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policy matters

california senate OFFICE OF RESEARCH

OPTIMIZING PUBLIC BENEFITS FROM STATE-FUNDED RESEARCH

At the request of Senator Bob Wieckowski, chair of the Senate Budget and Fiscal Review Subcommittee 2 on Resources, Environmental Protection, Energy, and Transportation, we investigated ways to optimize public benefits of state-funded research by performing a literature review and interviewing 42 research scientists and administrative leaders from 21 institutions, both public and private. Although we primarily focused on energy-related research, our conclusions are universally instructive for state-funded research, regardless of scientific discipline.

Our investigation led us to two main findings:

- ***There are nine key principles to consider when designing, assessing, or reconfiguring state-funded research programs to optimize public benefits.*** Figure 1 below lists the key principles, which are discussed in more detail later.
- ***There are three basic components necessary to achieve optimal research program performance: (1) legislative program goals, (2) an impartial expert advisory council, and (3) a program administrator.*** Optimal research program administration requires unique structure, culture, personnel, and supporting services specifically oriented to support research granting programs. We found that certain existing entities in the state are well-suited to administer and guide state-funded research programs to ensure the key principles are implemented.

Appendix A includes a more detailed analysis of research contracting and intellectual property management, two complex issues that can significantly impact public benefits from state-funded research. *Appendix B* lists all interviewees.

FIGURE 1
Key Principles for Research Programs

- Clearly defined research goals and objectives
- Impartial expert guidance
- Adaptability and flexibility
- Efficient granting
- Intellectual property stewardship
- Review and assessment
- Marketing and outreach
- Cross-agency coordination and collaboration
- Skilled workforce and economic development

FIGURE 2
Public Benefits of Research

BACKGROUND

Decades of study on the design and implementation of research programs have provided a body of evidence that identifies certain concepts and practices as beneficial for driving scientific progress and optimizing public research investment for the greatest public benefits. Figure 2 above illustrates the many types of public benefits of research, including technological breakthroughs, new firms and economic growth, and a skilled workforce.

Scientific research takes many forms and is categorized by how immediately relevant its results are for societal needs. The types of research are labeled basic, applied, development, and demonstration, as depicted in Figure 3 on the following page. Basic research is conducted in pursuit of new knowledge of nature and its laws, such as Einstein's theory of general relativity. Applied research seeks to solve practical problems using basic research findings, such as utilizing Einstein's theory of general relativity to establish the global positioning system (GPS). Research development refers to creating or improving procedures and products, such as deploying a network of satellites to make applied research on GPS technologically accessible. Demonstration research sits at the interface of science, the economy, and policy to test and measure the effects of research development in real-world conditions.

Although immediate societal relevancy is an attractive choice for publicly funded research programs, basic research historically has yielded the largest economic returns on public investment, ranging from 20 percent to 50 percent.[1] The research literature also shows that basic research results in greater potential for societal and policy impact over time.[2] For example, NASA developed an instrument intended for basic Earth sciences research that has been applied to monitoring the Aliso Canyon methane leak[3] and, most recently, invasive species in the Sacramento–San Joaquin Delta ecosystem.[4]

FIGURE 3
Types of Research

The technique arose from basic research and is proving a powerful tool in addressing California's emerging natural resource challenges.

State agencies utilize research in several ways in pursuit of an agency's mission. State-funded research can be classified into two broad categories: "internal," when the research is conducted in-house by agency staff, or "external," when the agency uses contracts, grants, or cooperative agreements to transfer funds to external organizations in exchange for services or product development. External research can be further classified as having either direct agency benefits or broad public purpose benefits, depending on the primary motivation for conducting the research. External research with direct agency benefits includes projects that acquire property or services necessary for the agency to meet its specified mission. As an example, the State Water Resources Control Board regularly contracts with the U.S. Geological Survey to collect data on ambient levels of groundwater contaminants over extended time frames to inform its regulatory mission. In comparison, the intent of broad public purpose research is to foster new scientific and technological advances for the public benefit. Many state agencies conducting external research facilitate both direct and public purpose types of projects. This report focuses exclusively on optimizing the public benefits from state-funded external broad public purpose research.

KEY PRINCIPLES FOR OPTIMIZING RESEARCH PROGRAMS

We assessed the literature and interviewed leading researchers and research institute administrators to form nine key principles to guide the creation, assessment, or reconfiguration of state research programs. In addition to good governance principles that apply to all state programs, such as transparency, accountability, and oversight, we found the nine principles are essential for research programs to optimize public benefits. We recommend each principle be addressed in the authorizing legislation for research programs and given funding to ensure its implementation.

Clearly Defined Research Goals and Objectives

Research outcomes specifically follow program goals and objectives, so it is critical to develop clear goals and precise objectives for all levels of the research program structure. This includes outlining legislative program goals and facilitating independent experts to specify objectives for each research goal. Of all the key principles, this aspect of research program administration overwhelmingly was prioritized by published studies and interviewees. Evidence shows research programs that fail to clearly articulate their intended objectives fail to generate outcomes aligned with the higher-level goals of the program.[5] Conversely, overly prescriptive goals and objectives can risk limiting innovative approaches and new directions in response to discoveries.

This principle exists to avoid mismatches between the research that society requires and program results that can occur without sufficient or appropriate direction. By clearly articulating the research goals and objectives of a program, the Legislature also will help ensure its intentions are implemented.

Impartial Expert Guidance

To ensure funding is allocated free from special interest bias, non-conflicted experts should be carefully recruited to serve an advisory role in steering research content, direction, and review. Similar to the clearly defined goals and objectives key principle, impartial expert guidance was a priority throughout our analysis.[6] Although the structure and framework for expert guidance differ across research programs, all of our interviewees agreed engaging experts is a key criterion for guiding a program. We discuss the structure and role of independently selecting experts to guide a research program in more detail later.

Adaptability and Flexibility

As research goals and strategies are modified to better serve a changing society, mechanisms should be in place to allow for adaptability in directing and managing research programs, funding, and specific objectives. Indeed, a certain level of autonomy and independence in guiding and implementing the research program is critical to allow research programs to adapt to changing research landscapes, societal needs, and opportunities. For example, the California Breast Cancer Research Program maintains the flexibility to shift focus from basic to more applied research and development (R&D) as needed to more nimbly address the multifaceted medical challenges of Californians.[7] Likewise, the national Howard Hughes Medical Institute has advanced its impact by supporting the adaptability of high-risk projects and elongating grant periods.[8] To maximize the state's investment in research, publicly funded programs should have the flexibility to support all levels of research, from basic to demonstration, to most effectively meet high-level, long-term program goals.

Efficient Granting

To ensure state-funded research programs attract strong talent and fully utilize California's research facilities, granting agreements need efficient, flexible, accessible processes. Inconsistent and unnecessarily complex research granting discourages some of the best research talent from applying for state grants. In addition, opportunities for federal fund-matching depend on granting practices that align with federal programs, and funding schemes should be designed for long-term and adaptable research projects. At the national level, Congress has authorized some research agencies with unique authority to bypass typical governmental contracting regulations, allowing additional flexibility to develop agreements tailored to the project and its participants.[9] Many assessments credit this flexibility as a pivotal contributor to programs' records of successful innovation.[10] A more detailed analysis of research granting and contracting is found in *Appendix A.*

Intellectual Property Stewardship

To promote public benefits from research output, while at the same time creating incentives for additional private-sector and federal investment to develop and commercialize new products, intellectual property (IP) must be managed effectively and consistently. Studies show designing effective and consistent policies for managing IP is one of the best tools the state has available to encourage the progression of knowledge from ideas to products, which bolsters the public benefits of research activities.[11] Risk is inherently involved in translating novel ideas to marketable products, and limitations posed by ineffective or conflicting policies can significantly inhibit the development of new products and services.[12] A more detailed analysis of IP stewardship is found in *Appendix A*.

Review and Assessment

Regular reviews at all levels of a research program serve to confirm effectiveness and inform future decision-making. Periodic evaluations can reduce unproductive expenditures from poorly informed research design and implementation, saving resources and upholding high-quality research practices.[13] Performance should be measured against the goals and objectives of the research program, whether the results advance novel understandings or offer applied solutions to societal problems. No single model will apply to all contexts, so evaluations may be based on a range of merits, from academic excellence to policy, industry, and public relevance.[14] Numerous promising frameworks have been developed for this purpose, including automated programs that reduce administrative burdens.[15]

Marketing and Outreach

Research programs have shown greater public benefits when (1) study results are made freely available through open-access publishing,[16] (2) data collected from research activities are compiled and maintained in online databases for public use and review, (3) funding opportunities are widely advertised to attract proposals from diverse teams, (4) research findings are summarized and shared in lay terms for public understanding, and (5) networking is encouraged among researchers, as well as with the public.[17]

Among the most common critiques of national-level research programs is a call for further investment in efforts to publicize results. Some federal agencies have established offices that work exclusively to ensure the results of research activities are identified, disseminated, and preserved through guidance and hands-on support. One example is the U.S. Department of Energy (DOE) Scientific and Technical Information Program, which is a collaboration of all DOE labs and research programs.

Cross-Agency Coordination and Collaboration

Research programs managed by a single agency without consultation with other entities risk redundancy and gross inefficiency. Program administrators and researchers should be encouraged to foster broad, flexible engagements with numerous public- and private-sector actors. Studies confirm that research breakthroughs and leveraging of funds are more likely to arise from successful collaboration.[18] Cooperation among leading agencies also would prevent duplication of research funding efforts and combine unique expertise and perspectives. At the national level, high-performing agencies such as the Advanced Research Projects Agency–Energy (ARPA–E) are designed to coordinate with other agencies to support external funding of creative and high-risk research.[19]

Skilled Workforce and Economic Development

Skilled workforce and economic development research funding should be flexible among material support, student and personnel training, and regional capacity-building to sustainably propel the research results forward. Economic benefits and knowledge transfer from research are enhanced by a more informed and diverse workforce and in geographic areas with concentrated academic research activity.[20]

Companies depend on publicly funded research as a source of novel ideas and technological knowledge.[21] For programs that intend to support applied R&D closer in proximity to marketable products and services, analyses have shown that regional capacity building improves firm productivity and regional economic development.[22] Applied research programs that utilize technology clusters made up of numerous stakeholders tend to foster regional economic growth, resilience, and vitality by improving research output and rapidly bringing new products and services to market.

RESEARCH GRANTING PROGRAM STRUCTURE

Distinct entities are required to assume different roles and responsibilities to ensure the key principles are incorporated into a successful research granting program. Figure 4 below lays out the three basic components necessary to achieve optimal research program performance: (1) legislative program goals, (2) an impartial expert advisory council, and (3) a program administrator. Figure 4 also shows some key characteristics of the research program advisory council and administrator.

The foundation of establishing an optimal research granting program starts with the Legislature declaring its high-level goals and priorities. These goals provide the fundamental direction and mission that permeates the full research program timeline. The following sections discuss the details of implementing an expert advisory council and program administrator.

FIGURE 4
Three Basic Components of a Research Granting Program

LEGISLATIVE RESEARCH PROGRAM GOALS

EXPERT ADVISORY COUNCIL

- Independently selected and required to be impartial and expert
- Provides direction and guidance for program administration
- Articulates legislative goals into specific objectives
- Retains fidelity of legislative intent

PROGRAM ADMINISTRATOR

- Implements research granting program to fulfill legislative goals
- Follows advice and guidance from advisory council
- Articulates specific project-level objectives in research grant solicitations clearly linked to the legislative goals

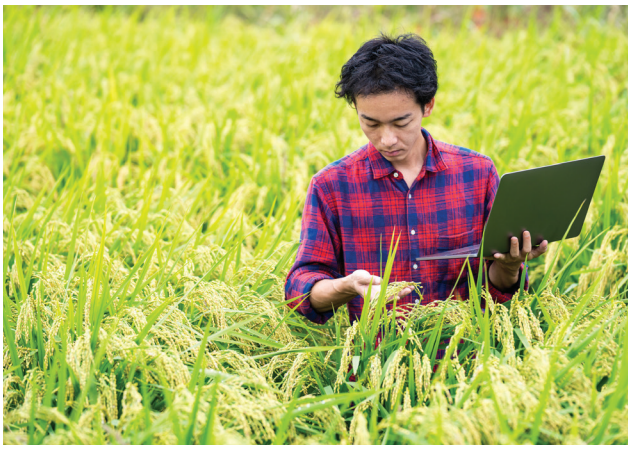
Expert Advisory Council

To carry out the legislative goals of a research granting program and ensure the key principles are implemented, it is essential to recruit impartial experts to guide program administration. In general, the role of a research program advisory council should be to offer advice and recommendations on policy and program implementation and development. Specifically, an expert advisory council should articulate specific program objectives, review funding models, ensure a competitive project selection process, and conduct periodic regular reviews for goal alignment.

Using technical experts to keep pace with the changing landscape of cutting-edge scientific fields is critical to directing public funds toward research areas with the largest impact potential. The council should be flexible and adaptable to meet changing conditions and be allowed to target all types of research, from basic to demonstration, in pursuit of maximum public benefits.

The selection process to fill an expert advisory council needs to be as independent and rigorous as possible. The selection process utilized by the National Academies of Sciences, Engineering, and Medicine (NAS) is widely considered to be among the most robust and transparent in preventing conflicts of interest and adequately selecting for appropriate expertise.[23] More relevant to California and modeled after NAS, the California Council on Science and Technology (CCST) is a nonpartisan, nonprofit organization established via the Legislature to provide independent and objective scientific advice on policy issues from the best scientists and research institutions in California and beyond. When selecting committee advisers, CCST initially screens recognized leading experts from diverse disciplines and backgrounds. Nominees are further assessed by an oversight committee for final approval after a thorough balanced viewpoint and conflict-of-interest evaluation.

It is likely most efficient to house any advisory council in the administrative entity implementing the research granting program, although the research program administrator should be required to choose council members from a list recommended by an independent entity such as CCST. For example,



CCST could provide a list of three experts for each open seat on the advisory council. This allows the program administrator discretion to choose an independently selected adviser who fits well with the program and also allows the advisory council to use the program's administrative resources to conduct its work.

Program Administrator

Optimal research program administration requires unique structure, culture, personnel, and supporting services specifically oriented to support public purpose research granting programs. Supporting services must be tailored for the research program, including legal services, information technology, IP management, marketing, external peer review, and workforce development, among others. Federal models of lean, ambitious research programs emphasize the importance of flexibility and autonomy in promoting an environment of innovative thinking and risk-taking. Additionally, research program managers require unique skills that bridge the spectrum from expert-level technical scientific backgrounds to demonstrated leadership in program development, peer review, and scientific project management at the level of experimental design and guidance.

In general, the following aspects of research grants administration should be considered when creating, assessing, or reconfiguring state-funded research programs to ensure the key principles are met and public benefits are optimized.

> ***Technical expertise.*** One key aspect of successful research administration is hiring

program managers and officers who have demonstrated expert-level technical and scientific backgrounds and who maintain an active relationship with the research community. Managers administering state research programs require extensive field-specific and specialized skills.

- ***Agency culture.*** To drive an innovative and risk-taking research granting program, research administration requires a certain level of autonomy and independence.
- ***Support offices.*** Successful research granting programs rely heavily on support offices specialized at meeting the unique needs of a research grants program. Achieving many of the key principles is largely dependent on support offices dedicated to those endeavors, such as having designated offices for marketing and outreach, as well as workforce and economic development.

Principles in Practice

One exemplary model of research administration is ARPA–E, a federal program designed to foster scientific breakthroughs. Authorized in 2007 by Congress, ARPA–E is an independent agency within DOE empowered to operate outside many of the standard federal administrative procedures.[24] Unique among public research agencies, ARPA–E is exempt from some federal laws to allow for efficient contracting and competitive staff recruitment. Program directors also are given extensive authority to design, assess, revise, and guide research projects. Characterized by institutional independence and a flat organizational structure, ARPA–E maintains a streamlined and efficient administrative structure by relying on DOE to provide many of its supporting resources. DOE's mission is to address America's " . . . energy, environmental and nuclear challenges through transformative science and technology solutions," and much of ARPA–E's success is due to having DOE's supporting resources and institutional culture. According to NAS, ARPA–E is among the most agile, efficient, and effective federal research agencies.[25]

At the state level, the University of California (UC) system has been managing research granting programs since the 1940s.[26] The UC Research Grants Program Office (RGPO) administers three state research granting programs on behalf of the state: the California Breast Cancer Research Program, the Tobacco-Related Disease Research Program, and the California HIV/AIDS Research Program.[27] Recipients of research funds include research institutes, firms, universities, and nonprofit organizations throughout the state. RGPO benefits from the flexible and specialized support of the greater UC system, while maintaining a high level of autonomy and lean staff. RGPO manages more than $100 million per year in scientific research grants across the three state programs. Each program is run by four to eight staff members and led by doctorate-level experts with demonstrated leadership in the respective specialized fields. Mirroring federal standards, RGPO employs an open, competitive review process that ensures all researchers, regardless of affiliation, are treated equally. UC scientists, therefore, receive no special privileges before, during, or after research funding.

RGPO is housed within the UC Office of the President (UCOP) and receives specialized support services from UCOP offices, such as human resources, information technology, research contracting, IP management, legal support, research policy analysis and coordination, financial accounting, budget analysis and planning, procurement services, innovation and entrepreneurship, diversity and engagement, marketing communications, government relations, ethics, compliance and audit services, and media

relations. Figure 5 below shows a schematic of how an entity such as RGPO receives consolidated support and resources for administering its multiple state research granting programs. We find a structure such as shown in Figure 5 is ideal to provide a compatible cultural environment, specialized support, and removal of redundancies to allow for innovative and robust research program implementation.

To optimize the structure and budget of UCOP and help enable growth and provide more autonomy of RGPO, an option to relocate RGPO from UCOP and place it in a new UC entity recently was being explored.[28] Under the proposal, RGPO would continue its access to UC support services, either by UCOP, or within the new entity, or a combination of both. Regardless of whether RGPO stays within UCOP or is restructured in a more autonomous entity, we find RGPO is a feasible and desirable entity to administer state-funded public purpose research

programs of any discipline. We recommend the Legislature further investigate RGPO to determine how to best utilize and expand existing resources to manage additional state research granting programs and ensure the key principles are implemented.

FIGURE 5
Research Programs Receiving Specialized Support Services

APPENDIX A: RESEARCH GRANTING AND INTELLECTUAL PROPERTY MANAGEMENT

Research Granting

Our investigation revealed that funding procedures vary dramatically within and across state agencies, creating a complex and difficult process that discourages some of the best research talent from applying for state research funds. There are multiple reasons for this complexity. For example, AB 20 (Solorio), Chapter 402, Statutes of 2009, required the Department of General Services to develop templates specifically for California State Universities and UCs; however, the templates are rarely used. Specialized templates created for contracting with federal labs under SB 1629 (Spier), Chapter 256, Statutes of 2006, also are not readily used. Instead, many agencies negotiate unique contracts or grants language, which makes the process of applying for state research funds cumbersome. One reason for the inconsistency is some agencies process external research work as procurement contracts, while others use granting agreements. As described in the introduction, the difference between research projects with a direct agency benefit or a broad public purpose benefit can be described by the service provided to the agency. Whereas procurement contracting is appropriate for direct types of research, we find granting agreements are more appropriate for public-purpose research because of the streamlined flexibility they provide.

Additionally, the regulatory structure of state agencies can create complexity that prevents programs from fully utilizing the federally funded DOE or NASA research facilities that can offer more advanced resources.[29] Also, the best research resources are not always utilized by state agencies due to institutional practices of using the same researcher for projects rather than advertising and holding a competition for the best qualified. Opportunities for leveraging cost-sharing funds also can be missed when granting is overly complex, particularly when multiple state agencies collaborate on research projects, often requiring multiple individual agreements due to budget authority complexities.

Delegation authority for administering contracts and grants is a significant factor facilitating research program administration. Some agencies have been given delegation authority, enabling contractual changes without the need for additional approval. Others, however, are not given delegation authority, often resulting in delays and challenges with funding extensions and noncontroversial changes.

Federal research institutions appear to have the most difficult time negotiating funding agreements with state agencies due to unique factors such as public disclosure laws, payment schedules, and overhead costs. For example, federal law requires federal research institutions to receive payment in full up front, while California agencies have established a system of reimbursing expenses following the demonstration of progress. These difficulties with federal agencies also might inhibit cost-sharing, as federal research institutions must navigate how to reconcile state and federal requirements to receive funding from both.

In summary, public purpose research programs should (1) use granting agreements rather than procurement contracts, (2) have delegation authority, and (3) foster flexible funding schedules. In general, it also would be beneficial to ensure state research granting laws are closely aligned with federal laws to benefit from federal matching programs and world-class resources.

Intellectual Property Management

We found current state agency IP stewardship policies regarding research are inconsistent, and state agencies do not receive comprehensive or consistent guidance on managing IP. This lack of policy direction has led agencies to create their own IP policies that are either predetermined or negotiated in their research contracts or granting agreements, creating an inconsistent and uncertain landscape for research grantees to navigate. Poorly directed IP stewardship can hinder private research investment, particularly at the applied and demonstration stages.

To manage IP from research institutions, the federal government uses the Bayh–Dole Act of 1980, considered by the *Economist* as "possibly the most inspired piece of legislation to be enacted in America over the past half-century."[30] The act allows universities, nonprofit corporations, and small businesses to retain ownership of inventions made with federal funds and license those inventions to others, giving grantee institutions incentive to invest in the commercialization of their research.[31] Grantees are allowed to keep all revenue from federally supported inventions, subject only to Bayh–Dole requirements that some revenues be allocated to the inventors and that earnings in excess of expenses be reinvested in education and research.[32] The federal government retains a nonexclusive, nontransferable, irrevocable, royalty-free license to use, and authorize others to use, the inventions for or on behalf of the federal government. In the case of a patent owner's inaction to use the invention toward practical application, the act also preserves "march-in rights," allowing the funding agency to require the patent owner to grant a license to a third party or itself for further development. While some IP researchers have suggested improvements to the Bayh–Dole Act,[33] other assessments of state-level IP policies confirm the consistency gained by aligning with federal policy outweighs potential benefits from alternative models, considering the vast majority of California-based research is supported by federal grants.[34]

Multiple studies of IP policies suggest state governments should not pursue financial returns from state-funded research, such as royalties, because it would discourage commercial development of new products for the public good, yield a miniscule amount of revenue compared with the state's research budget, risk alienating commercial partners, and entail transaction costs greater than the revenue collected.[35] Studies and our interviews revealed royalty revenues, even for top-performing institutions, usually fail to outweigh the administrative costs of legal services, negotiation, and enforcement.[36] Academic and corporate grantees have expressed concern that royalty provisions hinder commercialization efforts.[37] The process of bringing new technologies or drug therapies to market requires skilled and delicate negotiations between stakeholders, including the property owners and venture capital entities. Due to the unique circumstances inherent in commercializing a specific product, the agreements must be handled on a case-by-case basis. Instituting predetermined royalties at the start of a research project can greatly slow or even prevent subsequent attempts to commercialize new discoveries.[38] Granting agencies such as the National Institutes of Health (NIH) ultimately have abandoned policies that require a financial return to the government after concluding that removing barriers to the rapid commercialization of products represents a greater public benefit than any potential revenue stream to the government.[39]

NIH has further crafted guidelines emphasizing the use of patents and exclusive licenses only when necessary for purposes of commercialization, to avoid hindering basic research results from further study and development to cross the "Valley of Death" between scientific discovery and market-readiness.[40] One provision of the Bayh–Dole Act allows agencies to claim particular areas off-limits to patenting under "exceptional circumstances," however, that authority has rarely been used.[41]

After reviewing the literature and interviewing key experts, we recommend the Legislature consider adopting a statewide IP policy replicating the principles of the Bayh–Dole Act for research granting programs. In addition to the Bayh–Dole Act, certain other provisions may be considered regarding access to research tools. Previous studies suggest a state IP policy should pay particular attention to the treatment and dissemination of research tools, such as publicly accessible data bases. A provision may also be included to address publications arising from publicly funded research. Since a principal objective of California IP policy should be the open dissemination of research results, which ultimately drives practical applications of science, open-access publishing may be included as a requirement of receiving state research funds.

As recommended by a leading report on California-based research IP practices,[42] a consolidated statewide office of IP management could serve to assume responsibility for tracking IP that results from state-funded research, monitoring the use of state-funded IP, and overseeing march-in rights.

APPENDIX B: LIST OF INTERVIEWS

California Air Resources Board
September 18, 2017, and January 11, 2018
Bart Croes, P.E., Chief, Research Division
Jorn Dinh Herner, Ph.D., Chief, Research Division Climate Change Mitigation and Emissions Branch
Alice Stebbins, Division Chief, Administrative Services Division

California Council on Science and Technology
September 8, 2017, October 2, 2017, and January 12, 2018
Sarah Brady, Ph.D., Senior Program Associate
Christine Casey, Ph.D., Senior Program Associate
Susan Hackwood, Ph.D., Executive Director
Brie Lindsey, Ph.D., Senior Program Associate
Amber Mace, Ph.D., Deputy Director

California Department of General Services
January 26, 2018
Christopher Gill, Attorney IV
Thomas Patton, Assistant Chief Counsel
Anna Woodrow, Assistant Chief Counsel

California Department of Transportation
January 17, 2018
Jim Appleton, Division Chief, Research, Innovation and System Information
Clark Paulsen, CPA, Chief, Division of Accounting
Blair A. Thompson, Chief, Office of Innovation, Risk and Strategic Management

California Energy Commission
September 13, 2017, and January 8, 2018
Laurie ten Hope, Deputy Director, Energy Research and Development Division
Linda Spiegel, Assistant Deputy Director, Energy Research and Development Division
Erik Stokes, Manager, Energy Deployment and Market Facilitation Office
Allan Ward, Assistant Chief Counsel

California Institute of Technology
August 3, 2017
Neil Fromer, Ph.D., Executive Director, Resnick Institute

California State University Office of the Chancellor
August 22, 2017
Nathan Evans, Chief of Staff and Senior Advisor, Academic and Student Affairs
Aaron Klemm, Chief, Energy and Sustainability
Ganesh Raman, Ph.D., Associate Vice Chancellor of Research

California State Water Resources Control Board
January 11, 2018
John Borkovich, Chief, Groundwater Monitoring Section

James Pooley Professional Law Corporation
January 16, 2018
James Pooley, Attorney

Lawrence Berkeley National Laboratory
August 9, 2017, September 5, 2017, and December 19, 2017
Horst Simon, Ph.D., Deputy Director
Elsie Quaite-Randall, Ph.D., Chief Technology Transfer Officer
Alicia Ward, Business Development Manager, Program Development Office

Lawrence Livermore National Laboratory
August 4, 2017
Steven Bohlen, Ph.D., Global Security E-Program Manager

NASA Jet Propulsion Laboratory
August 24, 2017, and November 2, 2017
Riley Duren, Chief Systems Engineer, Earth Science and Technology Directorate

National Academy of Sciences
September 29, 2017, January 18, 2018, and February 12, 2018
Paul Beaton, Senior Program Officer

San Francisco State University
August 22, 2017
Michael Scott, Ph.D., Associate Vice President, Research and Sponsored Programs

Stanford University, August 3, 2017, and January 19, 2018
Dian Grueneich, Senior Research Scholar, Precourt Institute for Energy
Katherine Ku, Director, Office of Technology Licensing

University of California, Berkeley
January 16, 2018
Pamela Samuelson, Director, Berkeley Center for Law and Technology

University of California, Davis
September 29, 2017
Dan Sperling, Ph.D., Founding Director, Institute of Transportation Studies
Austin Brown, Ph.D., Executive Director, UC Davis Policy Institute for Energy, the Environment, and the Economy
Susan Handy, Ph.D., Professor of Transportation Studies
Laura Podolsky, Policy Director, National Center for Sustainable Transportation

University of California Research Grants Program Office
August 23, 2017, December 15, 2017, and January 29, 2018
Julia Arno, Interim Executive Director, Research Grants Program Office

University of California, San Diego
August 10, 2017
Shannon Muir, Ph.D., Strategic Opportunities Research Analyst, Research Proposal Development Service

University of California, San Francisco
August 3, 2017
Regis Kelly, Ph.D., Director, Quantitative Biosciences Institute

U.S. Defense Advanced Research Projects Agency
February 12, 2018
Arati Prabhakar, Ph.D., Former Director, 2012–17

Endnotes

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