Ocean Research Advisory Panel

December 3-4, 2024

AGU Conference Center
2000 Florida Avenue NW
Washington, D.C.

Present:

Mary Glackin, Co-Chair
Christopher Ostrander, Co-Chair (virtual)
Claudia Benitez-Nelson (virtual)
Derek Brockbank
Jorge Corredor
Danielle Dickson
Tim Gallaudet (virtual)
Eunha Hoh (virtual)
Sandra Knight
Tommy Moore
Claire Paris-Limouzy (virtual)
Purnima Ratilal-Makris
Edward J. Saade (virtual)
Ana Spalding
Amy Trice
Maria Tzortziou

Also Present:

Viviane Silva, Designated Federal Officer
Victoria Kromer, Alternate Designated Federal Officer
Deerin Babb-Brott, Assistant Director for Oceans and Environment, White House Office of Science and Technology Policy
Sara Gonzalez-Rothi, Senior Director for Water, White House Council on Environmental Quality
Miriam Goldstein, Director for Ocean Policy, White House Council on Environmental Quality
Danielle Farelli, Assistant Director for Ocean and Science Technology, White House Office of Science and Technology Policy
Michael Kruk, Deputy Director, NOAA Technology Partnerships Office
Pamela Chu, National Institute of Standards and Technology
Carlos E. Del Castillo, National Aeronautics and Space Administration
Simon Freeman, Department of Energy
Justin Manley, Founder, Just Innovation

Tim Janssen, Sofar Ocean
David Millar, Fugro Americas
Dan Shropshire, Teledyne Marine
Brian Connon, Saildrone, Inc.

Day 1, December 3, 2024

Meeting Opening & Review Agenda

Viviane Silva, ORAP Designated Federal Officer; Chris Ostrander and Mary Glackin, ORAP Co-Chairs

Ms. Silva opened the meeting at 9:00 a.m. and discussed logistics for the day. Co-Chair Glackin reviewed the agenda and objectives for the meeting, which primarily focused on receiving input for use in the panel's second report. The Co-Chairs have presented the ORAP's first report to the Ocean Policy Committee (OPC) recommending the development of a National Ocean Data Strategy.

Ocean Policy Committee Update

Sara Gonzalez-Rothi, Ocean Policy Committee (OPC)

Ms. Gonzalez-Rothi thanked the ORAP on behalf of the OPC for their data report and encouraged the panel on their work going forward. Despite the upcoming change of administration, she was confident that the engagement between ORAP and the OPC will continue to be vital. ORAP's reports and the process they have undertaken to develop them will provide the model for the panel's future iterations. ORAP exists by statute and will remain for the foreseeable future, in the absence of an act of Congress. Mr. Gonzalez-Rothi requested that the ORAP consider what it may be able to achieve in the near-team, in what ways can the ORAP's work provide cues on which questions the budget request from new appointees should consider, how the ORAP can help inform how new political appointees and members of Congress think about ocean policy beyond appointments and budgets, and how ORAP can develop the pipeline of future ORAP members and topics.

Amy Trice asked if there are documents that ORAP members should familiarize themselves with, to guide their work going forward. Ms. Gonzalez-Rothi recommended reviewing the Ocean Climate Action Plan, the National Strategy for a Sustainable Ocean Economy, and the Ocean Justice Strategy. She encouraged the ORAP to look to its foundational documents and explore ways to weave these important topics into its activities.

Tommy Moore asked if the ORAP should be considering drafting briefings or transition documents as part of this meeting. Ms. Gonzalez-Rothi said the introductory materials given to new Knauss Fellows are very helpful. These include a brief overview of each line office and who to contact when they have questions. Something similar would be helpful for the incoming administration in regards to the OPC and its member agencies, as well as the communities ORAP members are familiar with. She also recommended early engagement with the incoming administration to touch on ongoing topics.

Derek Brockbank asked for suggestions on how the ORAP could continue to push the National Ocean Data Strategy forward in the new administration. Ms. Gonzalez-Rothi said at least half of the people who received the previous briefing will still be around in the new administration, but offering it again would be a good idea and could be done virtually. She also recommended providing a template of what the ORAP envisions the new administration building upon. This should include references to foundational documents that already exist and should not be recreated.

Ed Saade asked about the optimal timeline for ORAP's recommendations. Ms. Gonzalez-Rothi suggested resending the recommendation in January and looking to schedule the briefing by the end of March. Beyond the budget request and nominations, the other early action a new administration does is Executive Orders. Being cognizant of what these are will provide clues as to the direction the administration intends to move.

Mr. Brockbank asked if ORAP or OPC staff could help keep the members informed about who is coming and going in the administration. ORAP staff agreed to do so.

National Oceanographic Partnership Program (NOPP)

Jeremy Weirich, Director, NOAA Ocean Exploration

Jeremy Weirich discussed the work of the NOPP, which has been active since 1997. The goal of the program is to get ocean agencies, including the Navy, to work together. The program has grown considerably over the years, as has the interagency coordination. The program's focus is on nascent stage research of ocean topics and its projects must include multiple federal agencies, at least two sectors from public, private, and academia, and have coordinated agency review. The program is currently pushing for the inclusion of more philanthropic partners going forward. Though NOAA's appropriation for dedicated NOPP funding has not increased significantly, the program's real strength is the partnerships it enables and the coordination it provides. As one example of this, Jeremy Weirich discussed the FY23 Marine Carbon Dioxide Removal Funding Opportunity, which supported 24 projects and is still ongoing. Other recent NOPP projects included a study of the 2022-2024 hurricane coastal impact forecasts and a variety of efforts focused on marine biodiversity. There has been renewed interest in NOPP across government, with a desire to facilitate greater use of public-private partnerships (P3s) to execute ocean projects, what is being called "NOPP 2.0." NOAA Ocean Exploration is looking to codify changes to the program in order to provide clarity on its direction. There has been recognition within the program of the need to take on larger projects and priorities if NOPP is going to be an effective tool. Bigger projects will drive bigger budgets and a greater ability to leverage funding from outside sources, including from non-ocean partners. NOAA seeks to work with private companies and philanthropic groups in new ways in order to provide new incentives. The agency also needs to leverage other funding mechanisms within the federal government, as well as maximize the funds and funding mechanisms currently available.

Co-Chair Glackin asked what the breakdown tends to be between academic and industry partners on NOPP projects. Mr. Weirich said it is generally a good mix and he was impressed with how many industry partners were engaging on new topics.

Co-Chair Ostrander asked about the challenges and barriers in the current incentive structure and for any ideas on how it can evolve. Mr. Weirich said incentives vary depending on the project topic. The federal government can offer many kinds of assistance beyond funding, but non-monetary incentives are challenging on basic research projects. There are existing industry partnership structures that NOPP could explore to better incentivize private companies. It is important for Congress to hear from industry why additional funding is needed.

Ana Spalding asked about philanthropies that might be aligned with NOPP's mission and what incentives the program could offer them. Mr. Weirich said there are now several philanthropic organizations in the ocean research space and they have been providing access and assets to the ocean research community that has had a positive impact. In addition to ocean-focused philanthropies, there is also the opportunity to partner with those focused on topics such as health, energy, developing countries, and others that include an ocean component. Dr. Spalding asked if information collected on these campaigns can be incorporated back into the work of the federal government, given that the partner groups may have an agenda behind their work. Mr. Weirich said there are some challenges in this area and it would need to be determined on a case-by-case basis.

Danielle Dickson asked if NOPP has engaged with the investment banking sector. Mr. Weirich said those discussions have been happening within NOAA, but not yet within NOPP.

Amy Trice asked how a NOPP project functions, generally speaking, and whether the agency approaches industry with a proposal or the other way around. Mr. Weirich said it depends on the topic. Typically, projects focus on a particular research topic that is proposed in a Broad Agency Announcement (BAA) and then federal partners join and contribute funds or in-kind services. Following that, the principal investigator drives the effort to bring in industry or philanthropic partners.

Purnima Ratilal-Makris said the problem she has seen with NOPP is that the federal call asks for a cost share, which presents a hurdle for small businesses that may want to participate. Some states provide assistance for cost shares on federal projects, but not all. Mr. Weirich said NOPP is focused on emerging issues and is not the only federal partnership opportunity in this space. He felt that if there is an emerging research issue where there may eventually be a financial opportunity for industry, a cost share is appropriate. He noted that cost shares are on a case-by-case basis for each project and can be changed.

Deerin Babb-Brott suggested the ORAP refer to the many documents developed during the first Trump administration that could guide their thinking about a potential path forward. These included the Executive Orders, the Presidential Memorandum which set up NOMEC, and the OPC authorization that included ORAP as a component. Documents on the record describe and articulate these individual elements, as well as their intended interrelationships. This could be helpful in figuring out how to integrate the government's investment in basic R&D and where the ORAP and OPC want to go.

Ocean Emerging Technology: Barriers, Challenges, and Potential Mechanisms That Expand Opportunities for Public-Private Partnerships

Panel 1: Industry Perspective

Justin Manley, Just Innovation
Tim Janssen, Sofar Ocean
David Millar, Fugro Americas
Dan Shropshire, Teledyne Marine
Brian Connon, Saildrone, Inc.

Mr. Manley discussed his work operating a strategic advisory practice acting at the intersection of innovation and commercialization. The bottom line of his presentation was that government programs are typically slow and inflexible, while ocean tech innovation is fast and accelerating. There is significant room for improvement to inform markets, shape investment, and deliver economic and societal value. He provided a couple case studies where things are going well and others with more mixed results. Some of the difficulties of current partnerships were administrative burdens and tech providers proving incompatible with the mission/vision of the project. When Small Business Innovation Research (SBIR) grants are used for projects they have yielded mixed results. They are valuable for a number of reasons, including their focus on small business and because they have clear budgets and schedules, but they are not always connected to actual budgets, they are not administered consistently, and they are not always commercially informed. Other Transaction Authority (OTA) has yielded some transformative outcomes and inspired significant venture investments. While OTA is currently not used widely outside of the Department of Defense (DoD), it is a mechanism that more agencies should be considering. Emerging markets are an area where the government should engage with industry to develop the market in ways that work for everyone. Federal agencies should work with industry to develop a best practice guide that the end users agree on. Mr. Manley's recommendations for how the private sector can support effective adoption of novel ocean technologies by government agencies included: make solutions available for sale, endeavor to close the communications gap, advocate for innovations, and listen for distinctive government needs. His recommendations on what ocean agencies and departments can do to better harness the innovation occurring in the private sector included committing to buying commercial solutions, finding faster and more flexible paths to both testing and acquisition, engaging the private sector early in product/technology development, and getting out and seeing innovation at work. His recommendations on how new models might address the challenges that exist with respect to entering into P3s included using OTAs, training contracting officers to better understand the needs and goals, awarding incentive prizes, and buying data/services. Incentives the government could offer to attract partnership from industry may include the ability to shape best practices through multi-party conversations with stakeholders, the government providing clear guidance on technical needs and guidance on procurement plans, and offering to test collaboratively.

Amy Trice asked for more information on what was meant by "buy data." Mr. Manley said NOAA is moving to do some data buys. He highlighted as an example the Navy paying fishermen to install sensors on their boats to collect data. It is not necessary for NOAA to use its own ships or gliders to collect data

when it could get it from others. NOAA needs to figure out what data it wants to buy and come up with contract mechanisms that will allow the data to be purchased. Tax incentives for companies to give away data would also be very valuable. Amy Trice highlighted that ORAP has included tax incentive recommendations in the National Ocean Data Strategy Report submitted to the OPC.

Maria Tzortziou asked what strategies might be best for closing the communications gap. Mr. Manley said conferences and events are good at a high level for convening experts around themes. The most important thing is that individuals on both sides of the equation develop the comfort and confidence to have these conversations and work towards a true shared understanding. Developing best practices documents with all the relevant stakeholders involved is also a good practice.

Dr. Janssen discussed the work of his company, Sofar Ocean, which primarily partners with other companies in the commercial space. While Sofar Ocean has not partnered much with the federal government, the company has built incredibly valuable relationships with many government partners over the years. Sofar is fully focused on helping to close the ocean data gap. The company builds hardware and deploys sensors with partners to build large heterogeneous networks and generate data where there previously was none. Sofar's data produces new insights and reduces the uncertainty of forecasts, and Sofar then works to translate this into value for large industries, such as maritime shipping. By doing this, these industries can help pay for more data production, helping to feed into a data information funding cycle, which is key to what the company hopes to achieve. Overcoming technical barriers is typically where Sofar's touchpoints with the federal government happen. One example of this is the Bristlemouth partnership, which developed an open source universal connectivity standard for marine applications. Overcoming the barrier of integration may be the single most important step for ocean exploration and sensing. One mechanism that would have been helpful in more rapidly developing this tool would have been advanced market commitments, as are used in vaccine development. Making things simpler and more flexible in how contracts are done with companies would have also helped the process move faster. Another thing that is lacking in the efforts to move a project from R&D to operational impact is an enterprise model that would enable adaptation of an existing product to meet the usage of a specific organization. Figuring out how to take what is learned from a program like NOPP and adapt it to become an actual product would be extremely valuable to government end users, as well as unlock a lot of interest from product companies. This would require thinking through the capability that the government wants to create in order to give them a better perspective on what is available and how it could strategically fund innovation projects.

Sandra Knight asked who developed the Bristlemouth standard. Dr. Janssen said it was developed by the company. They had all the patents on it and when they decided it should be an open source standard, they removed all their intellectual property (IP) and made the patents public. Now, the next phase is to work with partners, like MITRE, to help formulate the standard.

Mr. Millar discussed the work of Fugro, a multinational, publicly-traded corporation that has been in business for 65 years and has 11,000 employees globally. Fugro provides geo-data, information, and knowledge as the core of their business. While not a product development company, Fugro is a product integrator. Working with suppliers and partners, they integrate technology by developing fit-for-purpose

solutions that address their clients' needs and challenges. Mr. Millar has found there is a lack of alignment on what a P3 is, so for his presentation he used the definition of "a long-term agreement between one or more public agencies (federal, state, and/or local) and private sector entity or entities that includes shared responsibility, risk, and reward among the parties. Through this agreement, the skills and assets of the private sector are employed in delivering a product, service, or infrastructure for use by the public at large." He emphasized the importance of "long-term agreement" as opposed to short-term agreements that try to fit a P3 model into a constrained mechanism. Mr. Millar recommended ORAP refer to the National Geospatial Advisory Committee's report entitled "Advancing the National Spatial Data Infrastructure through Public-Private Partnerships and Other Innovative Partnerships" for a useful treatment of the subject. Key barriers for P3s include: there are few mechanisms to support P3s at scale, especially in the ocean science space; few agencies with Contribution Authority, which allows an agency to receive private funds in a limited capacity; an absence of a national collaborative governance process to guide the implementation of P3s; regulations prevent "data sharing" or "public access" to some types of data; and a lack of clarity with respect to environmental compliance. Challenges for P3s include: a lack of understanding of what P3s are and what is required to implement at scale; a lack of willingness and/or commitment to transfer responsibility from government to private sector; a lack of willingness and/or commitment to address barriers; a lack of dialogue between government and private sector regarding needs and capabilities; a lack of willingness and/or commitment to establish meaningful and sustainable mechanisms to explore P3s development; and a perception that emerging technology in the private sector only comes from small businesses. The potential mechanisms he recommended for supporting P3s at scale included: contribution authority; leveraging OTA; commercial solutions; an expansion of NOPP; SBIRs with an emphasis on Phase 3 commercialization; data buys; co-investment, which can be enabled through contribution authority and other means; and P3s for some functions or capabilities that could grow into supporting true longer-term P3s.

Deerin Babb-Brott pointed to the Regional Wildlife Science Collaborative, an under-utilized open source partnership that does some of what Mr. Millar described.

Amy Trice asked for more detail on Mr. Millar's comment that there is an absence of a national collaborative governance process to guide the implementation of P3s. Mr. Millar said part of the issue is in trying to force P3 models into existing contract mechanisms that may not be fit-for-purpose. Having an effective P3 requires the government giving much of the responsibility and control of a project to the private sector. The corresponding contracting and granting mechanisms do not necessarily do this adequately. The governance around this shift in control/responsibility has to be thoughtfully considered and incorporated these frameworks and mechanisms. Co-Chair Glackin commented that the ocean community has a difficult time prioritizing and the private sector cannot get a clear picture of where the science is going. A clear vision with broad alignment would provide direction for the private sector on where they are moving.

Ed Saade said technology transfer back and forth between industry and the government is another area that needs to be recognized and improved. The end goal of this work is the same for both government and industry.

Mr. Shropshire discussed Teledyne Marine's work, another large company with a global footprint and 15,000 employees around the world working in a number of fields. About 50% of their business is in high technology digital imaging. They are one of the largest companies in the oceanographic domain, with five principal market areas: energy, infrastructure, oceanographic, defense/security, and marine life. Mr. Shropshire began his discussion of P3s by looking at how these partnerships are currently funded. Projects run much more smoothly when funding comes directly to Teledyne from an agency, rather than when it is channeled through other institutions first, which is often the case. Size and skill are key factors in partnership effectiveness and how capable industry is in supporting federal projects. Existing technologies can be used to tackle many current problems and industry needs to make that clear to government agencies. He recommended establishing a forum for these kinds of communications. Mr. Shropshire discussed Teledyne Marine's partnership with the Navy on its Littoral Battlespace Sensing Glider program that has been underway for over ten years. As examples that could serve as models for future P3s, Mr. Shropshire discussed the NSF-funded Ocean Observing Initiative, CINAR-funded Storm Glider, and Canada's Ocean Tracking Network's monitoring of North Atlantic right whales. The internationally funded Argo program includes industry involvement at the steering committee level, which has helped make it especially successful. Some of the key ingredients to successful partnerships have included: aligning with Teledyne corporate goals (profit, market growth); use of commercial off-the-shelf technology (COTS) and COTS with customization; partnering with academics and research institutions to advance technology; including industry members on scientific teams and committees driving program direction; and nonprofits driving innovation by bringing together government, industry, and philanthropies. Other things that could make these partnerships more successful include: funding mechanisms to purchase COTS or modified COTS direct from mid-size and large public manufacturers, teaming relationships to provide services to include O&M, inclusion of industry partners in government road mapping and planning, and publishing technology roadmaps that state government needs three years out. To better harness the innovation occurring in the private sector, ocean agencies should influence the technology. Without direction, companies will build what they think the industry wants. Industry days and demonstrations should be used to help build awareness. Procurement strategies should be designed to be as simple as possible. There are currently challenges around IP and data rights, as well as fairness in competition, as it relates to entering into P3s. New models should include direct purchases of COTS or slightly modified COTS products which provide IP protection for industry and with partnerships on O&M.

Mr. Connon discussed the work of Saildrone, a private, venture capital-backed post-Series C startup with about 250 employees. The company started in 2013 with the awareness that the health of the planet is tied to the health of the ocean. Saildrone's three mission areas include defense and security, ocean mapping, and ocean research, leveraging a global fleet of ocean drones that are wind- and solar-powered to monitor the planet in real-time, above and below the surface. They have spent 46,000 plus days at sea with their vehicles and traveled over 1.6 million nautical miles. They can stay at sea for 12 months, and do an entire seasonality study in an area, which is very attractive to scientists. Some of the highlights of the last ten years of R&D at Saildrone included sensor integration with NOAA; the incorporation of engine, radar, and acoustics data; hurricane data collection; full ocean depth mapping; U.S. Navy integration; the Voyager becoming operational for maritime security and coastal mapping;

Surveyor which employs COTS as much as they can. Existing mechanisms that Saildrone has used for partnering with the federal government include: Cooperative Research and Development Agreements (CRADAs,) which are great for partnering on a specific project and was initially how the Surveyor got off the ground, but not good at setting up for scale; indefinite delivery, indefinite quantity (IDIQ) contract opportunities, which is being used for internal funding calls within NOAA; SBIRs, which work well but have small funding amounts; long-term frameworks, such as Office of Coast Survey (OCS) Hydrographic Services Contract; accelerators, such as the Defense Innovation Unit (DIU); and Broad Agency Announcement (BAA), though these tend to be difficult when a technology is already at Technology Readiness Level (TRL) 8 or 9. The five challenges and proposed recommendations identified by Mr. Connon included (1) R&D projects that have no transition path to operations - the government needs to commit long term-funding once R&D validates the solution; (2) Models for data/mission as a service are not understood - the government must embrace these models to rapidly integrate; (3) Annual funding and budget delays put the private sector at risk - multi-year funding programs are needed that can weather budget uncertainties; (4) Contracting timelines and processes are often arduous - the government needs to be willing to accept new approaches that are less risk averse; and (5) Establishing a program of record to solidify long-term funding is a complex and lengthy process - the government must adopt more agile and flexible acquisition processes. Saildrone is not a product company, they are a data or mission as a service company. This poses difficulties in contracting terms when it comes to defining what that looks like or how to charge.

Co-Chair Ostrander said a number of themes arose repeatedly during this panel presentations, including data and service procurement, OTAs, evolving and improving the outcomes of the SBIR/Small Business Technology Transfer (STTR) process, and standards on both the hardware and data side, as well as discussion generally around collaboration and communication. He asked if any of the panelists had more specific comments on how to expand and improve NOPP after what they heard today. Mr. Shropshire said the list of NOPP awardees over the last five years only included one industry partner, with the rest going to academic or research institutes. This may be due to a lack of specificity and not understanding the government's goals or what problems that they are trying to solve. Regularly occurring industry days would help provide this specificity and inform federal agencies of what industry is working on. Mr. Connon said NOPP suffered from obscurity in the past and its rejuvenation has been much appreciated. When tackling a new subject, partnering with academia makes sense. Industry is looking for large scale operations over longer timescales to achieve the goals of the federal government. There may be potential for NOPP to be more involved in facilitating discussions about transitioning technologies. Mr. Manley said that if NOPP brought all of the stakeholders into the same room to think about how to do better procurement, acquisition, and research to operations (R2O), it would become a center of excellence for creative thinking across agencies and be a huge value-add for partners. Rebranding NOPP may also be a good idea, though it looks like NOPP 2.0 is headed in the right direction. Mr. Millar said the NOPP mechanism has great potential, but its primary issue is one of funding and prioritization. If a programmatic need was identified and a cross-agency requirement that could be tackled using NOPP, this would inspire a consolidation of interests, support, and funds, including from the private sector. Dr. Janssen agreed that NOPP partners need to start with the end goal in mind. They need to determine

what core capability they want to develop and work their way back to figure out what intermediate steps are needed to get to a fully operational capability.

Sandra Knight asked what a contracting vehicle would look like that could get from basic research to TRL 8 or 9 and a marketable product. Dr. Janssen said demand is what is needed. For a good product opportunity, the government does not need to provide any money; industry will invest. Alignment of incentives is the most important thing, and creating long-term demand by having clarity about what the need is and discussion around how industry can help meet that need. Mr. Connon said establishing the ability to pull a product out of the R&D phase into operations with a guarantee that the government will buy the product will accelerate the development. Dr. Janssen added that there needs to be recognition of the cost delta between doing an early R&D project and developing an actual product. The investment levels go up exponentially, but the value should also go up correspondingly.

Danielle Dickson asked to what extent dealing with the administrative burdens of interagency contracting presents real barriers. Mr. Connon said it is a significant burden on small companies to manage. Companies like Saildrone can expand as they get larger contracts, but at the initial stages it is very challenging. Mr. Shropshire said that this is even a major burden for large companies with many people handling contracting. Even though they have far more resources, they will take the path of least resistance and pass on complex projects in favor of something with a single contract. For large contracts with several entities and funding, he recommended having a large company take on the initial contract and then subcontract the work out to everybody else. Currently, it is the other way around with smaller companies funding larger businesses by buying their individual products.

Ana Spalding asked about how to ensure justice in the collection and application of all these data by incorporating vulnerable communities and ensuring they can benefit. Dr. Janssen said the way they have gone about this is by involving these communities in the data collection and getting them to own the data and share it. Easier-to-use sensors would democratize access to data. Mr. Connon suggested not discounting professional societies and what they are doing. There has been a large shift in representation in the field, but it can be a challenge. New technologies, such as uncrewed systems, open up new possibilities for more people to participate in ocean science. Mr. Manley said scale solves a lot of these problems. If they can scale and drive more ocean data accessibility, it will trickle out to more communities.

Panel 2: Government Perspective

Michael Kruk, NOAA Technology Partnerships Office
Pamela Chu, National Institute of Standards and Technology (NIST)
Carlos E. Del Castillo, National Aeronautics and Space Administration (NASA)
Simon Freeman, Department of Energy

Mr. Kruk discussed the mission of NOAA's Technology Partnerships Office (TPO) to foster innovation, partnerships, and economic growth by investing in small business R&D, facilitating P3s, and transferring NOAA innovations to commercial applications. TPO oversees all of NOAA's CRADAs and all phases of SBIRs are run through the office. TPO is NOAA's primary interface with private sector innovation. NOAA's

SBIR grant program is a congressionally mandated set-aside for small businesses to engage in federal R&D with potential for commercialization. It aims to meet federal R&D needs, increase private sector commercialization of innovation derived from federal R&D funding, stimulate technological innovation, and foster and encourage participation in innovation and entrepreneurship by women and socially/economically disadvantaged individuals. FY25 SBIR Phase I topic areas include extreme events and cascading hazards; coastal resilience; the changing ocean; water availability, quality, and risk; effects of space weather; and monitoring and modeling for climate change mitigation. These topics are large by design in order to broaden the applicant pool. NOAA's technology transfer efforts aim to move IP from within the agency to a secondary external user with a goal of promoting increased commercialization and use of NOAA's innovative technologies. NOAA protects the IP of innovations developed by its employees, grantees, or contractors as a way to increase their impact and use. TPO facilitates CRADAs, which allow NOAA and non-federal partners to share resources toward a common goal and unlock potential for collaborative problem solving and innovation. The government cannot fund a CRADA, but rather NOAA provides in-kind personnel, facilities, equipment, and other resources. In response to the question from the previous panel concerning the path to long-term funding in a CRADA, Mr. Kruk said there is no path because CRADAs are not funded. The future funding comes from royalties and potential license agreements. The idea behind CRADAs, therefore, is to develop IP.

Purnima Ratilal-Makris asked if CRADAs are just for partnerships between government and private companies, or if they include academia. Mr. Kurk said they can include anybody, including academia and the federal or state government.

Danielle Dickson asked if TPO offers funding to NOAA line offices to use CRADAs for intra-agency collaborations. Mr. Kruk said CRADAs do not come with any funding from the government.

Co-Chair Ostrander asked how many of the CRADAs currently in place have been generated inside NOAA versus industry proposing them. Mr. Kruk said CRADAs typically start with industry approaching the TPO who matches them with NOAA programs.

Sandra Knight asked about the royalties that come in from projects such as Science on a Sphere or Deep-ocean Assessment and Reporting of Tsunamis (DART). Mr. Kruk said they come in a variety of different ways, but they do not receive a lot of royalties. NOAA employees can collect up to $150,000 in extra income from royalties and the institution receives royalties as well as the lab the inventor partnered with. Amounts may exceed that with approval from the President.The money transfers do not happen within TPO, so he was unaware of the amount collected by the parties.

Dr. Chu discussed partnership opportunities at NIST and highlighted the Building Quality Confidence in Carbon Measurement Systems initiative, as well its version of the CRADA. She discussed NIST's work in advancing carbon dioxide removal, focusing on the seawater carbon reference materials production. NIST has in-house core lab capabilities with expertise to support rapidly developing technologies and help move them from labs to standard development. NIST performs extensive stakeholder engagement, primarily focused on the precompetitive technology space. Stakeholder input is then incorporated into global standards leadership by working with standards development organizations (SDOs) to develop

consensus standards. Dr. Chu discussed some examples of NIST's P3 approaches to address pre-competitive challenges towards standards development. Agency-wide, NIST currently has 24 active consortia and 691 consortia CRADAs. Within the consortia, NIST requires all participants to sign a CRADA to ensure that everyone is on a level playing field and has a good understanding of the expectations of the pre-competitive space. She described the makeup and activities of the Low Carbon Cements and Concretes Consortium, which is comprised of 52 member organizations from across the private and public sectors who coordinate with voluntary consensus SDOs and facilitate standards development, inter-laboratory comparisons, and reference materials. The consortium also coordinates with other federal agencies as they work to accelerate the adoption of innovative low-carbon building materials. NIST is growing partnerships and convening stakeholders to help build trusted MRV (measurement, report, and verification) and carbon accounting. They are looking at quantifying Carbon Dioxide Removal (CDR) across engineered and nature-based pathways. They seek to enable measurement comparability for informed CDR and CCUS (carbon capture, utilization, and sequestration) decisions and promote equitable trade.

Maria Tzortziou asked how NIST prioritizes which products to develop standards and reference materials for. Dr. Chu said she did not believe NIST has a formalized program for prioritizing. NIST's Office of Reference Materials receives proposals from the rest of the agency and helps prioritize them.

Co-Chair Ostrander asked how NIST goes about forming consortia and determining which topics make it to the consortia phase. Dr. Chu said the agency tries to keep track of the trends that are happening. The Program Coordination Office looks at opportunities and requirements and NIST scientists engage in scientific meetings to learn more about emerging needs.

Amy Trice asked if Congress assigns NIST its particular tasks. She also commented that NIST's ocean portfolio is pretty small comparatively. The ocean community is struggling to create standards across many different parameters to enable data sharing. She asked how they could push for their priorities to be taken up by NIST. Dr. Chu said that within NIST they will bring ideas together and promote initiatives, but they have to get ranked at higher levels within the agency, the Department of Commerce, and the administration. There is a lot of top-down direction as well.

Dr. Del Castillo discussed his work at NASA's Ocean Ecology Laboratory (OEL), including their PACE (Plankton, Aerosol, Cloud, ocean Ecosystem) program, and presented his perspectives on barriers, challenges, and potential mechanisms to expand opportunities for P3s. The spectroscopy observations collected through PACE have provided a great deal of information about the biology and chemistry of the ocean, as well as atmospheric properties and the very first hyperspectral measurements of land changes. It took about 20 years to bring this mission from inception to launch, which is far too long. In the context of trying to find ways to accelerate these projects, OEL has been exploring partnerships and has encountered many of the same stumbling blocks previously mentioned. NASA operates under the Open Data, Open Science construct, so all of its data is free. NASA data is well-calibrated and maintained, which provides an opportunity for partners to add value to it to create new commercial products. NASA also buys commercial remote sensing data. A common complaint is that it is hard to get commercial data and there are questions about data quality. This is an obstacle for the federal government buying data

from commercial producers, but if industry comes to a mission during the system design phase they can explore potential solutions. The government cannot move at the speed of some agile private companies and the red tape can be overwhelming. Another challenge is that NASA is structured as a matrix organization, which can lead to significant obstacles and a lack of support. A broad conversation to accelerate procurements and the agreement processes is needed. The effort required for some agreements, such as with other federal agencies, can be so challenging that NASA walks away from them. NASA focuses its work between TRLs 1 and 6. They have mechanisms to mature technologies but far too many end up as orphan developments. NASA frequently leverages SBIRs for producing new instruments.

Sandra Knight asked what NASA's role is in setting the standards for validation, verification, and uncertainty quantification and if it is able to include this in its specifications. Dr. Castillo said NASA does not have an official role in setting standards. The agency looks at the data and compares it with field measurements to determine whether the quality is as good as it needs to be. Dr. Knight felt this is an area where this topic ties into ORAP's data report.

Dr. Freeman discussed Advanced Research Projects Agency–Energy's (ARPA-E) emerging technology programs in the ocean realm and examples of interagency collaboration. ARPA-E funds high-risk, potentially high reward technology development in energy and emissions research across five mission areas: (1) increasing efficiency; (2) reducing imports of energy commodities; (3) reducing emissions; (4) reducing nuclear waste; and (5) grid resiliency. There is also an overarching directive to keep the U.S. ahead of the competition in energy technology generally. The ~$450 million that ARPA-E awards each year is primarily in the form of cooperative agreements. Though it was modeled after DAPRA, everything ARPA-E does is driven towards commercial development. It is all unclassified and intended to create new opportunities for growing the economy through energy technology. Impact and scale are what ARPA-E strives for. ARPA-E's four current ocean programs include MARINER, which is an effort to build a gigaton-scale ocean bioenergy industry; ATLANTIS, which is rethinking floating offshore wind technologies; SHARKS, which aims to develop new hydrokinetic turbine technology; and SEA-CO2, which works to realize a marine carbon dioxide removal (mCDR) industry. He discussed each of these, including SEA-CO2, which, in addition to producing great science, will be working to get quantification mechanisms for robust verification of carbon removal for industry. If they can get to a point where they can accurately verify the value of carbon credits, their value goes up, which encourages a more profitable mCDR industry. Effective regulation is going to require a data-driven method of verification that is as deterministic as possible. One example of a successful public-private partnership with ARPA-E is with Ocean Rainforest Incorporated and NOAA's National Center for Coastal Ocean Science. This interagency agreement started in 2017 with NOAA, and then expanded to include Ocean Rainforest in 2020. The agreement took about 6 months to create. Through this interagency agreement and partnership, Ocean Rainforest was able to obtain the first of its kind permit in California waters (separate from permits needed at the state level). Additionally, NOAA was given a plus up to support the use of the data collected off that area.

Ana Spalding asked about permitting and the delays this can introduce to projects. Another bottleneck with respect to ocean energy can be the grid side. She asked if improved permitting is part of how the

government can streamline this process. Dr. Freeman said that what they have found through the process of permitting the first-of-a-kind seaweed farm is that the permitting process must be transparent because of insurance issues. Quantification of real-world risk is very important and good data can expedite the permitting process.

Public Comment

Sonya Legg commented on behalf of the Center for Ocean Leadership (COL), who is very interested in facilitating collaboration across sectors, including government and private sectors. As an organization with over 90 affiliate members, including academia, nonprofits, and the commercial sector, that works closely with federal sponsors, the Center is keen to continue to try to connect and convene activities between these different sectors. COL staff is highly skilled and well trained in ocean science and policy and skilled at facilitating, coordinating, and synthesizing discussions. For example, COL staff assisted in the NOPP Marine Life Forum and the Ocean Biodiversity Summit meeting, assisted with the task teams for the ocean biodiversity and eDNA strategies, and also the MTS Tech Surge for Ocean Biodiversity. COL has been convening a series of virtual discussion forums, bringing together different sectors. One of the current focuses is on the needs of the ocean workforce across different sectors. The Center for Ocean Leadership is ready to help in activities that bring together different sectors.

Day 2, December 4, 2024

Meeting Opening

Viviane Silva (DFO); Chris Ostrander and Mary Glackin (Co-Chairs)

Ms. Silva reopened the meeting at 8:30 a.m. and Co-Chair Glackin reviewed the agenda for the day.

Recap of Panel Discussions

Chris Ostrander and Mary Glackin (Co-Chairs) and ORAP Members

Co-Chair Glackin led the ORAP discussion reflecting on the previous day's panels. She noted that there were many common messages from the private sector and common messages from the government sector, though they did not overlap much. It seemed that the government sector was not seeing the challenges to partnering with the private sector that are causing them significant burdens. Mr. Saade agreed with this. The panels demonstrated the disconnect between the two sides. Co-Chair Ostrander also noticed this, but took it as a good affirmation that ORAP is on the right track in addressing it. Co-Chair Glackin thought it would be worth ORAP's time to give further consideration to the role and structure of NOPP in this context, as well as discuss how their report could address the emphasis of different TRLs.

Amy Trice said the need for prioritization came through clearly in the industry panel. Knowing where the government is going at a high level is essential. Despite political changes, there are still priorities, and being more direct about these would help. This is an area the OPC could play a valuable role. Co-Chair Glackin pointed out that the National Academies are currently preparing their Ocean Decadal study. Co-Chair Ostrander added that it is not just the priorities, but also where the technical requirements and

models for contracting are heading. Part of the challenge industry is having is the aggregation of government demand and the modes by which the government is contracting those services.

Maria Tzortziou said the comments from the private sector on NOPP expansion, data as a service, more flexible funding mechanisms, and more efficient paths to making products operational were very consistent across the speakers. They wanted to see a commitment from the public side on finding solutions. ORAP should capture these recommendations in their report.

Tommy Moore said there is also a disconnect in that programs are focused on bringing small businesses into initiatives that are too large in scope for them to play a meaningful role. There is a need for discussion on how to scale things up to meet national and global aspirations. On the equity side, it is not just the monetary benefits, but also the intangible benefits. If considerable public funds go to a private company, the societal benefit needs to be comparable to that investment and felt equitably across society. There is a need for tools and better data collection on how to approach that, monitor it, and ensure benefits are equitable.

Sandra Knight said there were multiple layers to the transition to operations. Panelists were focused on their own TRL focus areas and something was needed to help them see beyond that to the larger picture of product development. She wanted to explore what kind of agreements can be put in place with the operational parts of the agencies in NOPP that requires them to start tracking research investments and have milestones at which they will be evaluated for moving them to operations. The recommendations need to include something about the transition vehicles available.

Ed Saade said the topic of successful large-scale partnerships with major companies, particularly at NASA, never came up and would have helped the discussion.

Ana Spalding said ORAP may want to consider categorization of its recommendations into pathways for impact for different levels of industry and for different levels of priority. She did not think generic guidelines would be useful.

Carlos Del Castillo said the public sector panelists were trying to present success stories as examples of what can work. NASA has had a program for bringing research to application for about 20 years, but research data is not easily transferred to the applications community or the private sector. There is a steep learning curve, but the agencies are putting money into teaching people how to use them. Large companies involved in the space sector are successful because of the work that came before them. He highlighted a fundamental difference between the sectors: when a private sector rocket explodes on the launch pad, the company cheers and goes looking for lessons learned; when a NASA rocket explodes, the agency gets called before Congress to justify its use of tax dollars. There is a reason for the processes and why they are slow. They have to consider that these are tax dollars.

Deerin Babb-Brott pointed to some of the documents that could be synthesized, in addition to a data call across agencies, to understand what the key R&D technology needs and interests are to determine which provide the opportunity for short-and medium-term success. Co-Chair Glackin suggested starting a Google folder for ORAP members, bringing together documents from the first Trump administration.

Next Steps Regarding the Biogeochemical Observing Technologies (BOT) Report

Maria Tzortziou and Danielle Dickson (Working Group Co-Chairs) and ORAP Members

Maria Tzortziou discussed the current status of the BOT report, which offers an initial set of recommendations to the OPC about opportunities to leverage P3s to advance emerging marine BOTs and advance ocean science initiatives. The goal of the report is to identify barriers and challenges, recommendations for addressing those challenges, and examples of technologies that are mature for investment. In addition to the input received during this meeting, the subgroup recently heard from colleagues in the government and the private sector about factors that contributed to the success of the USGS' 3D Elevation Program. She presented several of the key insights to the report, which will be updated to incorporate additional input. The draft recommendations for addressing barriers to P3s currently include:

- Establish and define standards for emerging technologies;
- Coordinate interagency communication and engage the private sector;
- Offer incentives to leverage industry infrastructure to collect publicly-accessible measurements;
- Apply more flexible funding mechanisms;
- Provide intra-agency support for public private partnerships; and
- Ensure appropriate legal protections for all parties involved.

Danielle Dickson discussed these in detail. One of the changes to the recommendations since the spring ORAP is language around more flexible funding mechanisms and urging the government to look to existing mechanisms that could be a model for emerging ocean technologies. One example discussed was the Denali Commission which is a federal agency that allows for the transfer of funds from other agencies to contribute to the needs of rural communities in Alaska. They also included the suggestion of employing technical points of contact to serve as liaisons between private industry and federal agencies to support P3s. The working group hoped to discuss with the ORAP whether this is a good model that could potentially be expanded to other federal agencies. They discussed whether NOPP would be a good place to set interagency priorities and needs and where they might be interested in helping create a market in which industry could invest. Once there is interagency agreement on what the priorities are, NOPP could be in a position to move forward on contracts, rather than grants, as a mechanism for R&D. Dr. Tzortziou presented a schematic they wanted to include in the report to connect some of the recommendations to the challenges. She also presented the revised list of emerging technologies to be included in the report in order to be more relevant to the missions of the different agencies and to different industries, as well. The working group is interested in identifying additional existing partnership mechanisms that could inform the recommendations to address the challenges and barriers discussed in the report. They encouraged ORAP members to continue thinking about this and reach out to them with any further suggestions.

Co-Chair Glackin confirmed that the intention is to filter all the possible technologies down to the ones that really underscore the challenges and recommendations highlighted in the report. Maria Tzortziou

added that they also wanted to focus on technologies that are relevant and of interest to a wide range of public agencies and industries.

Co-Chair Ostrander commented on the suggestion about moving to more contracts rather than grants. From what the panelists said during this meeting, it goes beyond those two mechanisms to include CRADAs, OTAs, cooperative agreements, prizes, and more. ORAP should explore the diversity of funding vehicles available to the government and push them away from just doing grants and contracts. NOAA has a very limited scope for using the OTA from the Weather Forecasting Act, but that could be broadened.

Tommy Moore commented on some of the challenges mentioned by the panelists around bringing technologies to a market that does not materialize at the scale necessary to be profitable. He also said that, if the report is going to include language about NOPP setting priorities on where to invest, there should also be language on who NOPP should consult with in determining this. Co-Char Glackin said that we don't want to necessarily anoint NOPP for this. Tommy agreed and said that it was more that NOPP could create the guidance around how that could be done.

Co-Chair Glackin suggested including a life cycle of what needs to happen for each technology to bring them to maturity.

Sandra Knight asked if by "improving the market" they really mean understanding the market. This ties back to the setting of priorities and who should be charged with it. She recommended adding more variables to define what "emerging" means versus "mature". Co-Chair Ostrander said defining emerging technologies is important but did not think the TRL was the way to go about it. Jorge Corredor said he would phrase "improving the market" as developing strategies to encourage market acceptance or market adoption of such new technologies. One of the ways of addressing this is the development of standards and standard reference materials. He also noted the importance of models for validation. Danielle Dickson said the Unified Forecast System might be a good example of how to transition models to operations faster. Amy Trice suggested that perhaps the OPC might be the place where priorities are set given that it is a higher level than NOPP.

Ed Saade noted that there is an extensive amount of public-private partnerships that have to do with accomplishing goals, not just inventing technology or doing research, such as 3DEP.

Ana Spalding suggested clarifying the usage of "industry" in the report to reflect the diversity of the private sector. Categorizing which types of partners are best suited for which types of priority or TRL stage would add some clarity to the report.

Danielle Dickson said she wanted to better understand the mechanisms available under different departments involved in ocean research. Co-Chair Glackin said each agency has pretty much the same set of tools. Sandra Knight said that labs have special contracting mechanisms available to them that operational organizations typically do not.

Deerin Babb-Brott said culture is another topic to consider raising. Making partnerships a more pleasant experience is not something that can be legislated but initiating the conversation at places like the OPC could lead to positive results.

Danielle Dickson asked the ORAP where they might look to include language in the report around opportunities for workforce development. Co-Chair Ostrander said that the White House just released a new strategy for advancing STEM education and cultivating STEM talent, which includes a section on workforce development. The topic is very large and he did not feel ORAP could do it justice in this report.

Maria Tzortziou asked if they should keep the term "emerging technologies" or change it to impactful technologies. Co-Chair Ostrander said they should keep the term emerging since it was in the initial task from OPC. But ORAP has a lot of space to define "emerging" how they see fit.

ORAP Discussion and Next Steps

ORAP Co-Chairs & Members

Co-Chair Glackin said the BOT report should be ready to be formally accepted at the next ORAP meeting. The ORAP Co-Chairs will be closely monitoring developments with the incoming administration and will make plans to re-launch the data report at an appropriate time. ORAP members should be assembling their own ideas on future topics, while also being prepared for taskings from the new administration. She noted that the current administration decided not to fill the open ORAP seat from the current slate but rather have a call for new nominations.

The next ORAP meeting is tentatively scheduled to be held virtually on April 29 and 30, 2025.

Adjourn

Viviane Silva (DFO) & ORAP Co-Chairs

Ms. Silva adjourned the meeting at 9:55 a.m.

“I hereby certify that to the best of my knowledge, the foregoing minutes are accurate and complete.”

Viviane Silva, ORAP DFO, January 31, 2025

Chris Ostrander, ORAP Co-Chair, January 31, 2025

Mary Glackin, ORAP Co-Chair, February 18, 2025