and opportunities for collaboration.

Long-term planning and cost-benefit analyses can not only help local industries prepare for future conditions, but could also provide valuable information to the real estate, insurance, and investment industries. Successful engagement of these non-traditional partners for the DOE would broaden the value the labs provide to the nation's economic enterprises. Most importantly, however, adaptation options for the region could be planned on decadal time-scales, making it possible to fully adapt to changing conditions without shocks to the economy after acute events.

Functionally, such a distributed effort could be supported in different ways, though the best option is not obvious. Local programs could be "taxed" with an increase in overhead to support the RECAST office but this is sub-optimal as smaller laboratories would not be able to field significant teams. Alternatively, a program line created in the "landlord" office could be used to support the efforts at a given laboratory, but the logic would have to be clearly articulated. Another option would be a separate fund line through the Undersecretary for Science and Energy to the labs within this area, supplied through Congressional actions. Though difficult, by providing funding through appropriations, the service activities performed at each RECAST office can be clearly linked in the eyes of the public to Congressional mandate. This latter option also provides the greatest freedom in defining regional boundaries and appropriately distributing resources through the network.

Numerous interactions with other federal agencies are already expected making it possible for the RECAST network to also provide contact to the rest of the federal complex (e.g., NOAA, NASA, USDA, and DOI). The labs are already successful locally—why not expand that success everywhere?

**Principal Contributors:** Michael Jaworski (PPPL), Robert McQueeney (Ames), Trent Northen (LBNL), Dan Schwartz (UW), Dawn Wellman (PNNL)

## Oppenheimer Science and Energy Leadership Program

### International Engagement as Success Posture and Recruitment Advantage

**Summary:** Science, technology, and innovation are global in terms of practice and partnership. Not only does the heightened complexity of the scientific challenges that the DOE labs undertake require harnessing the collective scientific knowledge of the international community and engagement, but also engagement with the global community mitigates the risk of technological surprise. Moreover, a consistent, clear approach to international partnership at the laboratories is a decisive attractor for talent.

The future outlook for U.S. engagement in the global science and technology community via DOE is bright: U.S. facilities, U.S. workers, and U.S. ideas continue to make America a valued and treasured partner. We see an opportunity to further integrate DOE's approach to international engagement to preserve American security and prosperity and to continue to make the DOE labs not only partners of choice, but employers of choice.

**Background:** The United States is no longer a majority fraction of the world-research enterprise by funding or by personnel. Pioneering and pivotal science experiments often require the combined efforts of multiple nations pooling resources and talents. As globalization increases, the world's top talent must work in areas where it can continue to connect internationally. In FY16 the United States provided 26.4% of total global R&D spending and U.S. government represented 6.7% of total global R&D spending. The total number of international collaborations begun via DOE national laboratories has increased. According to the FY15 DOE Annual Technology Transitions Data Call, the total number of SPP, CRADA and ACT agreements between DOE national labs and foreign governments more than tripled, from 26 to 86, while total funds-in increased only slightly. The national labs host thousands of international users at their designated user facilities: a total of 15,325 international users accessed these facilities in FY15.

**A Strategic Approach to International Collaboration.** Differing views on international conference participation and vacillating approvals for collaboration with other countries combined with the necessary sensitivity to foreign nationals cast several shadows over the DOE laboratories. The national labs successfully engage with numerous international partners, one at a time, and with certain countries more frequently than others. Many of the labs have long-established research partnerships with foreign government entities, research institutes, and universities, as well as corporations in countries including Germany, Japan, South Korea, Canada, the United Kingdom, and China, among others. The DOE has very recently been focusing on reducing the administrative barriers to collaborating internationally by introducing more tailored agreement mechanisms such as the "international CRADA" and a new policy (P485.1) defining the process for consideration of international engagements. These situations are considered on a case-by-case basis by DOE and often by different program offices. Although the United States has treaties and science and technology agreements with foreign governments, there is not a clear, well-articulated foreign engagement strategy between DOE national labs and foreign entities that can be used as a basis for a particular collaboration.

International engagement needs to be evaluated in light of overall relevance to mission advancement. Objectives for each specific international collaboration or partnership should be formulated by the proposing laboratory in terms of how the combined work advances the DOE missions. That is, collaboration should be framed and evaluated in the context of how it helps the United States achieve the strategic objectives supported by DOE. Each year, the national labs perform annual lab planning and produce their own annual lab plans. As part of this lab plan, each national laboratory could consider how international collaborations may fit within its overall strategy.

**A Graded Approach:** Higher technical readiness level (TRL) research closer to commercialization requires more thoughtfulness when engaging internationally. This consideration is appropriate, but if not

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fully communicated can create a sense of inconsistency that dissuades global practitioners from engaging with the DOE lab system. This begins by understanding the TRL of the proposed activity and applying tailored considerations based on whether the TRL is high, medium, or low. For emerging markets within the decadal timescale where the United States is in contention for future market dominance, a high level of caution is warranted. One example of this type of market could be additive manufacturing (i.e., 3D printing). However, in mature markets such as steel-making, the majority of the economic value lies outside of manufacturing. In these sectors the typical thinking about competitiveness may be reversed. Low TRL research that may disrupt existing markets and improve U.S. competitiveness in these sectors could possibly represent a higher risk relative to benefit than higher TRL research that may provide a large distributed benefit to the large number of U.S. consumers of the existing product.

A key consideration for DOE participation in an international collaboration must also be the chances for success: what are the mechanisms in place that will help measure and manage performance? What are the track records of the partners so that we may be reasonably confident in accomplishing the mission? What level of project management rigor is to be used? These questions become more important particularly as the size and complexity of the endeavor grow. The level of assurance required to authorize the engagement must be scaled to take into the overall impacts of a failure as well as the types of failures. Recognizing the need to distinguish opportunities by TRL and country, these criteria should be distributed at the lab director level to guide local efforts in developing bottom-up collaborations efforts from researchers.

Diplomatic relations help open up new opportunities for scientific partnership between countries. In some cases, scientific collaboration has been an early demonstration of good faith and common values between partners that drives new levels of diplomatic engagement. But the future will also hold opportunities and crises that only science and technology can address. We already see some of these situations present. A scientific understanding of global weather and/or resilience is required to direct U.S. attention to the key global partners or issues that can have the most positive impact. Scientific analysis of the best conditions for pivotal experiments (such as sky surveys or dark-matter searches) inform the United States about which partners can provide the best locations for such science.

**A Vision for DOE Driving Global Scientific Excellence.** We see, a decade from now, a DOE that drives global scientific excellence while advancing the prosperity and security of all Americans. This vision is achievable with a thoughtful and consistent approach to international engagement. To succeed, DOE must have a globally aware and globally engaged workforce, the right connections and partnerships to stay abreast of science and technology developments around the world, a competitive advantage based on strategic investments within the United States, and a world-wide reputation as a valuable and reliable partner.

**Principal Contributors:** Timothy Meyer (FNAL), Lia Merminga (SLAC), Howard Yuh (PPPL), Michael Willardson (SLAC)

# Reflections and Ideas from the first cohort of the Oppenheimer Science and Energy Leadership Program



Thursday, March 9, 2017  
Big Ideas Summit Presentation



# We thank the National Laboratory Directors and the Department of Energy for this opportunity!

## OSELP

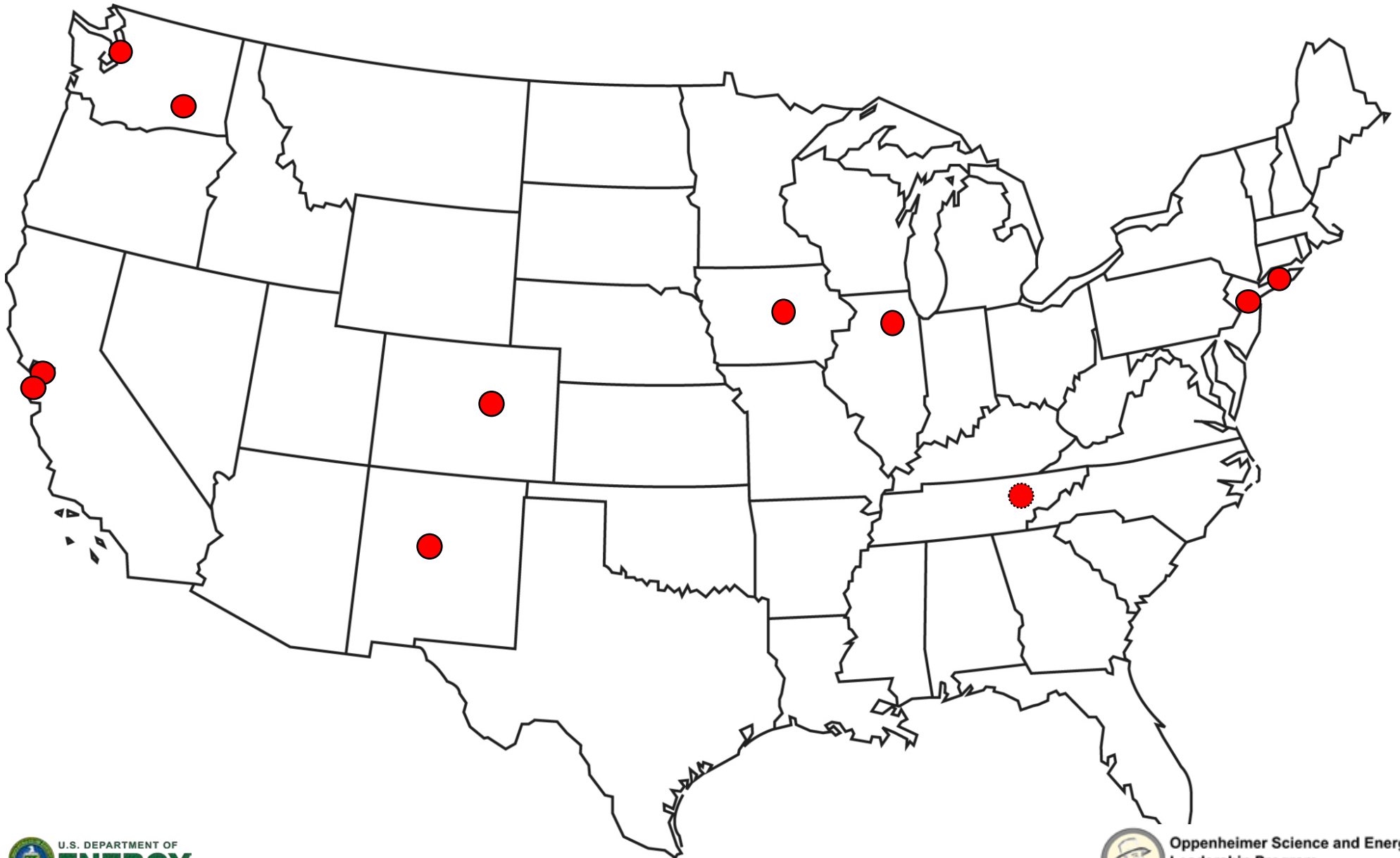
- With special thanks to:
  - Adam Cohen, Deputy Undersecretary, Department of Energy
  - Teeb Al-Samarrai, White House Fellow
  - Kevin Doran, Department of Energy
  - Dave Catarious, Department of Energy
  - Karen Gibson, Department of Energy
  - Mike Knotek, OSELP Mentor
  - Bill Wepfer, OSELP Mentor
  - Chuck Shank, OSELP Mentor

# We are a diverse set of leaders from across the DOE complex who bring unique perspectives to the table

## OSEL

- Goal of building networks of people and ideas across the Department of Energy network (Labs, Universities, etc.)
- We are 14 from a pool of 34 nominees from the 17 labs
- We are a diverse group with “DOE insider” perspectives
  - Chief Operating Officer
  - Technology Transfer Chief
  - Associate Lab Directors, Directors, and Senior Managers
  - Research Scientists
  - Professors

Our think pieces were influenced by both  
**who we are** and where we visited

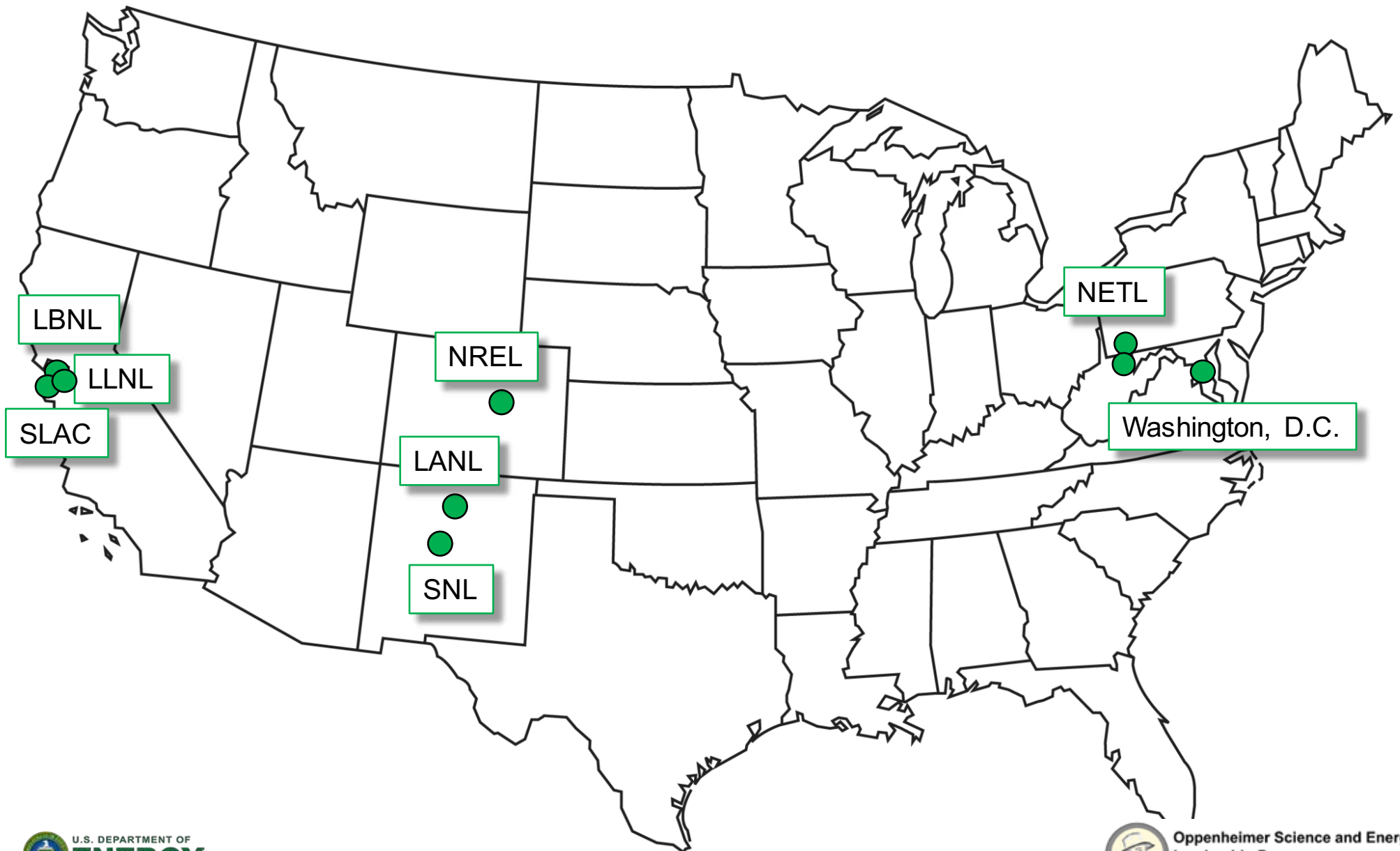


# Our think pieces were influenced by both **who we are** and where we visited

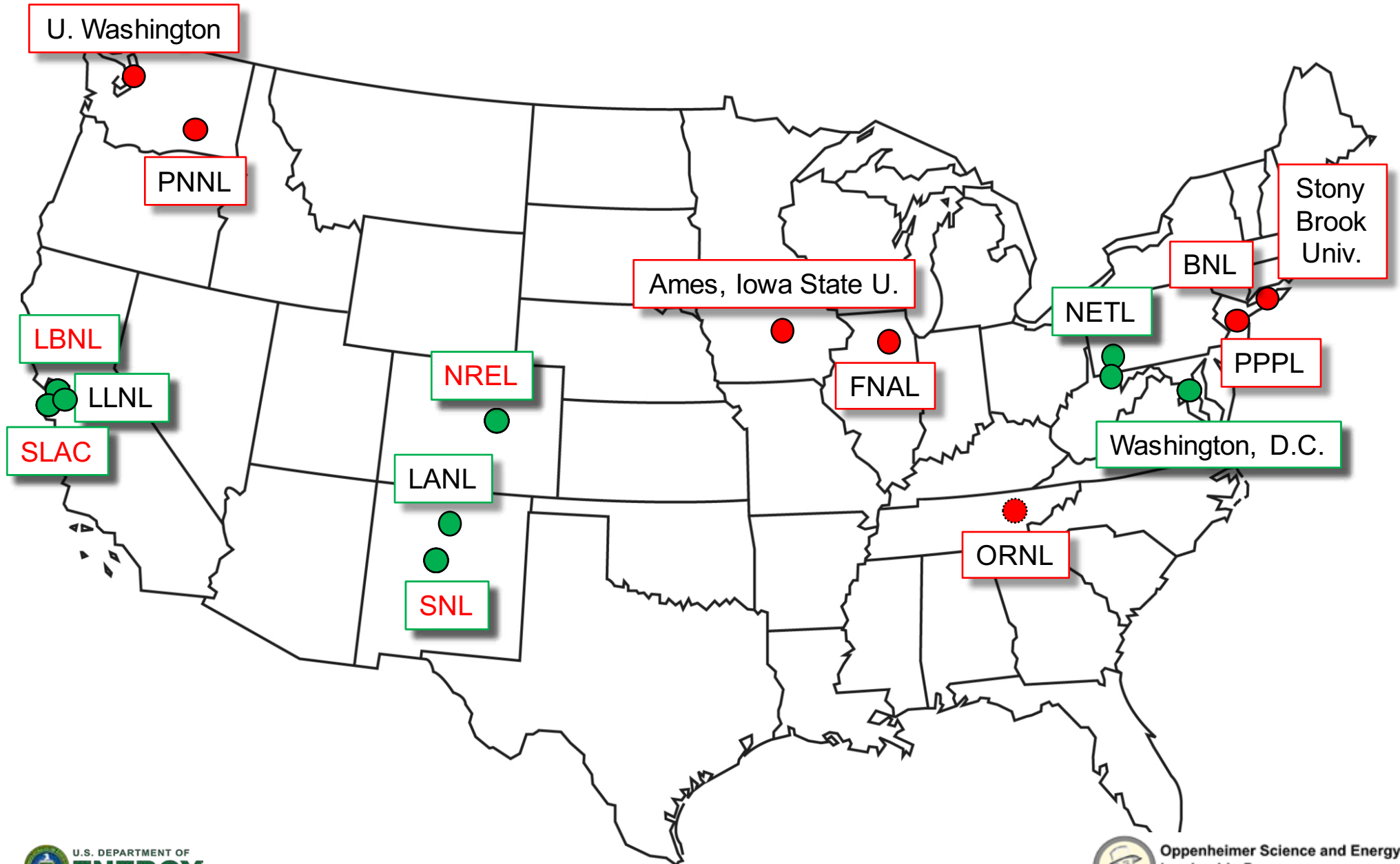




# Our think pieces were influenced by both **who we are** and **where we visited**



# Between **who we are** and **where we visited**, we have experienced 13 of the 17 DOE labs





# Our experiences went far beyond the DOE Labs and included extensive industry, academic, & government interactions

**RAND CORPORATION** **Chevron** **West Virginia University** **U.S. DEPARTMENT OF ENERGY**

**Berkeley UNIVERSITY OF CALIFORNIA** **northeast NATURAL ENERGY** **DLC - DUQUESNE LIGHT CO.** **U.S. DEPARTMENT OF ENERGY** **THE WHITE HOUSE WASHINGTON** **DEPARTMENT OF TRANSPORTATION UNITED STATES OF AMERICA**

**Stanford University** **Western Interstate Energy Board** **CENTER FOR THE NEW ENERGY ECONOMY** **Colorado State University** **NASA** **Portrait of a man**

**Google** **NVIDIA** **COLORADO Energy Office** **ARROW ELECTRONICS, INC.** **CO-LABS** **DEPARTMENT OF DEFENSE UNITED STATES OF AMERICA** **dc water is life** **NATIONAL CANCER INSTITUTE**

**New Mexico CONSORTIUM** **United Way** **mPower** **arpa.e** **OPIC**

**NORTHERN New Mexico College** **NMSBA Los Alamos National Laboratory Sandia National Laboratories Solving New Mexico's Small Business Challenges**

**U.S. DEPARTMENT OF ENERGY** **U.S. DEPARTMENT OF ENERGY**

**Most of our hosts commented that we asked a lot of questions. Perhaps too many. Suspiciously, our bus had a fuel fire shortly after we left the fossil fuel experts at NETL...**



**Our lengthiest facility tour of the entire OSELP experience!**



# We are presenting four “think pieces” that look at four different scales of the labs as a network

## Workforce-of-the-Future

Can we enhance our “DOE Lab Brand”?  
Can we reduce fragmentation of researchers across projects?



## CLARITI

Data-driven tools for identifying teams



## International Partnerships

Can we improve 2-way communication about international opportunities?  
Can we identify a graded set of processes?



## RECAST

Can the labs do more in communities beyond state lines?



# Workforce-of-the-Future



## Contributors

*Trent Northen, LBNL*

*Nancy Haegel, NREL*

*Daniel Schwartz, UW*

*Daniel Sinars, SNL*

*Dawn Wellman, PNNL*

*Johney Green, NREL*

Message: A strong national lab “brand” & continued attention to workplace environment will sustain excellence in workforce talent and performance.

# DOE must attract & retain talented leaders to meet its mission



The **mission** of the Energy Department is to ensure America's security and prosperity by addressing its energy, environmental and nuclear challenges through transformative science and technology solutions.

## Leaders in energy, environmental remediation, and nuclear security need

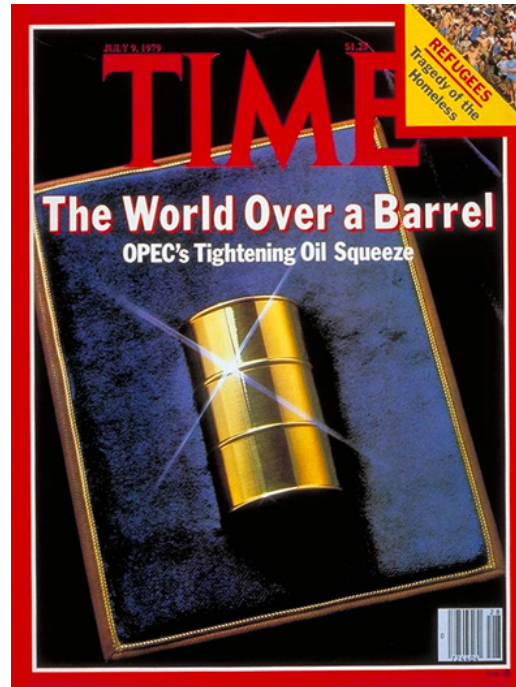
- world-class scientific/technical knowledge
- skills to envision and lead multidisciplinary team science
- ability to partner with diverse stakeholders
- vision for where advances are taking the field



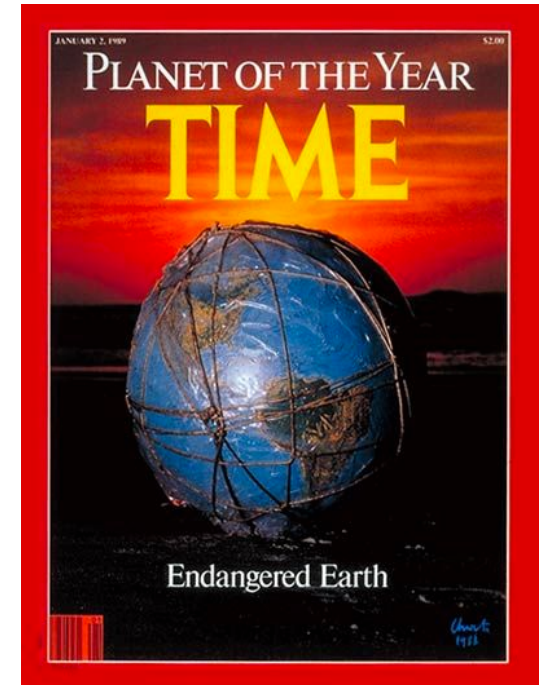
# Today's DOE leaders came of age in a unique era for science & society



Cold war linked to DOE nuclear mission



Energy crisis linked to DOE energy mission



Environmental remediation linked to DOE stewardship mission

Clear link between national priorities & DOE mission helped attract and retain top talent.



# Future DOE leaders are immersed in today's science & society context



Terrorism and national security



Tech, big data, & entrepreneurial aspirations



Two career families and demographic change

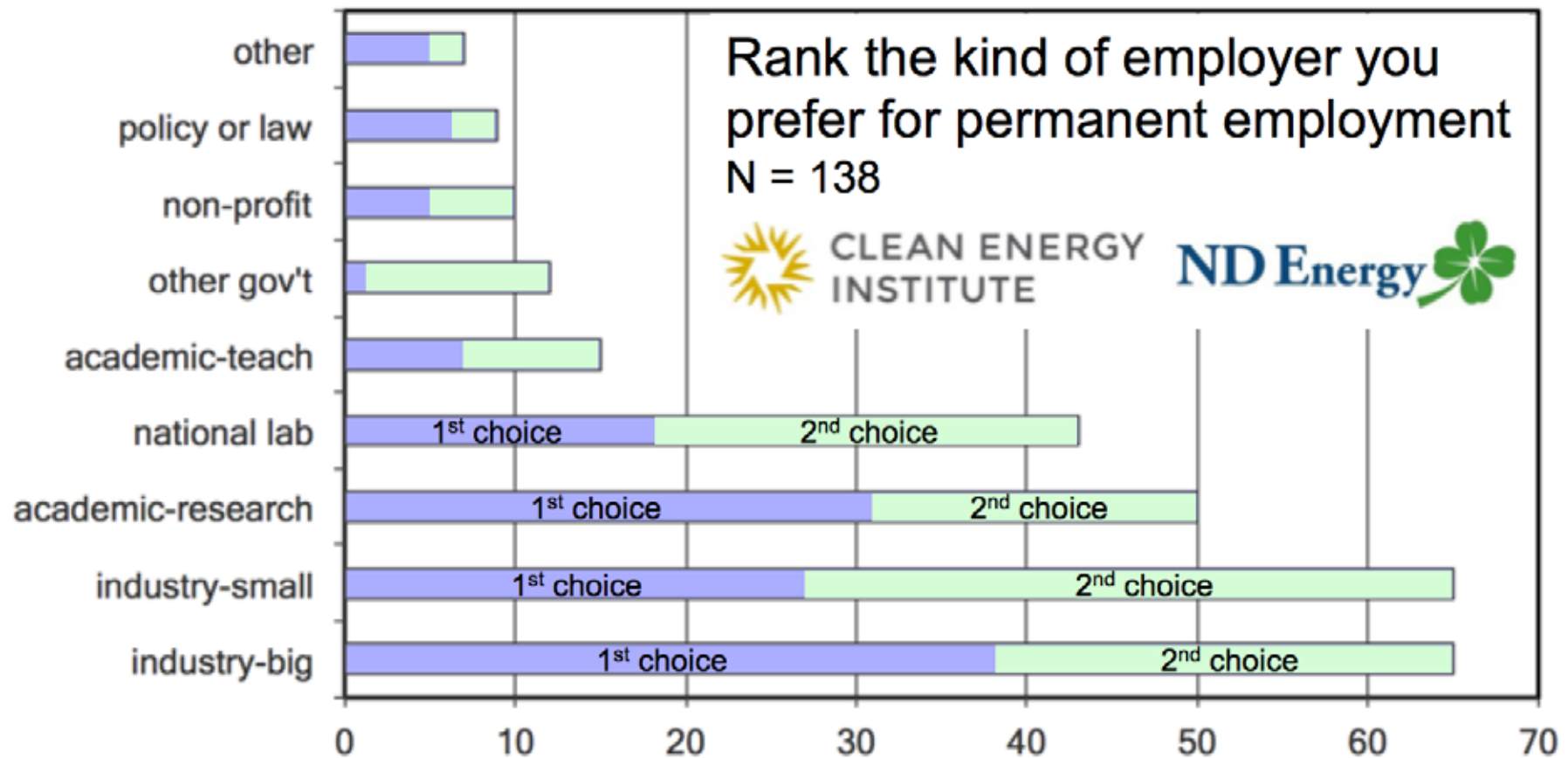
How does DOE attract and retain the best talent in today's science and society context?

# Surveys assessed career attitudes and priorities in emerging energy leaders

- Students and postdocs in university energy centers
  - 72 out of 104 at University of Washington Clean Energy Institute
  - 66 out of ~100 at ND Energy, University of Notre Dame
- Early career research program awardees.
  - 98 responses out of 450 total awardees

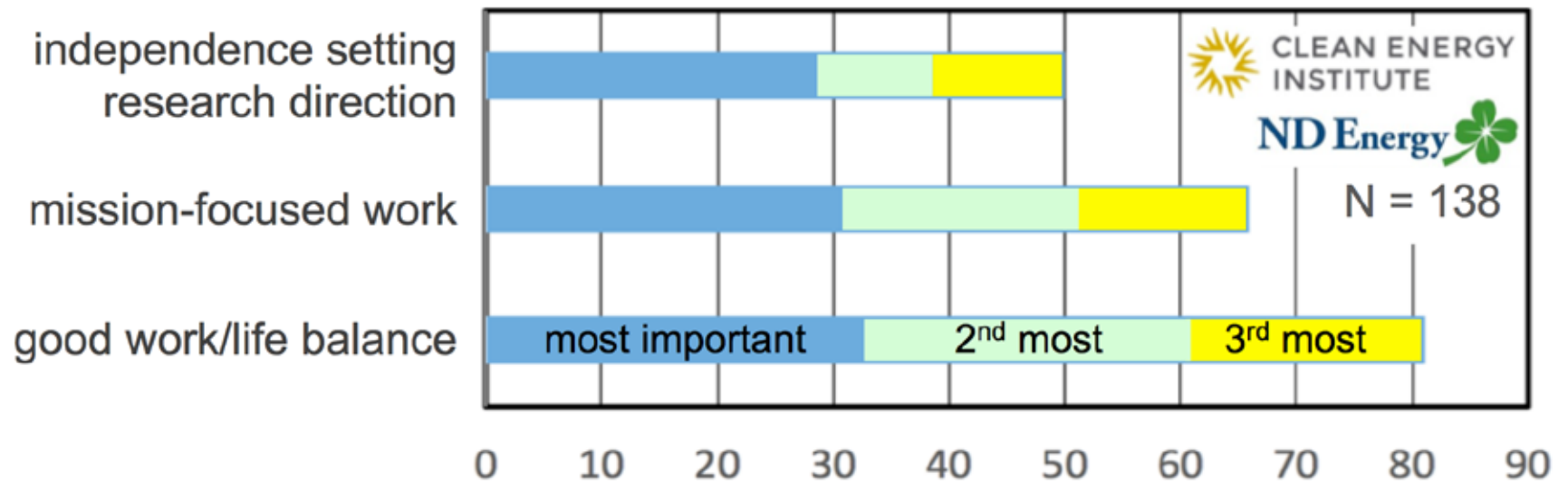


# Energy students tend to prefer small and large industry employment



National lab employment is recognized as a solid career option, with intermediate student demand.

# Students ranked three key workplace attributes well above all other choices



- **Work/life balance** was the highest priority workplace attribute and a “top 3” issue for nearly 60% of all students.
- Choices linked to compensation, job security, location, career path options, travel, collaborative environment, etc. were much less cited as desirable workplace attributes.

# Survey of all DOE Early Career Research Program Awardees

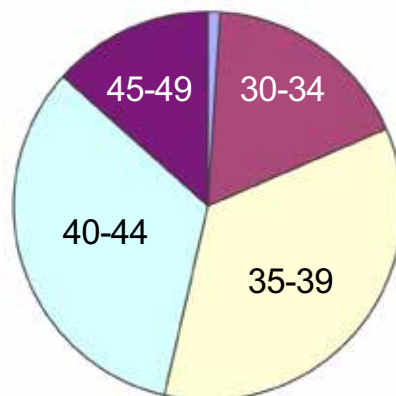
**Premise:** The perspective of DOE Early Career Research Awardees provides valuable insights into the status of future scientific/technical leadership.

Office of  
Science

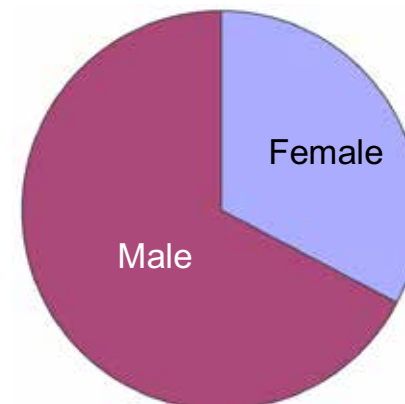
**Approach:** A University of Washington IRB-reviewed survey instrument with 11 questions was sent to the 450 addressable awardees.



**Response:** 98 awardees completed the survey, about **half from labs**.



AGE



GENDER

**Plan to publish a perspective piece on these outcomes.**



# Preliminary Analysis: DOE Early Career awardees report quite high job satisfaction

Awardees are generally happy with their current positions

- **Over three-quarters of respondents report a job satisfaction >70%**
- **Attraction to mission, quality of life, and funding stability grow as important factors**

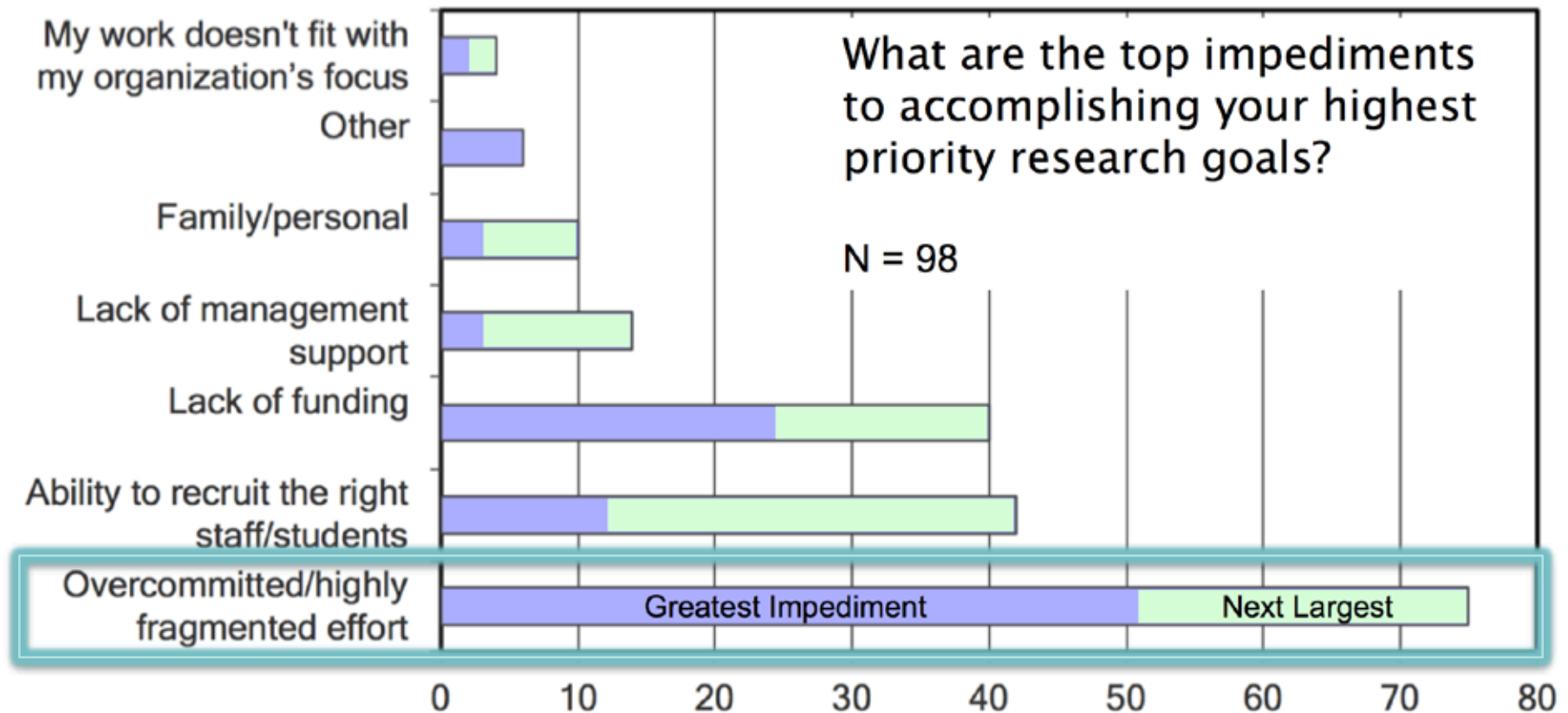
There were two dominant factors that attracted early career awardees to their current jobs:

- **“Freedom to set research direction”**  
>60% cited as the first or second most important factor.
- **“Ability to work on innovative research”**  
~50% cited as the first or second most important factor

**A sustained focus on creativity and innovation in research is a key factor for retaining high performing DOE investigators.**



# Preliminary Analysis: Early Career awardees identify noteworthy research impediments



**Retention Issue?** >75% of respondents cite overcommitment & fragmented effort as the top or second biggest impediment.

# Workforce Observations & Retention-Oriented Recommendations

- The lab system depends on scientific and technical excellence – there is overall positive job satisfaction among the talented DOE Early Career awardees.
- Fragmentation challenges cited by early career awardees can be addressed in several ways:
  - *Large cross-cutting programs that can “change the world” provide opportunity for long-term impact (e.g. grid modernization)*
  - *Broader adaptation of the 50/50 funding model used at different DOE nanoscience centers.*



# The National Lab mission could be used as a powerful recruiting tool

OSELP participants were awed by the mission, scope and, capabilities of the Lab Complex.



DOE Early Career Awardees validate the amazing career opportunities at the national labs.



National Lab **innovation**, **facilities**, and **workplace culture** can be a powerful recruiting and retention tool.





# Creatively Convey the National Lab Mission & Innovation Opportunity

**Create a National Lab brand to support recruitment and public engagement in the mission**



# We are presenting four “think pieces” that look at four different scales of the labs as a network

## Workforce-of-the-Future

Can we enhance our “DOE Lab Brand”?  
Can we reduce fragmentation of researchers across projects?



## CLARITI

Data-driven tools for identifying teams



## International Partnerships

Can we improve 2-way communication about international opportunities?  
Can we identify a graded set of processes?



## RECAST

Can the labs do more in communities beyond state lines?



# CLARITI\*

## A data-driven approach to building the best science teams

**Modern data analytics can elicit more value from the scientific outputs of the Labs**

Scientific network visualizations facilitate building the best teams for tomorrow's science challenges



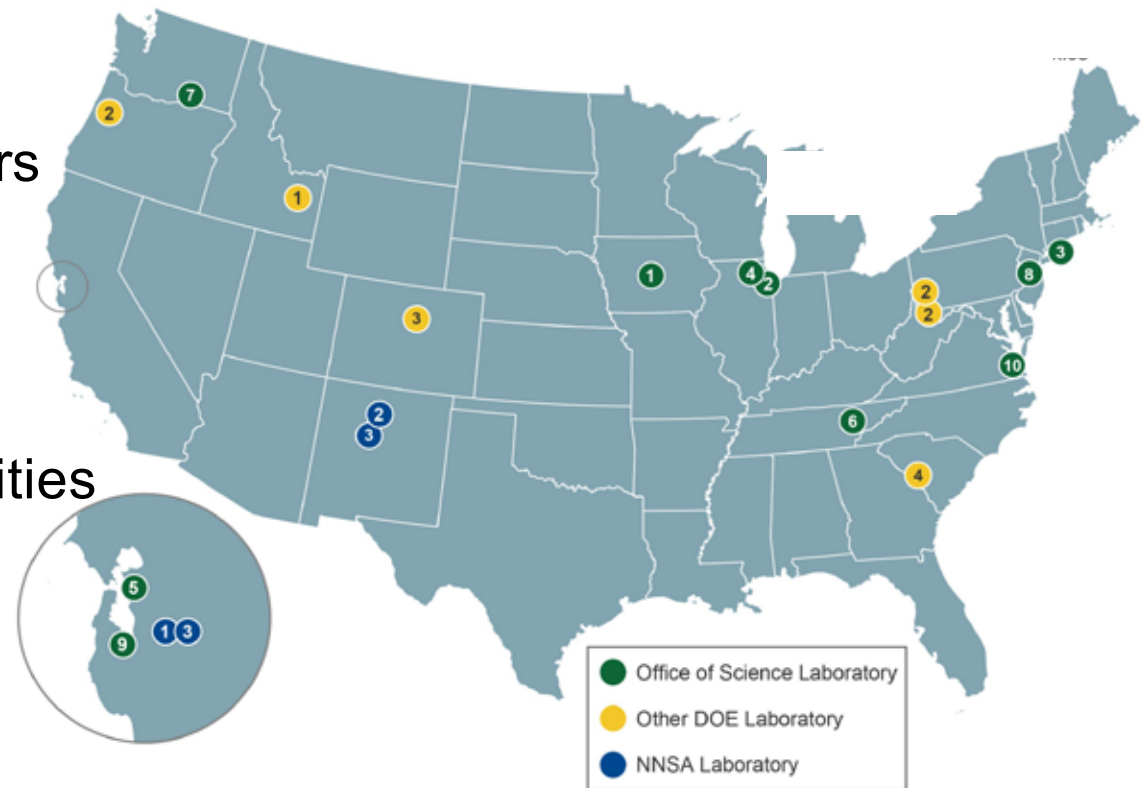
\*Creating Links across Research Institutions for Teaming

Intelligently



# The DOE Labs are a matchless resource for the nation

- 17 Laboratories
- >20,000 scientists and engineers  
    >2,000 postdocs; >2,500 students
- Highly diverse expertise
- Forefront, unique scientific facilities
- United by the DOE mission
- Collaboration is critical:
  - ...in small groups
  - ...across Departments
  - ...across Labs
  - ...with external partners
  - ...across countries
- But team-building typically *ad hoc*



Difficult to identify team members with appropriate, complementary expertise

**Can we do this better?**

# The DOE Labs should be leaders implementing data analytics to provide and use network information

- DOE Lab technical outputs also contain important network information
- Possible to mine publications, patents, reports, ..., to illuminate productive interconnections
- Better collaborative teaming will improve the Labs
- The Labs should partner with OSTI on this
- OSTI maintains database of 70+ years of Lab outputs
- Initial discussions very promising

**X-ray induced chemical reaction revealed by in-situ X-ray diffraction and scanning X-ray microscopy in 15 nm resolution (Conference Presentation)**

Mingyuan Ge ; Wenjun Liu ; David Bock ; Vincent De Andrade ; Hanfei Yan ; Xiaojing Huang ; Amy Marschilok ; Esther Takeuchi ; Huolin Xin ; Yong S. Chu

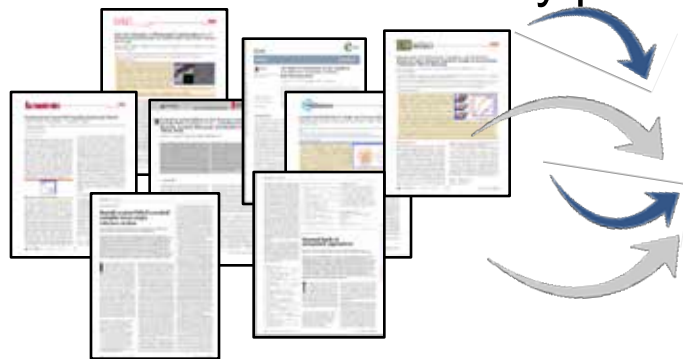
[ - ] Author Affiliations

**Mingyuan Ge, Hanfei Yan, Xiaojing Huang, Huolin Xin, Yong S. Chu**  
Brookhaven National Lab. (United States)

**Wenjun Liu, Vincent De Andrade**  
Argonne National Lab. (United States)

**David Bock, Amy Marschilok, Esther Takeuchi**  
Stony Brook Univ. (United States)

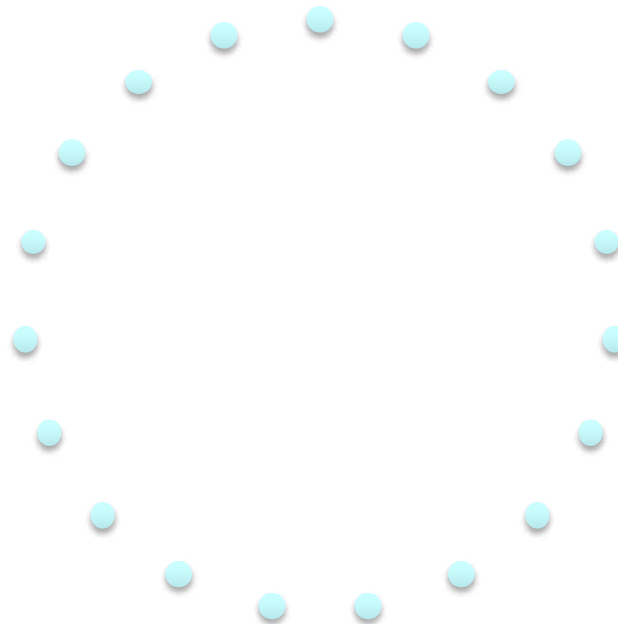
Proc. SPIE 9927, Nanoengineering: Fabrication, Properties, Optics, and Devices XIII, 99270H (November 3, 2016); doi:10.1117/12.2237229



# Example: A formative approach for visualizing the DOE science network, to identify, cultivate, and strengthen communities of practice

A few case studies to show utility

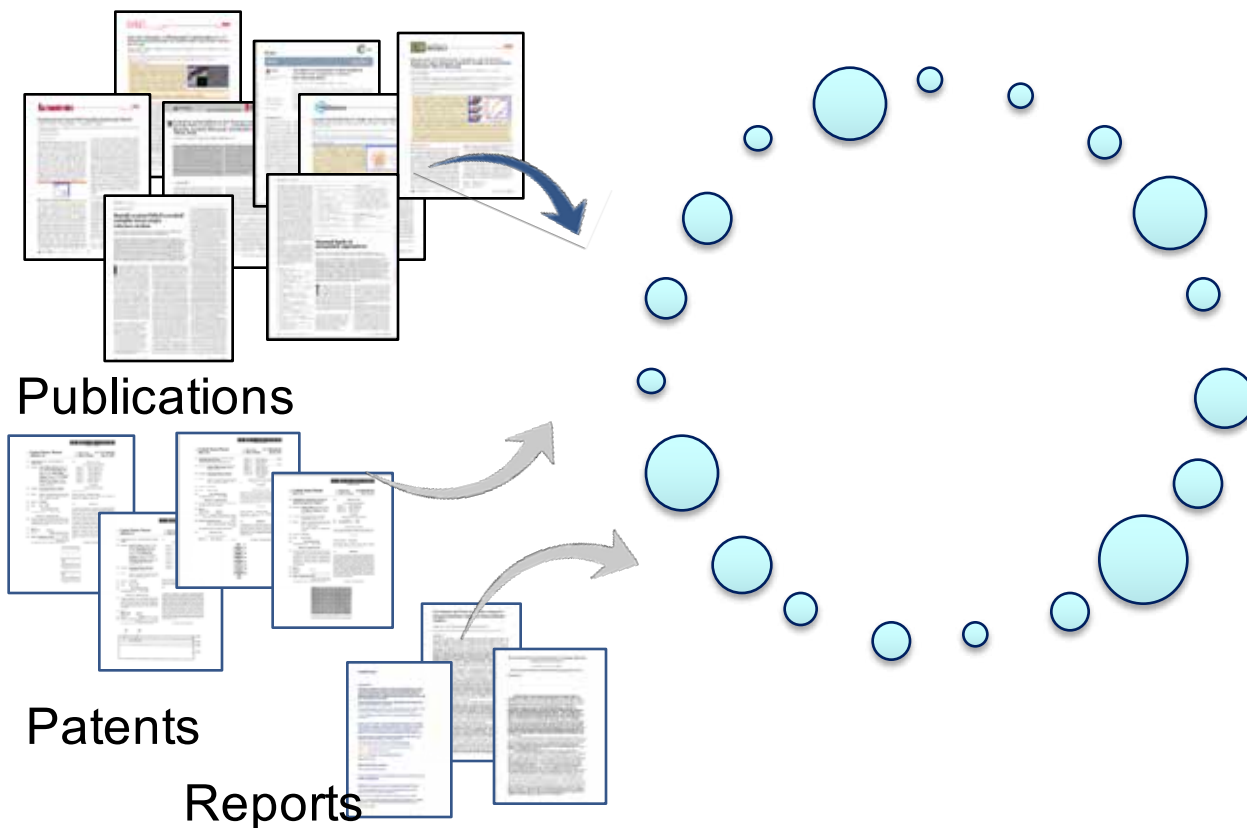
- 17 Labs  $\leftrightarrow$  Circles



Example: A formative approach for visualizing the DOE science network, to identify, cultivate, and strengthen communities of practice

**Input: LARGE datasets**

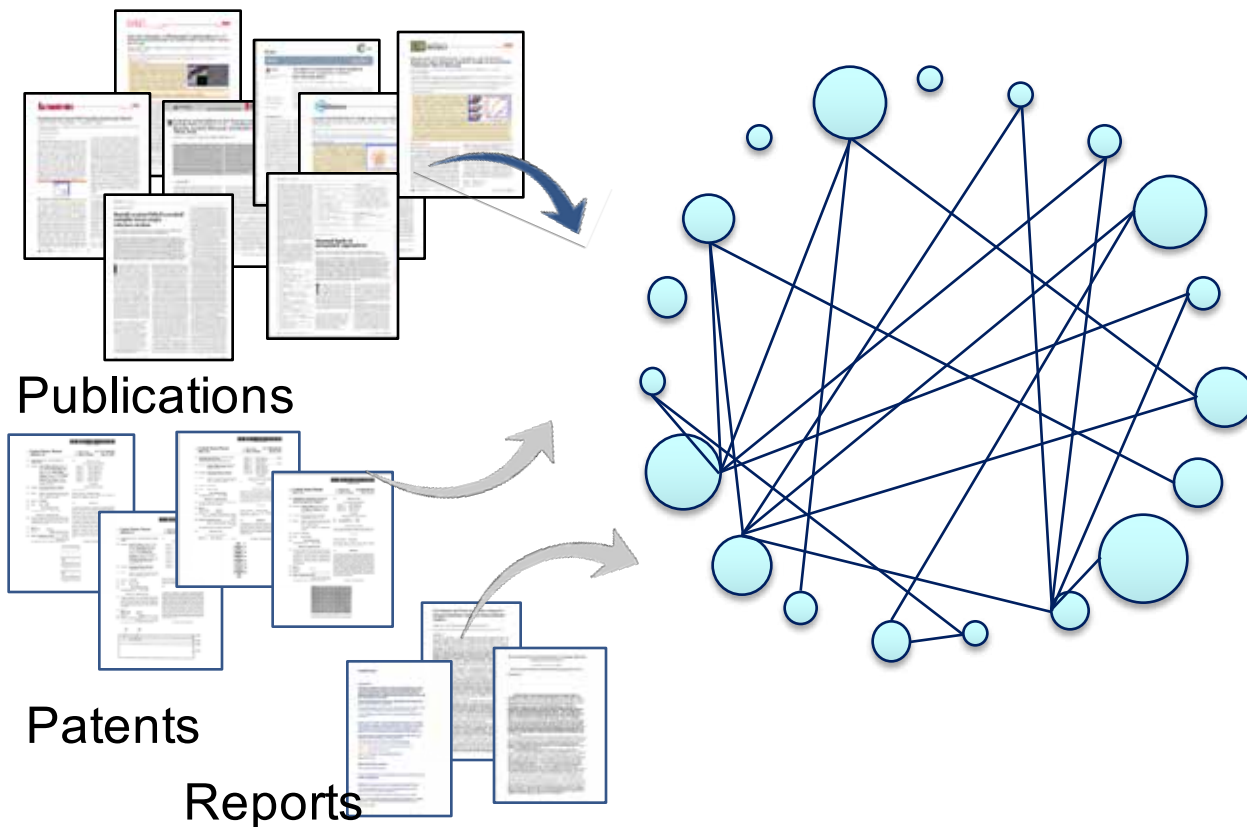
- 17 Labs  $\leftrightarrow$  Circles
- Lab output  $\leftrightarrow$  Circle size





Example: A formative approach for visualizing the DOE science network, to identify, cultivate, and strengthen communities of practice

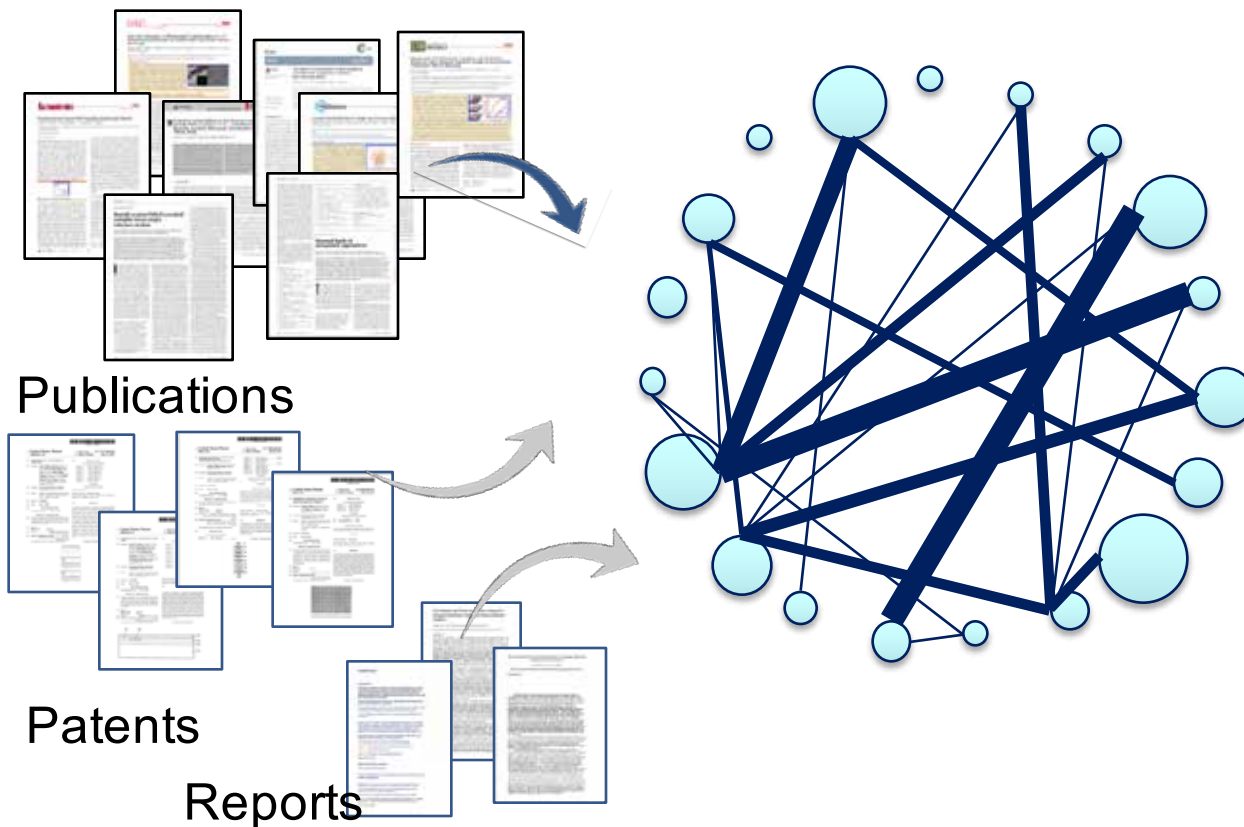
## Input: LARGE datasets



- 17 Labs  $\leftrightarrow$  Circles
- Lab output  $\leftrightarrow$  Circle size
- Lab collaborations  $\leftrightarrow$  Line interconnects

Example: A formative approach for visualizing the DOE science network, to identify, cultivate, and strengthen communities of practice

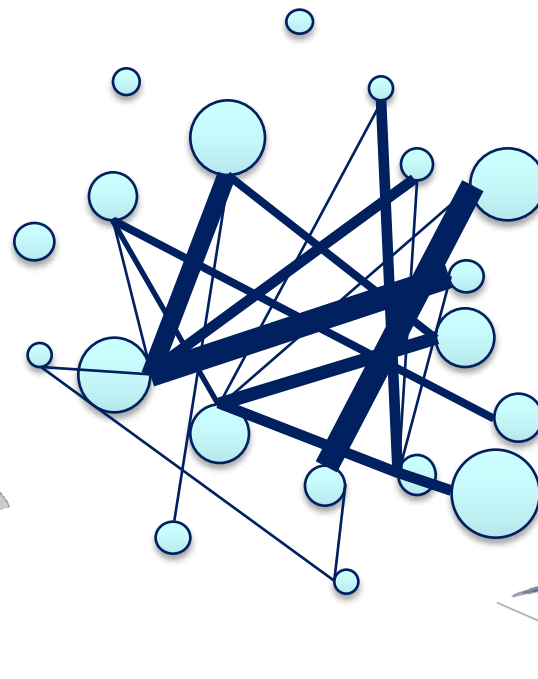
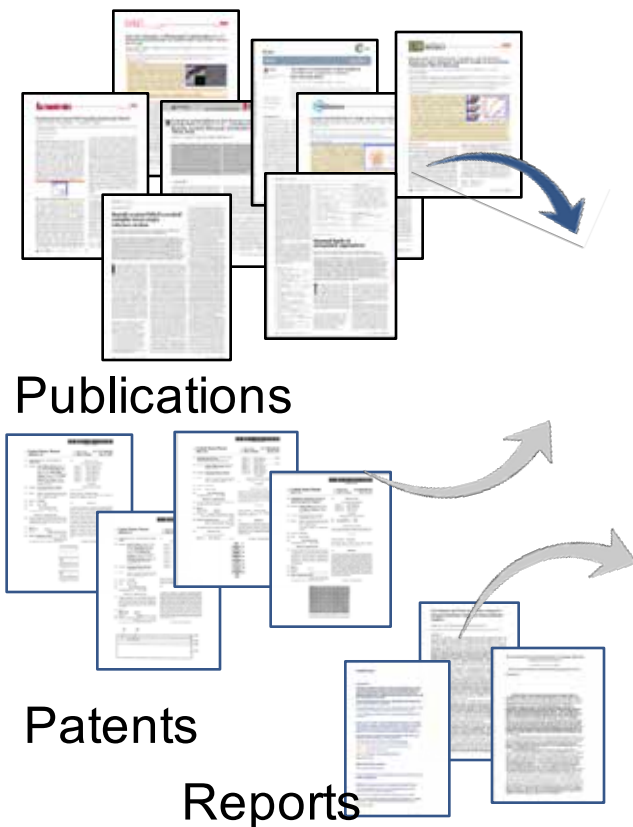
## Input: LARGE datasets



- 17 Labs  $\leftrightarrow$  Circles
- Lab output  $\leftrightarrow$  Circle size
- Lab collaborations  $\leftrightarrow$  Line interconnects
- Number of collaborations  $\leftrightarrow$  Interconnect width

Example: A formative approach for visualizing the DOE science network, to identify, cultivate, and strengthen communities of practice

**Input: LARGE datasets**



- 17 Labs  $\leftrightarrow$  Circles
- Lab output  $\leftrightarrow$  Circle size
- Lab collaborations  $\leftrightarrow$  Line interconnects
- Number of collaborations  $\leftrightarrow$  Interconnect width
- Interconnects draw Labs closer together in space

**Output: Network information**

# Different types of collaborative output can be visualized

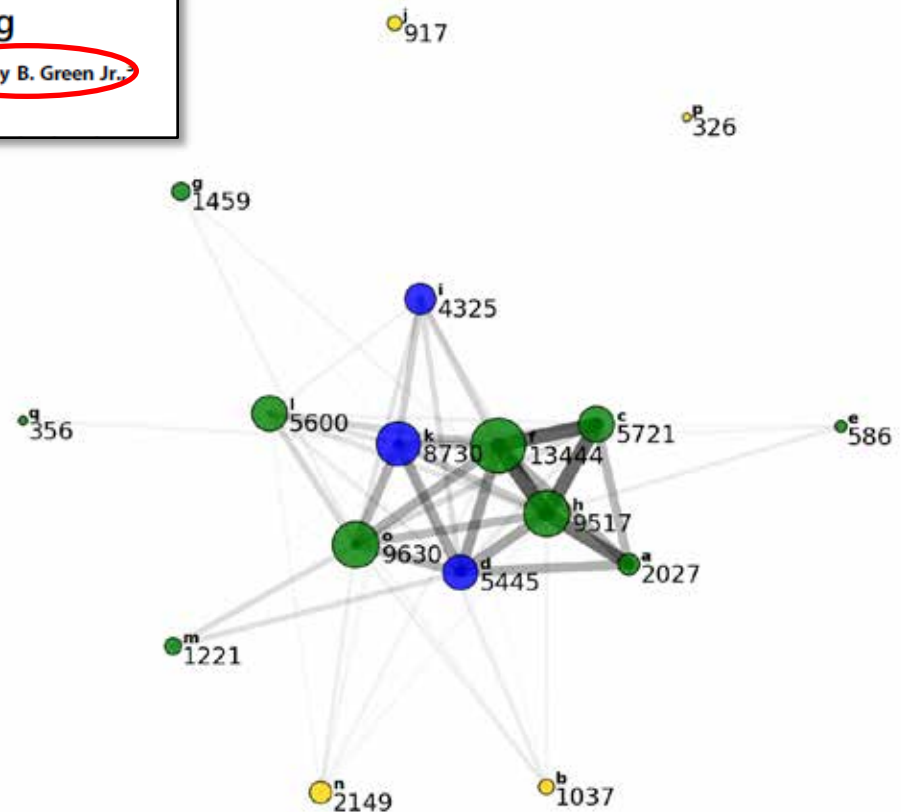
SCIENCE ADVANCES | RESEARCH ARTICLE

ELECTRICAL ENGINEERING

Discovery of true electrochemical reactions for ultrahigh catalyst mass activity in water splitting

Jingke Mo,<sup>1</sup> Zhenye Kang,<sup>1</sup> Scott T. Retterer,<sup>2</sup> David A. Cullen,<sup>2</sup> Todd J. Toop,<sup>2</sup> **Johney B. Green Jr.,<sup>2</sup>** Matthew M. Mench,<sup>4</sup> Feng-Yuan Zhang<sup>1\*</sup>

## Publications



2012-  
osti.gov



Different types of collaborative output can be visualized

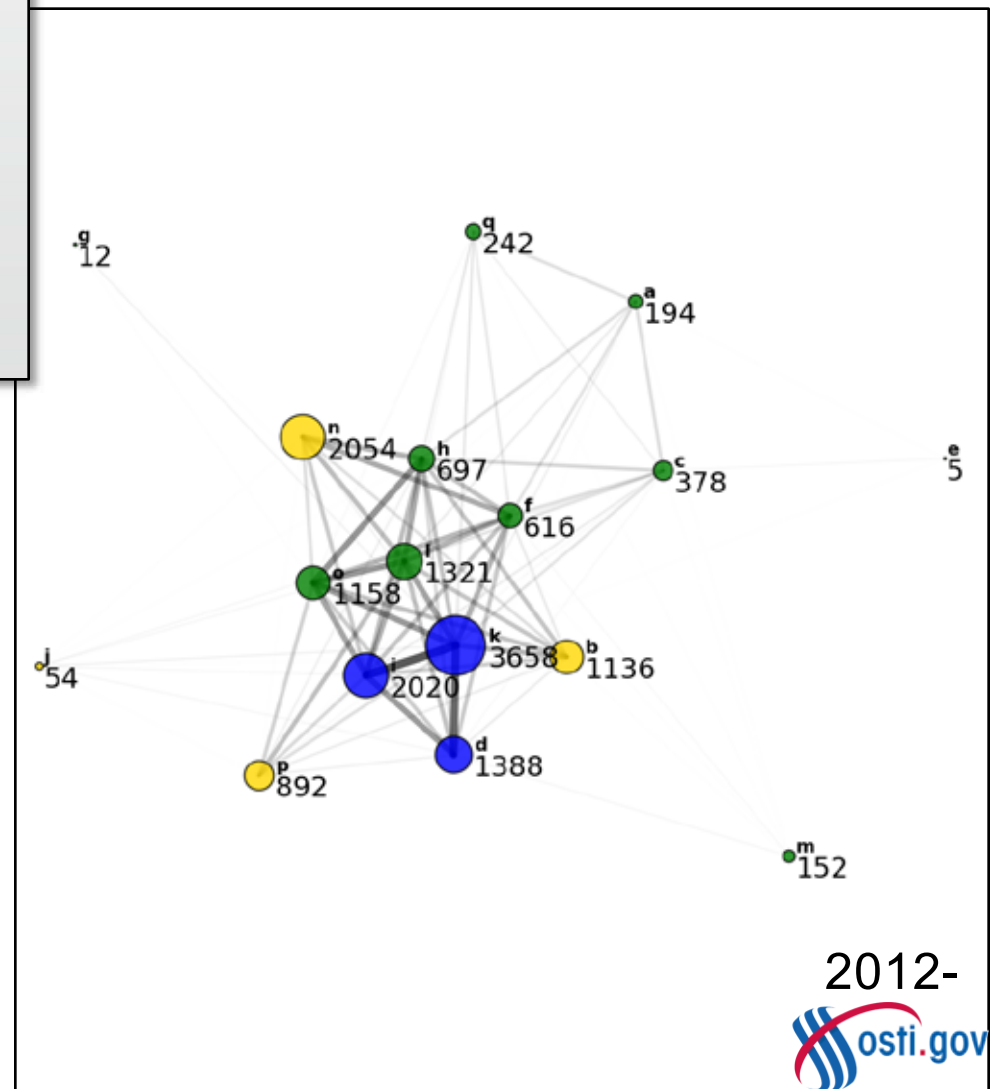
## Iodine Adsorption on Ion-Exchange Resins and Activated Carbons—Batch Testing

September 2014

1 KE Parker  
2 EC Golovich

3 DM Wellman

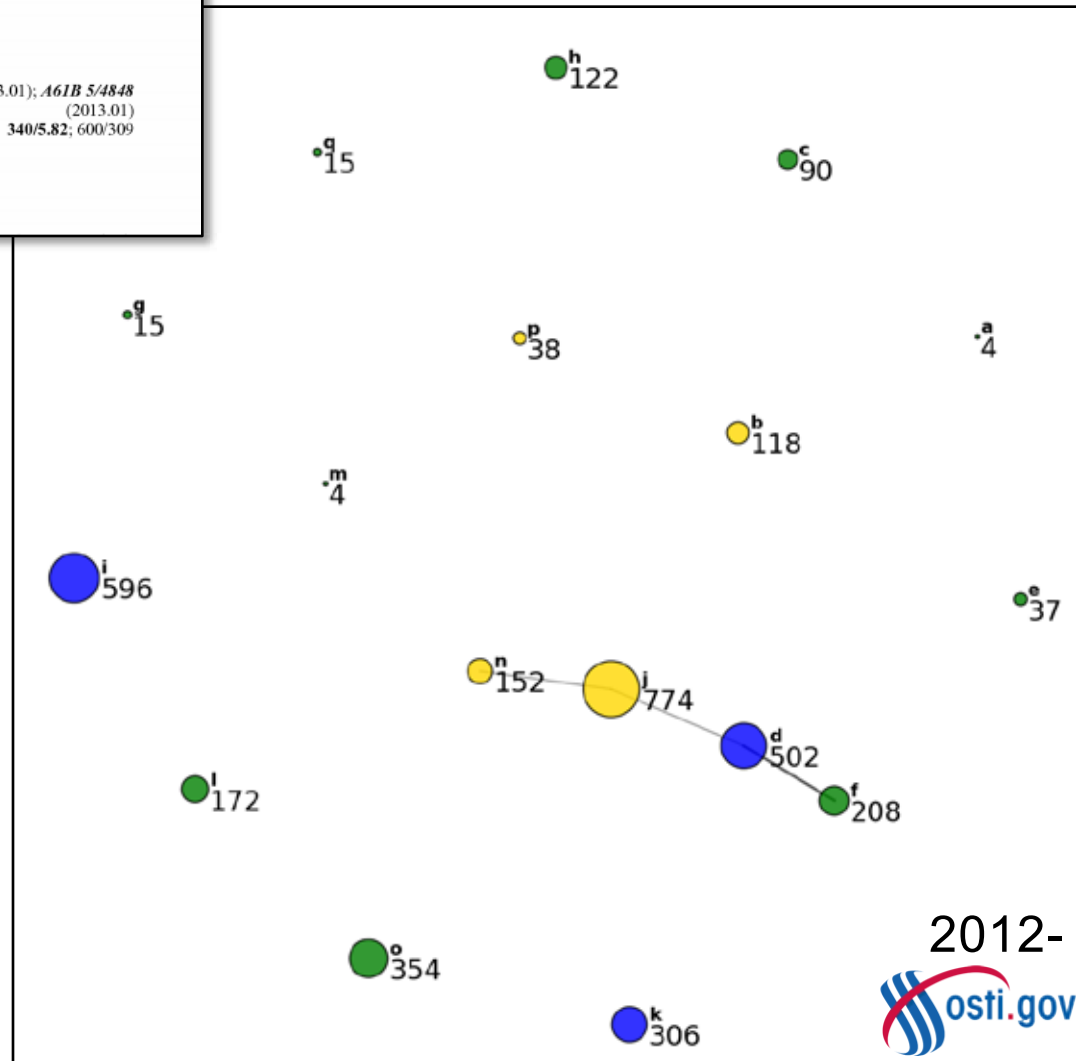
Reports



# Different types of collaborative output can be visualized

(19) <b>United States</b>	
(12) <b>Patent Application Publication</b>	
Leclerc et al.	
(10) <b>Pub. No.:</b> US 2014/0247115 A1	(43) <b>Pub. Date:</b> Sep. 4, 2014
<hr/>	
(54) <b>NANOSTRUCTURE-INITIATOR MASS SPECTROMETRY BIOMETRICS</b>	<b>Publication Classification</b>
(71) Applicant: <b>The Regents of the University of California, (US)</b>	(51) <b>Int. Cl.</b> A61B 5/117 (2006.01) A61B 5/00 (2006.01)
(72) Inventors: <b>Marion Leclerc, Berkeley, CA (US); Benjamin Bowen, Walnut Creek, CA (US); Trent Northen, Walnut Creek, CA (US)</b>	(52) <b>U.S. CL.</b> CPC ..... A61B 5/1172 (2013.01); A61B 5/4848 (2013.01) USPC ..... 340/5.82; 600/309
(73) Assignee: <b>THE REGENTS OF THE UNIVERSITY OF CALIFORNIA, Oakland, CA (US)</b>	(57) <b>ABSTRACT</b>

Patents



2012-  
osti.gov

# Different types of collaborative output can be visualized

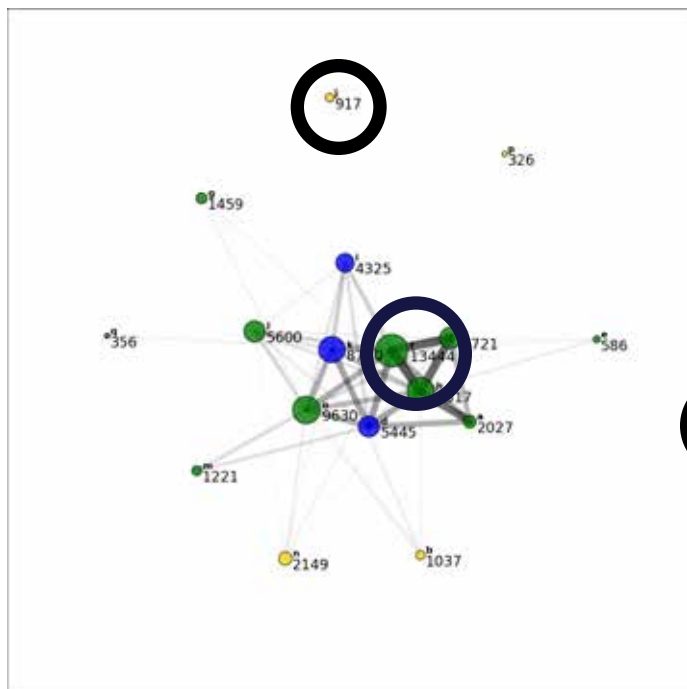
## Publications

SCIENCE ADVANCES | RESEARCH ARTICLE

ELECTRICAL ENGINEERING

Discovery of true electrochemical reactions for ultrahigh catalyst mass activity in water splitting

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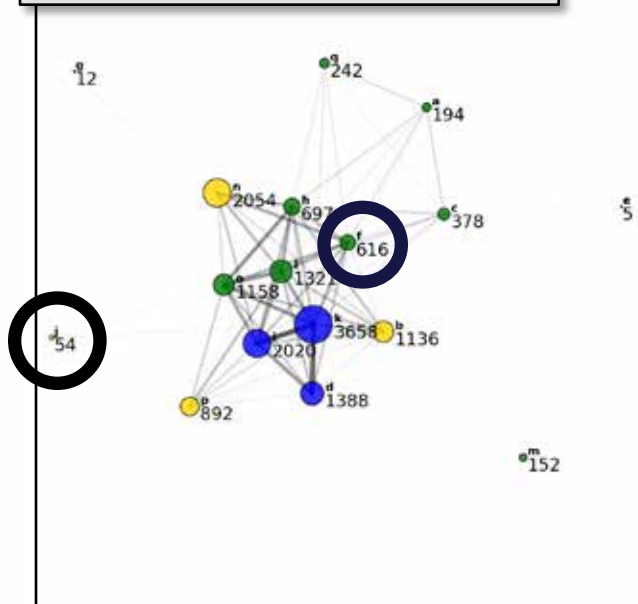
2012-  
osti.gov

## Reports

Iodine Adsorption on Ion-Exchange Resins and Activated Carbons—Batch Testing

September 2014

1 KE Parker  
2 EC Golovich  
**3 DM Wolcott**



2012-  
osti.gov

## Patents

(19) United States  
(12) Patent Application Publication (10) Pub. No.: US 2014/0247115 A1  
Ledere et al. (43) Pub. Date: Sep. 4, 2014

(54) NANOSTRUCTURE-INITIATOR MASS SPECTROMETRY BIOMETRICS

(71) Applicant: The Regents of the University of California, (US)

(72) Inventor: **Marian Ledere**, Berkeley, CA (US); **Trent Northen**, Walnut Creek, CA (US)

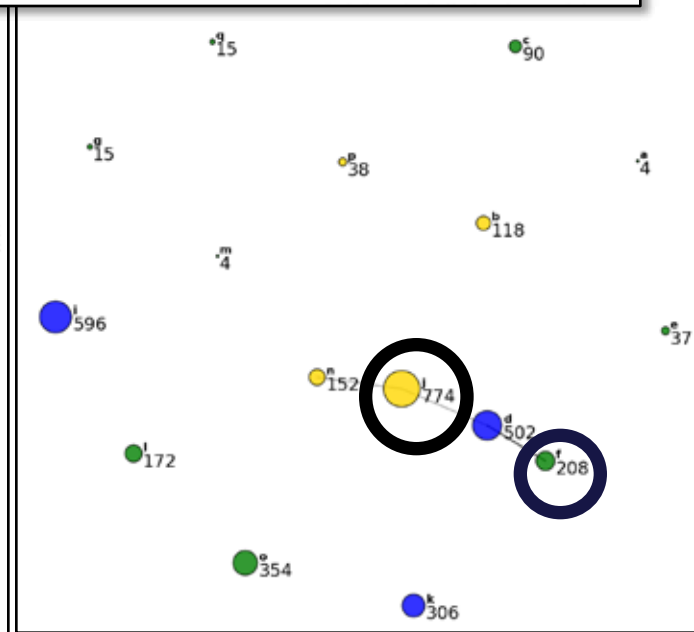
(73) Assignee: THE REGENTS OF THE UNIVERSITY OF CALIFORNIA, Oakland, CA (US)

Publication Classification

(51) Int. Cl. A61B 5/117 (2006.01); A61B 5/00 (2006.01)

(52) U.S. Cl. A61B 5/117 (2013.01); A61B 5/0448 (2013.01)

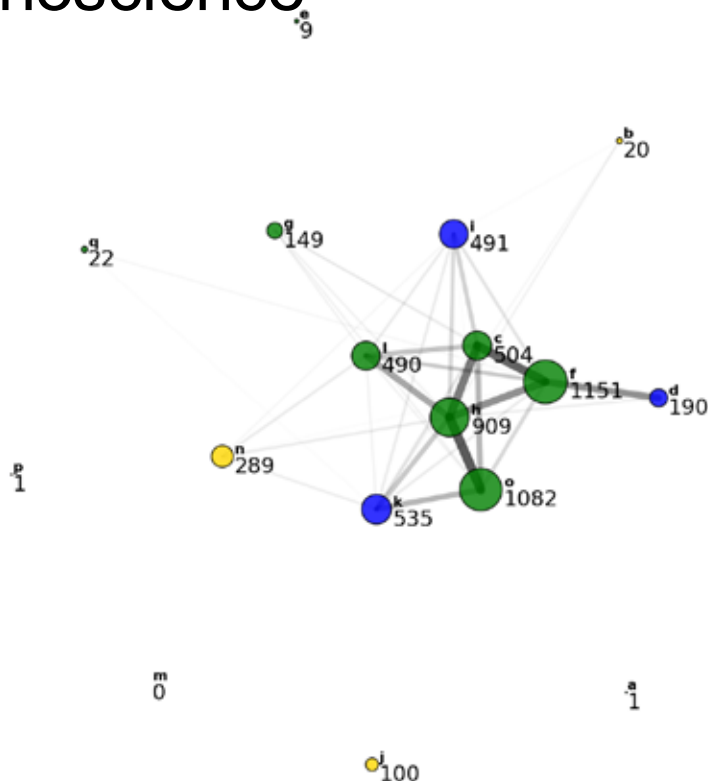
(57) ABSTRACT



2012-  
osti.gov

# Network maps visualize topical communities of practice

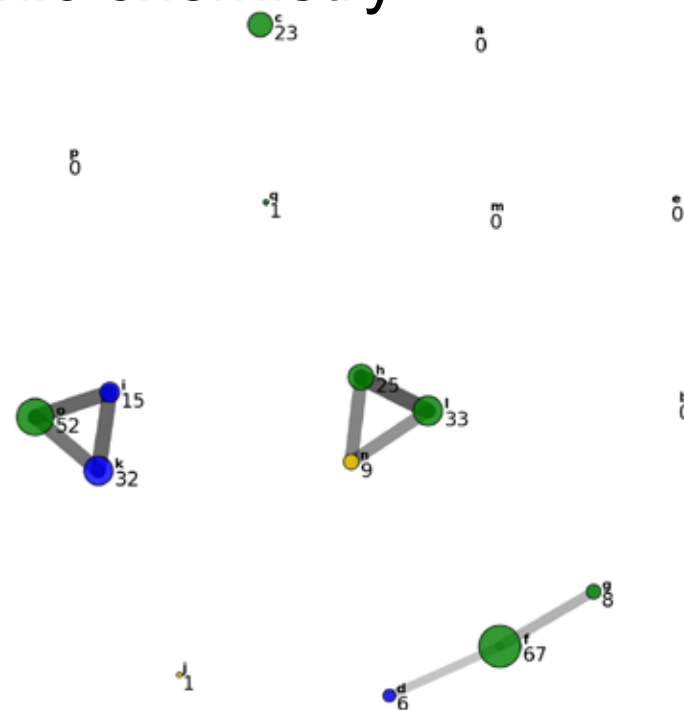
## Nanoscience



- Many Labs
- Large publication numbers
- Highly interconnected

Publications 2011–present

## Organic chemistry



- Fewer Labs
- Smaller publication numbers
- Three multiLab teams; no interactions between them
- “Competition”

Publications 2011–present



# Improving our ability to visualize the DOE science network can assist diverse groups of stakeholders



## DOE Lab scientists

Identify existing networks in topical areas

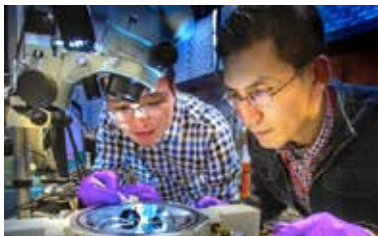
Locate colleagues w/complementary expertise;

Foster new, high-value relationships

Identify potential mentors; career pathways

Plan strategic investments within their groups

Find experts for Red Teams, advisory groups, panels



## Young investigators

## Lab leadership



## Program managers



## External customers

(e.g., industry partners, other agencies, academics)

Locate DOE subject matter experts

# Message

**The Labs can lead in using data analytics to build the best teams for American science primacy**

## Recommendations

- **CLARITI: The Labs, in partnership with OSTI and DOE, should implement modern data analytics to gain more value from existing repositories of technical information**
- Engage knowledgeable subject matter experts (e.g., librarians, Institutional Review Board) for robust, appropriate data handling
- The Labs and DOE should explore new mechanisms for low-barrier cross-Lab seed projects & mini-sabbaticals for Lab scientists
- The Labs should incorporate short-term, cross-Lab assignments into leadership trainings



# We are presenting four “think pieces” that look at four different scales of the labs as a network

## Workforce-of-the-Future

Can we enhance our “DOE Lab Brand”?  
Can we reduce fragmentation of researchers across projects?



## CLARITI

Data-driven tools for identifying teams



## International Partnerships

Can we improve 2-way communication about international opportunities?  
Can we identify a graded set of processes?



## RECAST

Can the labs do more in communities beyond state lines?



# Regional Energy Centers for Adaptation and Sustainable Transition (RECAST)

Utilizing Lab Extensions to Continuously Renew our Energy Services



*Creating Materials & Energy Solutions*  
U.S. DEPARTMENT OF ENERGY



M.A. Jaworski<sup>1</sup>, R. McQueeney<sup>2</sup>,  
T. Northen<sup>3</sup>, D. Schwartz<sup>4</sup>,  
and D. Wellman<sup>5</sup>

<sup>1</sup>Princeton Plasma Physics Laboratory

<sup>2</sup>Ames Laboratory

<sup>3</sup>Lawrence Berkeley National Laboratory

<sup>4</sup>University of Washington

<sup>5</sup>Pacific Northwest National Laboratory

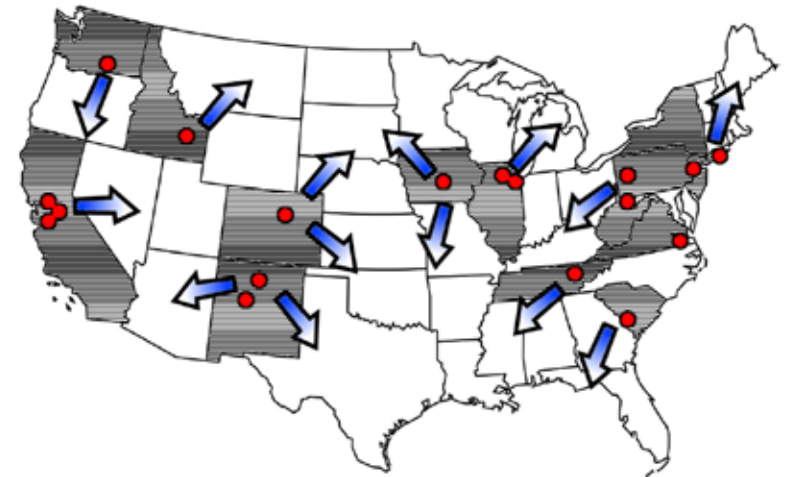
Big Ideas Summit IV;  
Oppenheimer Science and Energy Leadership Program  
March 9-10, 2017  
Washington, DC



# RECAST aims to redefine “Region” to cross our state lines

Key questions covered:

- Why do we need RECAST? **Need among public and businesses.**
- Why multiple offices? **Regional variety.**
- What would they do? **Provide expert analysis on resource utilization.**
- Why isn't this done now? **Need to incentivize regional mindset.**
- How to act on this? **Create prototype office.**





# Labs already demonstrating successes in improved resiliency of energy systems – how can we do more?

- Sandy served as “wake-up call” for need for better planning – responses now being developed
  - Helped launch Grid Modernization
  - Infrastructure Security and Energy Resiliency division
- Many labs already have community relations offices – *we see an opportunity to expand across state lines to have regional influence*
- US economic benefit if adaptation to new conditions (market-driven and environmental) can be planned out
- Need exists for smaller communities and businesses with small margins that cannot make long-range plans

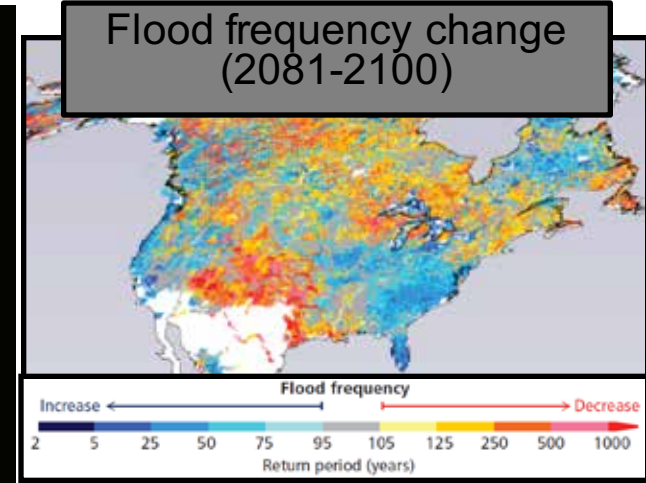
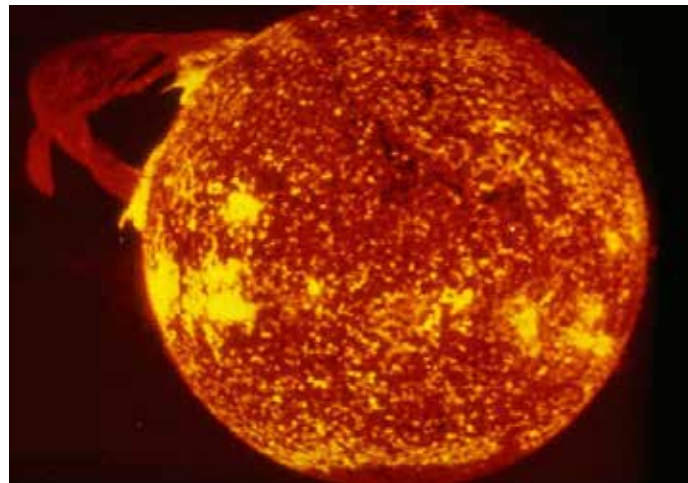


**Alice Hill**  
Fmr. Spec. Asst. to POTUS,  
Sr. Dir. For Resiliency  
Policy

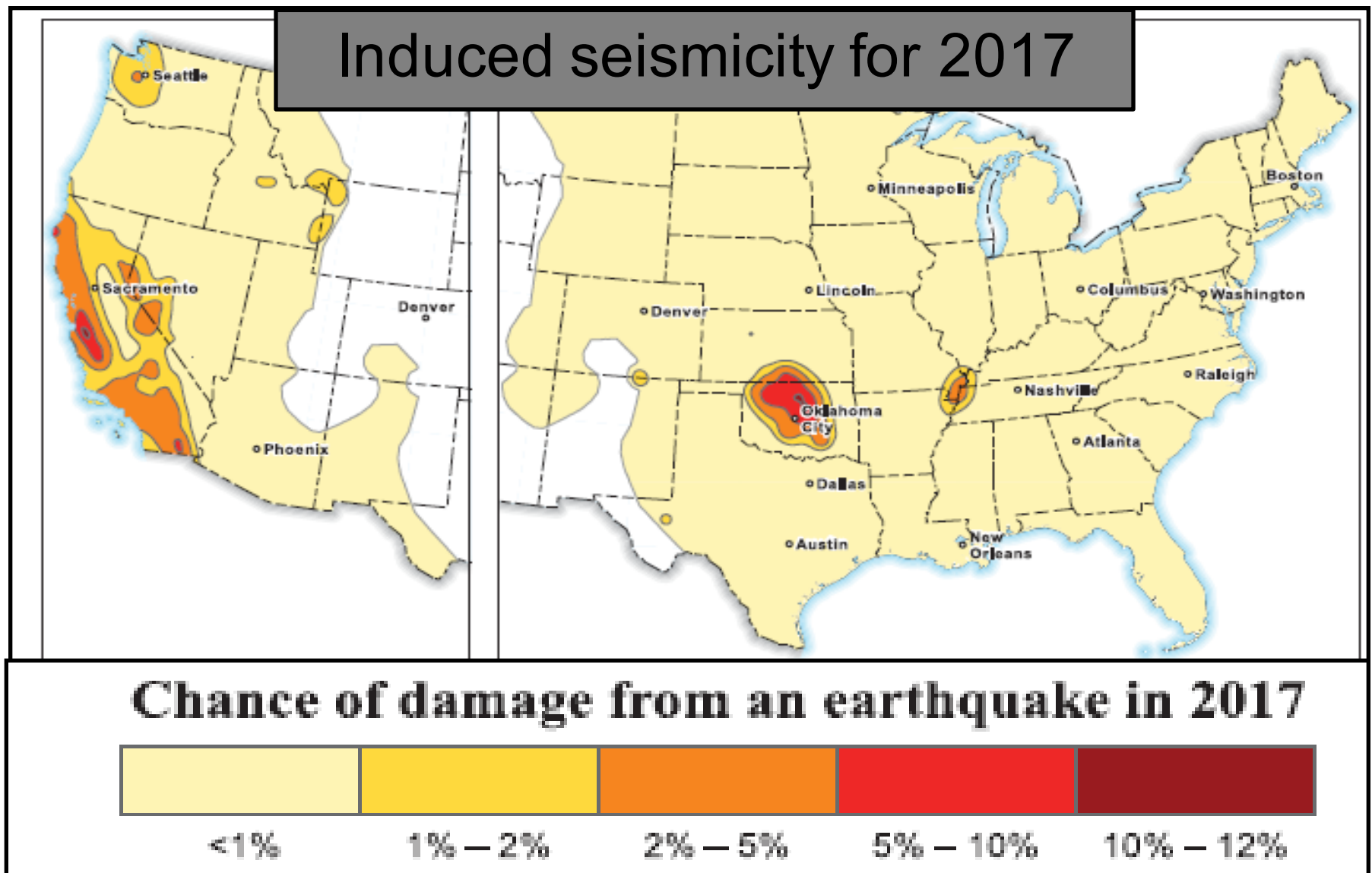


# Grid Modernization already presenting great case examples – why not broaden?

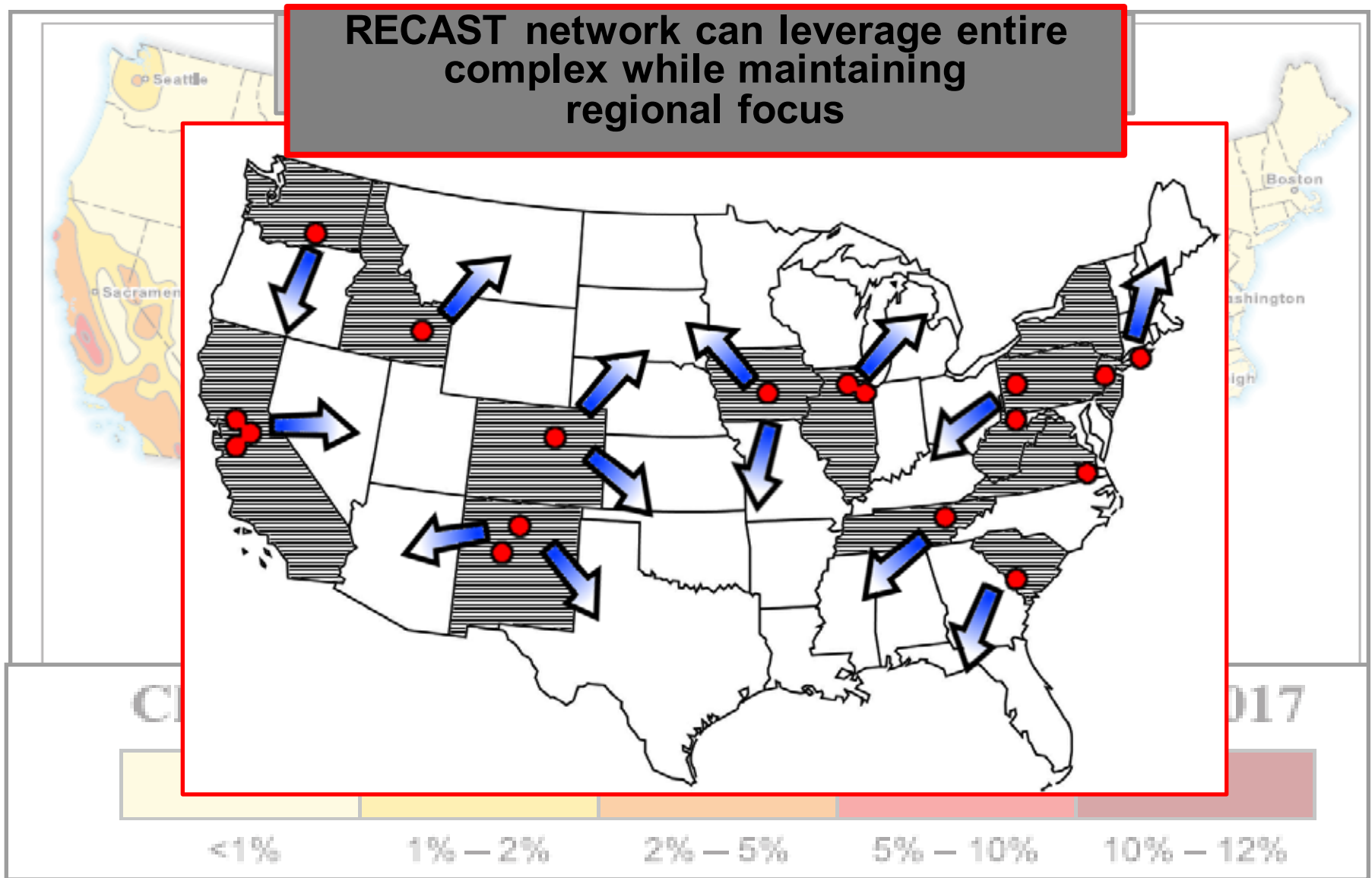
- Laboratories regionally distributed and working on resiliency against acute events (*interagency, intergovernment*)
- “Big-picture” drivers
  - Changing markets, and natural and man-made disruptions
  - Regional variety
- Local points-of-contact can provide gateway to rest of DOE and other agencies



# New energy technologies having significant, localized impacts



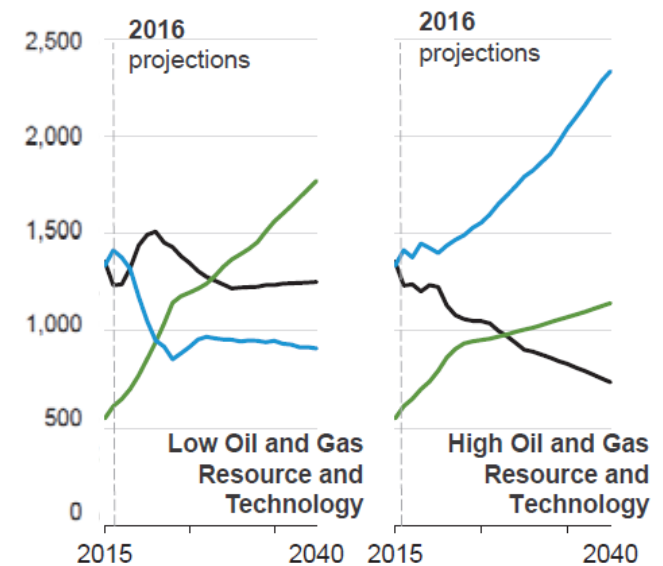
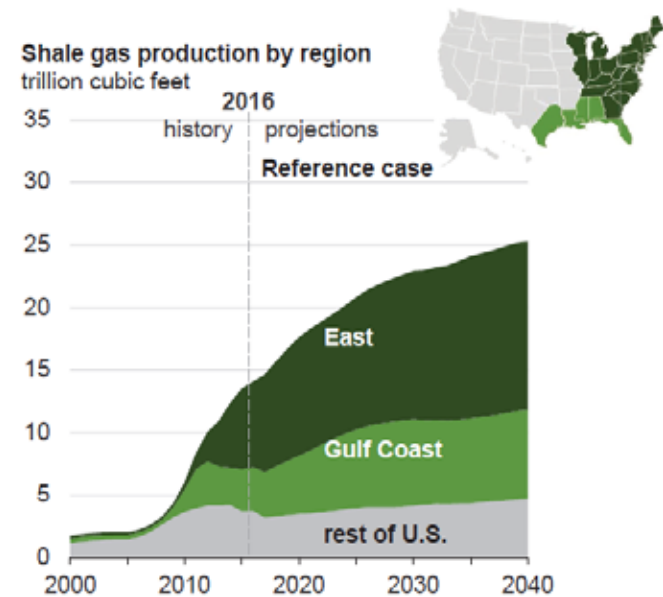
# New energy technologies having significant, localized impacts





# RECAST activities for impacting the region and serving the public

- Distinct activity from R&D – this is more direct impact on region
- Analysis of regional energy mix
  - Susceptibility to supply shocks
  - Planning for improved resource access (e.g. pipeline infrastructure)
- Analysis of current technological developments and trends
  - Potential impact/opportunities for region
  - Advanced planning for evolving industries
- Analysis of natural and man-made disruptions (**chronic & acute**)
  - Provide technical expertise on updated building codes
  - Inform municipal planning and identify at-risk real-estate (e.g. floods, wildfires)





# Incentive to adopt a regional mindset comes by making resource available

- Territorial mindset cited as significant burden
  - Allegheny Conference brought industrial partner for 3-state region
  - *Each RECAST office can bring entire lab network to the table*
- Use existing community relations offices to evolve prototype RECAST office at one or two labs over 1-2 year time-frame
- Compile regional databases of industries, communities and impacts for risk assessments
  - Refine logic for how to divide geography
  - Develop local region's community & industry network
  - Determine relationship with regional innovation hub concept
- Develop inter-lab and inter-agency network to apply to local region on model problem

# We are presenting four “think pieces” that look at four different scales of the labs as a network

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## RECAST

Can the labs do more in communities beyond state lines?



# G<sup>3</sup>

## Going Global is Great



# DOE already recognizes the value of international collaboration

- Many collaborations underway: in many ways with many partners, often driven bottom-up
  - Ranging from personnel exchanges (e.g., light-source users) to shared construction of globally-unique facilities (e.g., LBNF, ITER) to common-goal joined R&D programs (e.g., U.S.-China CERCs)

Table 5-10. FY15 Research Institutes Data by Lab Type

National Lab Type	FY14			FY15		
	Partner \$ In (\$MM)	DOE \$ In (\$MM)	Agreements	Partner \$ In (\$MM)	DOE \$ In (\$MM)	Agreements
Single-Program Science Labs	\$0.1	-	1	\$0.6	-	6
Multi-Program Science Labs	\$2.8	-	13	\$5.6	\$0.3	50
Energy & Environmental Labs	\$1.2	\$0.2	8	\$0.6	\$0.9	17
National Security Labs	\$0.2	-	3	\$0.2	-	13
National Security Production Facilities	\$0.1	-	1	-	-	0
<b>Total</b>	<b>\$4.4</b>	<b>\$0.2</b>	<b>26</b>	<b>\$6.9</b>	<b>\$1.3</b>	<b>86</b>

- DOE Office of International Affairs has worked with State Dept & others for developing high-level international S&T agreements
- International CRADA: great progress to streamline approach

# Both US & international agencies emphasize the increasing need for international collaboration



NSF:

- Office of International Science & Engineering (OISE)



State:

- Cole Donovan, Foreign Affairs Officer @ Office of S&T
- Jonathan Pershing, U.S. Special Envoy for Climate Change



NASA/U.S. Astronomy

- Joel Parriott, ED of AAS
- Brian Dewhurst, NASA HQ



DOE:

- Jon Elkind, Assistant Secretary for the Office of International Affairs
- John LaBarge, Director of Office of Lab Policy at Office of Science
- Helmholtz Association, Germany
  - Prof. Dr. Otmar D. Wiestler, President





# International collaborations require more analysis, consideration, and coordination than ever

- DOE is “special” compared to other agencies b/c of its complex mission
  - Collaboration vs competition
  - Security vs partnership
  - Diplomacy can lead science and science can lead diplomacy
  - Circle of relevant stakeholders is growing/changing all the time
- But issues & opportunities are getting bigger and bigger
  - Sometimes, different labs engage same partner differently
  - Sometimes, different programs view similar technologies differently
  - Sometimes, one partner crosses multiple programs
  - Sometimes, same partner views different labs differently
- ...notwithstanding the complex landscape for visas and immigration

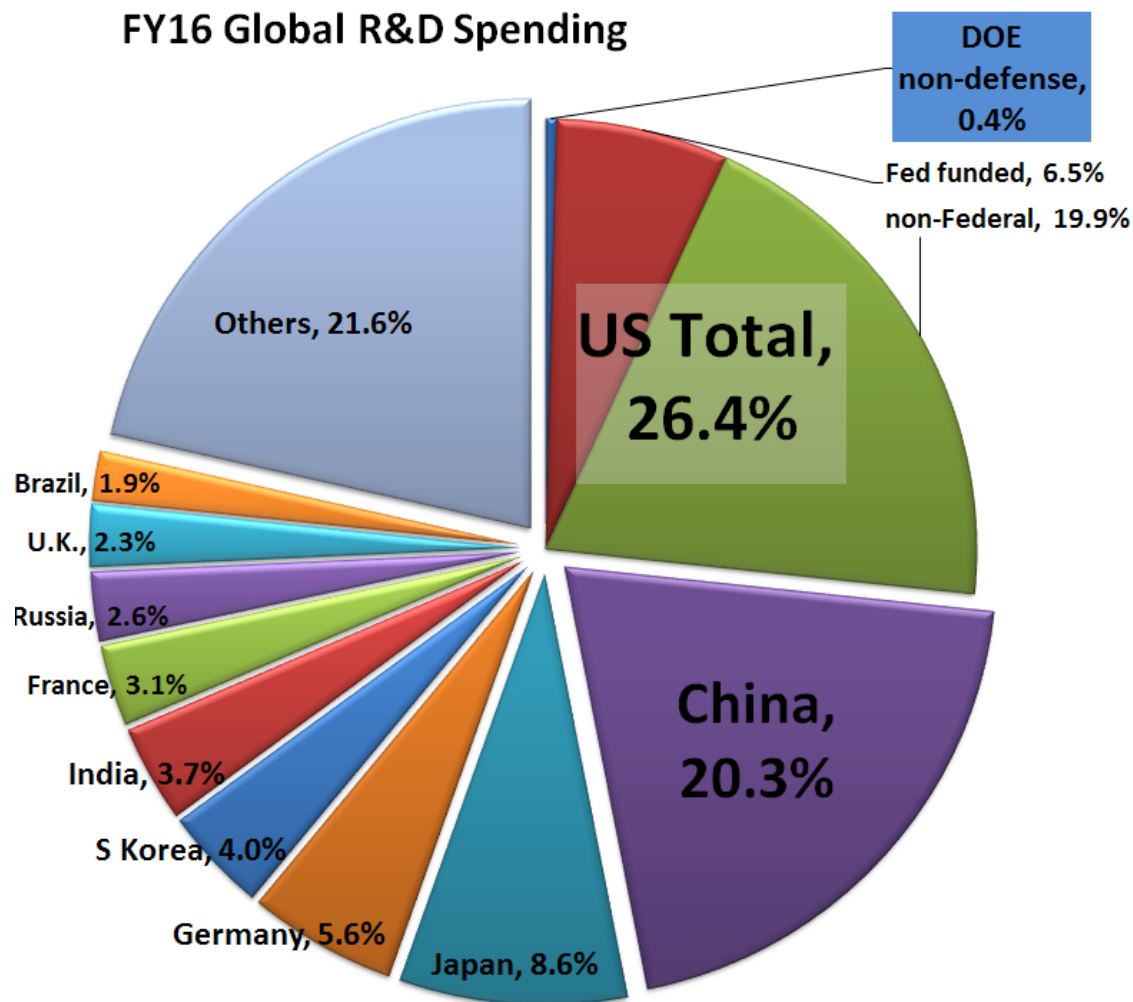
# Two-way, steady communication between Labs and HQ about engagement strategies is crucial

- International strategy is not easy
  - But uncertainty about whether and how to engage internationally distracts from the mission
  - In some cases, has a chilling effect and even dissuades talent from joining DOE labs
- We suggest a new level of two-way communication between labs and DOE to systematically and consistently develop the right international partnerships for each mission
  - Early disclosure, two-way conversation, clear decisions, and relevant feedback are important elements

# Complex context & multiple stakeholders require careful deliberation

- A comprehensive approach needs to be graded
  - Considerations include: TRL, criticality to DOE mission, track record, American security, geopolitics, and/or workforce-development
  - Pre-competitive technologies: encourage collab, share resources, mitigate tech surprise
  - Competitive technologies: choose partners in advance, emphasize collective advantage
  - Deployable technologies: all about economic security and national/defense security; be very selective, coordinate with other agencies
- For low TRL, annual-lab planning process can be used to identify and discuss key international partnerships needed to advance mission elements each year

# Successful strategies allow DOE to lead global scientific excellence even as the international footprint expands



- Labs as Tier-1 partners
- Workforce values global impact
- Intelligence on future global-research direction
- Leverage domestic investment
- Trust is hard. Remain a reliable, constant partner

# G<sup>2</sup>E

## Going Global is Essential





# We are presenting four “think pieces” that look at four different scales of the labs as a network

## Workforce-of-the-Future

Can we enhance our “DOE Lab Brand”?  
Can we reduce fragmentation of researchers across projects?



## CLARITI

Data-driven tools for identifying teams



## International Partnerships

Can we improve 2-way communication about international opportunities?  
Can we identify a graded set of processes?



## RECAST

Can the labs do more in communities beyond state lines?



# We end our presentation with some individual reflections on the impact of this program



# Daniel Sinars

## Sandia National Laboratories



An engineer at Google-X explained that he went to work there because he realized 'it takes a billion dollars of capital to do anything worthwhile.' My immediate reaction was that collectively the DOE network works with billions of dollars annually and we do amazing and worthwhile things every day!



# Amy Marschilok

## Stony Brook University



We have seen awesome facilities and heard about transformative science through this program. What has made this journey so special is the remarkable people who have shared their insight along the way.

# Mike Willardson Stanford University



As a relatively new member of the national lab system, this program has been an invaluable and accelerated indoctrination to the scope and complexity of the labs. Despite that complexity, this program has taught me that I, as an individual, have the opportunity and the ability to affect the system in positive ways.



# Daniel Schwartz

## University of Washington



I was awed by the scale of scientific and engineering challenges the DOE labs can tackle on behalf of the nation's security and prosperity. My past DOE experiences have been much like the parable of the blind man who touches a small part of the elephant and never comprehends its enormity.

# Johney Green

## National Renewable Energy Laboratory



Even though I had visited several of the National Labs in the past, I did not have a full appreciation for the breadth of capabilities across the complex. This program has helped me gain a deeper understanding of the different missions of the Labs and has broadened my perspective on the different research models and strategies that can be used to successfully advance those missions.

# Lia Meringa

## Stanford Linear Accelerator Center



Over the past year, the diverse and compelling mission of the DOE unfolded in front of our eyes, through stories told by a brilliant, deeply knowledgeable and passionate workforce, and through visits to best-in-the-world facilities with cutting edge infrastructure, all poised to transform science and the world we live in. I have been amazed and inspired, and deeply grateful for this experience.



# Howard Yuh

## Princeton Plasma Physics Laboratory



DOE's mission is embodied in its National Labs where science and technology is born. When united under a critical mission, provided sufficient resources, and led with visionary leaders, the ingenuity, talent, and experience I've seen at the National Labs can truly make our nation safer and more prosperous.

# Charles Black

## Brookhaven National Laboratory



I was struck by the pervasive sense of service and purpose running throughout the Labs, the DOE, and the government. This year we met so many intelligent, highly accomplished, and extremely capable people who are dedicated to serving our country and the world. I found it very inspiring.



# Dawn Wellman

## Pacific Northwest National Laboratory



This program provided an outstanding forum to gain a broad understanding of the vastly different strategic approaches and execution models that each laboratory uses, the underlying drivers, and an identify synergies and opportunities for improvement within the laboratory network through best practices. Additionally, having worked extensively with the larger, multipurpose laboratories across the complex, this program greatly improved my awareness and understanding of the value the smaller laboratories within the complex bring to the mission. The knowledge we have gained through this program is invaluable for our group of emerging leaders and our ability to help move the complex forward and address the nation's challenges.

# Rob McQueeney

## Ames Laboratory & Iowa State University



Even though I spent most of my career in the DOE lab system, I walked away with a greater appreciation for the integration of Labs, government, and industry, as well as a newfound inspiration for the DOE mission. My view of what is possible has expanded tremendously.

# Nancy Haegel

## National Renewable Energy Laboratory



A growing network of emerging leaders, connected by trust and shared experience, will be a great resource to the labs, DOE and the nation. This network will serve us well in reaching across boundaries to solve problems and generate exciting and compelling directions for the future. Thanks for this opportunity and I look forward to doing my part.



# Trent Northen

## Lawrence Berkeley National Laboratory



I was struck by the breadth of positive impact that the National Lab System has on the national security and the scientific, technical and economic competitiveness of the United States. I was extremely impressed by the outstanding leadership, deep commitment, and best-in-the-world facilities throughout the system and feel proud to be part of the Lab system.

# Mike Jaworski

## Princeton Plasma Physics Laboratory



Participation in this group has been both inspirational and challenging. The leadership within DOE, the national labs, and in other federal agencies have been incredibly generous with their time and all exhibit a dedication to service that is inspiring. It is a challenge to follow in these footsteps with the same dedication.



# Timothy Meyer

## Fermi National Accelerator Laboratory



The creation of this program was an inspiration and a message: DOE leadership investing in the labs and the future, and the program itself has been even more powerful for me because of the pervasive and personal commitment to excellence, integrity, and public service in everyone we've met.

# We look forward to the continuity of this program, and to continuing to build up a network of leaders



# Extras



# Our think pieces were influenced by both **who we are** and where we visited



# Our think pieces were influenced by both **who we are** and **where we visited**





**Our think pieces were influenced by both  
who we are and where we visited**



# We are presenting four “think pieces” that look at different aspects of the labs as a network

**Workforce-of-the-Future:** Building the Lab Brand and career opportunities to recruit the best



**International** partnerships that attract and connect world-wide talent and resources



**CLARITI:** Connecting lab scientists and expertise throughout the lab network



**RECAST:** Bringing to bear the collective expertise and resources of the Lab system to address regional issues

