Directorate for Engineering Advisory Committee Meeting

National Science Foundation
Alexandria, Virginia, April 4-5, 2024

ENG AdCom Members Present:
Dr. Robin Coger (Chair)
Dr. Lance Pérez (Co-Chair)
Dr. Gretchen Baier
Dr. Stephan Biller
Dr. Dianne Chong
Dr. Karina Edmonds
Dr. Cynthia Furse
Dr. Samuel Graham (Day 2)
Dr. Kimberly Jones
Dr. Tsu-Jae King Liu
Dr. James R. Martin II
Dr. Sanjay Natarajan
Dr. Ismael Pagán-Trinidad
Dr. Donna Riley
Dr. Bruce Tromberg

ENG Senior Staff Present:
Dr. Susan Margulies (Assistant Director)
Dr. Don Millard (Deputy Assistant Director)
Dr. Daniel Linzell
Dr. Anthony Maciejewski
Dr. Sohi Rastegar
Dr. Mihail Roco
Dr. Jeanne VanBriesen
Dr. José Zayas-Castro

Not present:
Dr. Charles Bott
Dr. Bika Carter
Dr. Gregory Keoleian
Dr. Danielle Merfeld
Dr. Franklin (Lynn) Orr
Dr. Julie Ross

Thursday, April 4, 2024

The meeting convened at 10:00 a.m.

CALL TO ORDER

Dr. Robin Coger called the meeting to order and welcomed everyone. She introduced the new Advisory Committee Member, Dr. Sanjay Natarajan from Intel. Advisory Committee Members and ENG leadership introduced themselves. The committee unanimously approved the minutes of the Fall 2024 meeting. **Dr. Susan Margulies** reviewed the agenda with the committee members.

DIRECTORATE FOR ENGINEERING REPORT

Dr. Susan Margulies, NSF Assistant Director for Engineering, described the organization of the directorate and introduced new staff and open positions.

She gave an overview of the NSF and ENG research budgets. She gave an overview of the Directorate statistics including the number of proposals received, number of panels, number of awards made, and overall funding rates. She mentioned that NSF does not yet have an enacted FY 2024 budget but there is an expected cut from the FY23 budget. She described ENG activities and investments in terms of the directorate's strategic goals and priorities. She highlighted the ongoing and new partnerships that NSF has with other NSF Directorates, through ENG center awards, and through collaborations with other federal agencies and other entities. She presented opportunities for engagement with NSF and encouraged correspondence with NSF Program Directors.

Discussion
The committee remarked on the breadth of programs supported by the Directorate. They asked about the role of NSF on the National Bioeconomy Board, and Dr. Margulies explained how ENG and other NSF Directorates have been involved in promoting fundamental and translational research in the bioeconomy space. The committee enquired about the reason for declining proposal submission rates and how the current ENG funding rate compares to the rest of NSF. NSF staff noted that the decline in submission rates is consistent across NSF and can be partially explained by a shift to continuous submissions. The committee discussed options for increasing awareness of NSF funding opportunities, such as doing more outreach. The committee discussed the importance of supporting early career investigators when funding for scientific research is flat or decreasing.

NSF BUDGET UPDATE

Mr. Antony DiGiovanni, Deputy Division Director, NSF Budget Division, described NSF's budget activities in the context of the U.S. federal budget process. He spoke about the three pillars constituting the basis of NSF's funding rationale presented to the White House Office of Management and Budget, Congress, and the National Science Board. He shared the FY 2024 enacted budget for NSF, which is lower than preceding year, and the FY 2025 budget request, which calls for an increase of over $1 billion. DiGiovanni also mentioned NSF's ongoing development of the FY 2024 current plan, which upon completion will facilitate access to allocated funds, and that internal planning for the FY 2026 budget request has begun.

Discussion
The committee discussed the enacted FY 2024 budget for NSF, expressing concern over the $500 million reduction. Mr. DiGiovanni emphasized the importance of allocating Congressional mandated funds effectively while navigating potential reductions. Questions about the impact of budget requests on final appropriations were raised, with Mr. DiGiovanni noting the limited influence of presidential requests on appropriations. The committee inquired about strategies used in the House and Senate, with DiGiovanni

noting differential support from certain members based on district interests. The committee voiced concerns about the impact of inflation on graduate students and suggested supplemental funding for existing projects in response to economic challenges.

BROADENING PARTICIPATION IN ENGINEERING: EPSCOR (ESTABLISHED PROGRAM TO STIMULATE COMPETITIVE RESEARCH) JURISDICTION ENGAGEMENT AND COLLABORATION

Dr. Sandra Richardson, Section Head for Research Capacity and Competitiveness, NSF Office of Integrative Activities, highlighted the crucial role of creating opportunities beyond research within the NSF ecosystem. She emphasized the significance of workforce development and training and extending partnerships beyond the EPSCoR system. Dr. Richardson gave an overview of EPSCoR, including its current jurisdictions, and the history of eligible cohorts since the 1980s. She underscored the collective responsibility of NSF to invest in these jurisdictions, citing that the EPSCoR program only makes up 2% of the total NSF budget. Dr. Richardson elaborated on EPSCoR provisions in the CHIPS and Science Act, emphasizing gradual funding increases to the program and capacity building prioritization. She outlined the members and goals of the NSF EPSCoR Strategy, Engagement, and Consultation Working Group and detailed implementation plan strategies to support research capacity building. Dr. Richardson concluded by highlighting key opportunities for engagement with EPSCoR.

Dr. José Zayas-Castro, Division Director, NSF Division of Engineering Education and Centers, outlined the implementation activities for NSF ESPCOR provisions within the engineering directorate. He emphasized the goal to enhance funding and opportunities for EPSCoR jurisdictions, aligning with the distribution of ENG-supported faculty nationwide. Zayas-Castro highlighted the engagement of various stakeholders at NSF in data-informed approaches to support ENG programs and contribute to NSF spending targets. He elaborated on the alignment of ENG with the goals of NSF EPSCoR and strategies employed by ENG to achieve these objectives.

Discussion

Dr. Coger moderated the discussion. The committee discussed strategies to promote collaboration between EPSCoR and non-EPSCoR institutions. Dr. Coger emphasized the importance of articulating the purpose behind such collaborations, highlighting the need to maintain national competitiveness in advancing cutting-edge research. Dr. Richardson underscored that the EPSCoR program is not solely responsible for support but aims to cultivate pathways to funding across NSF through partnerships and agency-wide efforts. Various suggestions were proposed by the committee, including appointing point persons for facilitating collaborations, addressing resource limitations for smaller institutes, and ensuring equitable access to opportunities. Concerns were raised regarding capacity building, opportunity hoarding, and transparency in collaborations. Ideas were floated to incentivize collaborations, improve grant submission processes, and engage industry partners. The committee emphasized the importance of fostering collaborations while benefiting the broader research community and suggested strategies for achieving systemic change and accountability within institutions.

PARTNERSHIPS: EXPANDING NSF INTERN

Lance Pérez, ENG Advisory Committee Co-Chair, introduced the panelists**.**

Dr. Prakash Balan, Program Director for NSF INTERN, NSF Division of Engineering Education and Centers, presented on the NSF INTERN program, highlighting the pivotal role of graduate students within NSF and acknowledging the evolving job market where a significant percentage of graduate students do not pursue academia. The INTERN program was introduced to address this need by providing professional development opportunities for graduate students while in school. Dr. Balan outlined the program's model, funding structure, and benefits for both students and host organizations. He discussed the diverse range of host organizations involved and the program's statistical impact across NSF, including investments in EPSCoR states and partnerships with other federal agencies. Furthermore, Dr. Balan highlighted the impactful outcomes of the INTERN program on students, faculty, and institutions, including publications, invention disclosures, and strengthened partnerships with host organizations.

Elisabet Metcalfe, Communications and Stakeholder Engagement Lead, DOE Geothermal Technologies (GTT) Office, shared insights into the office's implementation of the INTERN program in Fall 2022. She discussed the challenges faced in rolling out small grants due to limited funding mechanisms at the DOE. However, by leveraging a memorandum of understanding (MOU) between NSF and the DOE Office of Energy Efficiency and Renewable Energy, language was added for GTT to participate in the INTERN program, resulting in funding for 14 students. Ms. Metcalfe highlighted the diverse cohort of students who gained real-world experience in various sectors of geothermal energy. She emphasized the program's positive impact on students' career trajectories, as they were able to apply scholarly expertise and gain firsthand exposure to the field's passion and mission, ultimately motivating them to pursue careers in renewable energy. Ms. Metcalfe expressed anticipation for a larger cohort in the upcoming year and emphasized the enduring benefits of the program for both students and the broader geothermal energy sector.

Dr. Olivia Graeve, Professor of Mechanical and Aerospace Engineering, University of California, San Diego, shared insights into the successes of the INTERN program within her research group. She highlighted the experiences of three students who participated in the program and discussed their career advancements. Dr. Graeve emphasized the continued collaboration with host organizations, showcasing the positive impact of the INTERN program on her research lab and students' career trajectories.

Dr. Ruth Pachter, Senior Scientist, Materials and Manufacturing Directorate, Air Force Research Laboratory (AFRL), provided insights into the structure and organization of AFRL, along with details about the AFRL INTERN program and the number of students hosted. She highlighted examples of INTERN students at AFRL and discussed their research projects, emphasizing the positive impact of the program on student development. She elaborated on the outcomes of the program, including collaboration development, idea generation, and interaction among students from various programs.

She also mentioned the creation of pathways for hiring at AFRL and expressed hopes for the program's growth.

Mr. Van Blackwood, Tech Advisor at Air Force Office of Scientific Research (AFOSR), echoed the sentiments of others that the INTERN program has brought great value and new collaborations to AFOSR.

Discussion

Dr. Lance Pérez, ENG Advisory Committee Co-Chair, led a discussion focusing on enhancing participation in the program and overcoming barriers. Key points raised included strategies to involve more faculty and increase participation among master's students. Dr. Balan highlighted the need for increased awareness of the INTERN program, and that master's students typically do not participate due to time constraints. Ms. Metcalf emphasized the importance of NSF's role in recruitment and suggested targeting agencies like NASA to enhance visibility. Concerns about the duration of internships and whether they were long enough, particularly for lab programs that require safety training, were also addressed. The committee highlighted the need to engage undergraduates, suggesting collaboration with industry through programs like REU. Discussions also touched on differences between the NSF GOALI program and the INTERN program and how to contend with advisors who may not support the participation of their students in this program. Overall, the committee expressed enthusiasm for the program's potential to accelerate engineering research impacts and workforce development.

RESEARCH: TRANSLATION AND IMPACTS OF FUTURE MANUFACTURING RESEARCH

Dr. Robin Coger introduced the next session and the panelists.

Dr. Willilam Olbricht, Deputy Division Director, NSF Division of Chemical, Bioengineering, Environmental and Transport Systems (CBET), discussed the NSF Program on Translation and Impacts of Future Manufacturing. He outlined the program's focus on supporting projects that advance fundamental research and education to catalyze innovative manufacturing approaches. These initiatives aim to overcome current barriers in manufacturing, leading to transformative capabilities and significant departures from existing practices. Dr. Olbricht outlined potential outcomes include expanding job opportunities and bolstering U.S. leadership in advanced manufacturing.

Dr. Andrew Wells, Program Director, NSF Division of Civil, Mechanical and Manufacturing Innovation (CMMI), highlighted three thrust areas of the Translation and Impacts of Future Manufacturing program: cyber, eco, and bio-manufacturing, emphasizing their increasing importance. He discussed various award tracks, including recent additions, and highlighted ENG's role in fostering partnerships across NSF divisions. Dr. Wells provided statistics on awards, funding, and institutional demographics, along with examples of noteworthy projects.

Two awardees shared insights into their work post-receiving NSF Translation and Impacts of Future Manufacturing grants.

Dr. Junhong Chen, Crown Family Professor of Molecular Engineering, University of Chicago, discussed the faculty team members involved in a project focused on growing biodegradable electronics. He highlighted the training received from the program and showcased their work. Dr. Chen spoke about the project as circular eco-manufacturing concept, which addresses food insecurity, electronic waste, and supply chain interruption. He also mentioned cross-lab interactions, publications, and education and outreach activities as integral components of their project.

Dr. Marianthi Ierapetritou, Gore Centennial Chair in the Department of Chemical and Biomolecular Engineering, University of Delaware, introduced the team of principal investigators and students involved in their project. She outlined their vision to revolutionize chemical manufacturing by designing bio-based processes that are both environmentally and economically optimal. Emphasizing the significance of the chemical industry to the national economy, she discussed the potential impacts of their research on future manufacturing practices and its implications for education and workforce development. Their approach takes into consideration the economic and societal aspects of their research endeavors.

Discussion
Dr. Robin Coger moderated the discussion.

The committee explored strategies to enhance the impact of the Future Manufacturing Program. Suggestions included fostering collaboration between AI and manufacturing communities, implementing new methods for rapid commercialization, and incorporating life cycle analysis (LCA) and techno-economic analysis (TEA) early in the research stage. Dr. Chen emphasized the importance of involving LCA and TEA experts in evaluating different manufacturing approaches, while Dr. Ierapetritou highlighted the need for fair economic comparisons between existing and emerging technologies. The committee also discussed the representation of synthetic biology techniques in the manufacturing portfolio and the role of NSF funding in facilitating faculty engagement and industry partnerships. They emphasized the importance of scaling programs, recruiting industry partners, and disseminating program outcomes effectively to improve engineering education and workforce development initiatives.

REPORTS FROM ADVISORY COMMITTEE LIAISONS

Dr. Kimberly Jones, Chair of the Advisory Committee on Environmental Research and Education (AC-ERE), provided insights into the committee's initiatives and projects within NSF. She highlighted ongoing efforts in sustainability and strategic planning, emphasizing the need to address environmental impacts of research beyond travel, such as computing and chemical disposal. Jones discussed potential collaborations with NASEM and efforts to engage across NSF directorates to raise awareness of environmental research concerns. She asked NSF to consider requiring researchers to address the environmental impacts of their proposed research in proposal submissions.

Discussion
Dr. Coger moderated the discussion. The committee explored avenues for broadening outreach to increase awareness, including engaging industry members, and leveraging existing NSF programs like the Innovations in Graduate Education program for dissemination. Discussions touched upon best practices, including those for shared research facilities, and strategies to promote sustainable methods, acknowledging variations in university resources. Suggestions were made to tap into industry contacts through programs like Frontiers of Engineering.

Dr. Coger explained that the liaison for the Committee on Equal Opportunities in Science and Engineering (CEOSE), James Martin, could not be there, but provided a report. The report stated that the latest biennial CEOSE report was completed last summer and that the next report will be finished soon. The next report will be focused on rural America and persons with disabilities, with plans to discuss it at the Fall Advisory Committee meeting. The report also mentioned changes in membership and announced a new Chair and Co-Chair for the committee.

Dr. Coger explained that the liaison for the Advisory Committee for Cyberinfrastructure, Samuel Graham, could not be there. Dr. Coger mentioned that Dr. Graham is a new representative for this committee and will start next week, so his first report will be at the Fall Advisory Committee Meeting.

STRATEGIC RECOMMENDATIONS FOR ENG

Dr. Pérez invited the committee members to share recommendations.

The committee, led by Dr. Pérez, discussed several recommendations around the need to address budget reductions impacting research, suggesting that NSF provide supplements to existing grants. Furthermore, the committee advocated for maintaining a balanced research portfolio, supporting diversity and inclusion efforts, and expanding partnerships with industry and academia.

The committee suggested enhancing communication efforts to disseminate the impact of ENG-funded work more effectively. Ideas included utilizing platforms like Ted Talks and plain English videos, reviving programs like Nuggets for research highlights, and leveraging NSF-funded initiatives to improve researchers' communication skills. They also proposed exploring new channels such as social media and implementing innovative communication methods like YouTube videos to reach diverse audiences, including small and medium-sized businesses.

The committee also made recommendations around helping researchers find the right funding opportunities, such as improving the NSF website organization and implementing a generative AI concierge chat bot service to assist with finding the appropriate solicitations.

They highlighted the importance of aligning engineering education with workforce needs and suggested initiatives to support primarily undergraduate and minority-serving institutions. Additionally, they

discussed the importance of promoting experiential learning in engineering and utilizing technology to enhance marketing efforts for the engineering profession.

PREPARATION FOR DISCUSSION WITH THE DIRECTOR'S OFFICE

Dr. Coger invited the committee members to share recommendations for the NSF Director's Office.

The committee discussed several potential themes to bring up in their meeting with the NSF Director's Office. They wanted to know how the Director's office is thinking about upcoming budget cuts, emphasizing the central role of the Engineering Directorate in research innovation and translation. They discussed the importance of educating the engineering workforce for current and future demands and stressed that trainees and early career researchers need to be prioritized and paid appropriately, or they will be lost to other disciplines. The spoke about the necessity of NSF funding and partnerships for small and medium-sized enterprises. The discussion delved into topics such as workforce upskilling, resilience in the supply chain, and the transition of projects from ENG to other directorates like TIP. The committee underscored the need for broadening participation in STEM in the face of political challenges, and the dissemination of best practices to engage a wider audience. The committee settled on three themes to bring up with the Director's office:

1. Strengthening Partnerships: The committee underscores the importance of fostering existing collaborations while actively seeking out new ones, particularly within industry. The committee advocates for expanding these partnerships to drive innovation and address evolving challenges.
2. Navigating Budgetary Constraints: Amidst shrinking budgets and their ramifications on national and global landscapes, the committee underscores the imperative of strategic prioritization. They highlight the critical link between budgetary decisions and, diversity, equity, and inclusion (DEI) efforts, emphasizing the need for a diverse workforce to drive innovation and economic growth.
3. Defending DEI Initiatives: The committee will discuss the politicization of DEI initiatives and higher education. They stress the significance of safeguarding the integrity of DEI work within NSF and beyond, particularly in the face of external challenges and pressures. Additionally, the committee acknowledges the vital role of programs like EPSCoR in advancing these initiatives.

The meeting adjourned for the day at 6:00 p.m.

Friday, April 5, 2024

The meeting reconvened at 8:30 a.m.

ENGINEERING COMMUNITY IDEAS

Dr. Robin Coger moderated the discussion and asked the committee about what focus topics would like to see presented in the upcoming Advisory Committee Meetings.

The committee suggested on overview of the Diversity, Equity, and Inclusion (DEI) activities funded by ENG and proposed a systems view presentation of the engineering directorate's portfolio, emphasizing mapping projects by topic areas to enhance diversity and aid portfolio management.

They suggested a presentation about NSF programs that support the use of AI in engineering education and research, and about addressing ways to reach more individuals and fix the leaky pipeline in STEM careers. The potential leadership role of ENG in AI research was also considered, along with suggestions for forming subcommittees on AI to increase outreach and diversify thought and improve understanding of return on investment in technology tools. Energy implications of AI and ENG's potential leadership role in reducing energy costs were discussed, along with recruitment, retention, and broadening NSF's reach to traditionally unfunded institutions and researchers. They also explored the future impact of AI on education, research, and communities, highlighting its integration into daily life and K-12 education.

The committee also advocated for using various technologies, including AI and AR/VR, to reach underserved populations, prepare K-12 students for engineering, and enhance mentorship standards for personalized learning through AI.

EDUCATION AND WORKFORCE DEVELOPMENT: RESEARCH EXPERIENCES FOR UNDERGRADUATES (REU) AND RESEARCH EXPERIENCES FOR TEACHERS (RET) SITES AND INDUSTRY COLLABORATIONS

Amelia Greer, Program Director for Workforce Development, NSF Division of Engineering Education and Centers, focused on expanding workforce development through partnerships, focusing on three key factors: awareness, access, and capacity. She highlighted the impact of Research Experiences for Undergraduates (REU) and Research Experiences for Teachers (RET) Sites, and gave details about these programs, including participant demographics, program outcomes, and the role of ENG in funding. Dr. Greer emphasized the importance of partnerships in magnifying the impact of these programs, both directly and indirectly driven by NSF or PIs, and discussed their benefits of partnerships to the REU and RET initiatives.

Todd Younkin, President and CEO, Semiconductor Research Corp. (SRC), provided an overview of SRC's mission to support semiconductor research, education, and workforce development. He discussed the values and strategic vision driving SRC's efforts to cultivate future innovators. Dr. Younkin highlighted the NSF-SRC REU partnership, outlining its timeframe, funding model, and student cohorts, as well as the challenges faced in maximizing student participation. He emphasized the need to address issues related to funding timing and industry collaboration to accelerate progress in workforce development.

Erin Solovey, Associate Professor of Computer Science, Worcester Polytechnic Institute, discussed her role in running an RET site and provided insight into her background and research interests. She emphasized the impact of the RET site program on participating teachers, highlighting its structure and activities. Dr. Solovey detailed the involvement of pre-service teachers and high school STEM teachers in the program, along with the activities offered. She also outlined the activities and timeline of the summer research experience, as well as the ongoing engagement of teachers throughout the academic year. Additionally, Dr. Solovey mentioned the efforts of the RET industry advisory board to align program activities with workforce needs.

Discussion:
Dr. Robin Coger moderated the discussion.

The committee discussed the expansion and effectiveness of the REU and RET programs. Dr. Greer highlighted efforts to enhance diversity and partnerships within the programs, including initiatives to engage historically Black colleges and universities (HBCUs) and minority-serving institutions (MSIs). The committee discussed the challenges of increasing awareness and participation in these programs, suggesting potential partnerships with national organizations and industry to broaden reach. The committee also had questions about mentor training and curriculum sharing by the RET teachers. Dr. Greer emphasized the importance of school support and the need for practical resources to implement program outcomes effectively. Suggestions for future improvements included fostering partnerships with community colleges and industry, better tracking participants, as well as maintaining a cohort model to ensure program effectiveness.

PREPARATION FOR DISCUSSION WITH THE DIRECTOR'S OFFICE

Robin Coger, ENG Advisory Committee Chair, reminded the committee of the themes that they started developing yesterday that they will be bringing up with the Director's Office, including:

1. Strengthening Partnerships
2. Navigating Budgetary Constraints
3. Defending DEI Initiatives

The committee met in small groups to develop these themes further.

PERSPECTIVE FROM THE DIRECTOR'S OFFICE

Dr. Margulies introduced NSF Operating Officer Karen Marrongelle and Chief of Staff Brian Stone. Everyone introduced themselves.

Dr. Marrongelle thanked the committee members for their service and welcomed any advice. She mentioned the discussion from the previous meeting around the importance of industry partnerships and the importance of engineering education.

Dr. Coger thanked the Director's Office team for being there. She talked about the three themes that they plan to discuss: The budget, partnerships, and polarization.

Dr. Pérez raised concerns about the impact of budget constraints on the Engineering Directorate's ability to maintain its competitive edge in critical technological areas. The committee emphasized the importance of strategic investments in fundamental research to foster innovation and economic growth, advocating for a more unified and targeted approach to advocacy efforts.

Dr. Marrongelle expressed disappointment with the budget, emphasizing the critical need to maintain advantages and catch up in competitive fields. She highlighted the budget's failure to reflect the true state of affairs and stressed the importance of investing in fundamental research to stay ahead in current industries and foster new ones. Despite the challenges, Karen underscored the $9 billion still available for spending and advocated for continued investment, urging a coordinated approach to identify areas for cuts while emphasizing the budget cuts cannot continue in the future of NSF.

Dr. Jones turned the discussion to the importance of partnerships with industry to address budget shortfalls and promote a robust research ecosystem. She also highlighted the need for workforce development and funding engineering education to train the next generation of engineers.

Dr. Graham emphasized the role of basic science and engineering in driving innovations, often facilitated through partnerships. He highlighted a shift towards research security and export control, which could potentially restrict certain activities. He stressed the importance of the NSF in finding a healthy balance between innovation and addressing social, economic, and national security needs of the United States.

Dr. Marrongelle highlighted that the Engineering Directorate (ENG) serves as a connector between basic science and real-world applications. She acknowledged the tension between prioritizing security and fostering innovation, emphasizing the need for a sophisticated approach, especially in collaborations with other countries.

Mr. Stone stated that ENG is well placed to partner with other agencies because engineers are known as problem solvers. He also mentioned that Dr. Margulies is an advocate for keeping critical issues in engineering at the forefront and advocating for partnerships.

Dr. Riley expressed concerns about the politicization of engineering research and the negative consequences of politicizing higher education. She highlighted the importance of broadening participation in engineering as both a workforce development and long-term economic development issue. She emphasized the need for inclusive collaboration and education to safeguard intellectual property and ensure future investments. Dr. Riley called upon NSF to take a leadership role in convening

higher education and other stakeholders to underscore the importance of engineering research and education.

Dr. Marrongelle emphasized the need to raise awareness across various communities about the significant impact of the budget cuts. She expressed agreement with the idea of NSF taking a leadership role in addressing the politicization issue and indicated her intention to discuss it further. Despite bipartisan support, Karen clarified that the budget reduction was a result of a mathematical calculation rather than punitive measures against NSF. She stressed the importance of doubling down on their advocacy efforts and maintaining unity in their messaging.

Dr. Marrongelle and Mr. Stone thanked the committee and said that they would walk away energized by the ideas the committee has brought forth.

STRATEGIC RECOMMENDATIONS FOR ENG

Dr. Coger invited the committee members to share recommendations.

The committee recommendations revolved around three key themes: communication, reach, and leverage, which are interconnected. They suggested ways to streamline partnership building, such as developing templates for working with companies and utilizing associations to congregate different parties. Challenges around partnerships such as legal issues, industry involvement in the review process, and the need for bespoke partnerships were also addressed. Suggestions included standardizing agreements and expanding relationships with existing partners. The committee highlighted the importance of industry partnerships in addressing workforce needs, improving education, and tackling societal challenges. They proposed various strategies for enhancing communication, including speaking at industry events and improving the NSF website. Additionally, they discussed the complementary roles of the ENG and TIP directorates and suggested exploring this further in future meetings.

CLOSING REMARKS

Dr. Margulies thanked the committee members and the NSF team for their engaging comments and for providing them with direction. She thanked the outgoing Advisory Committee Members, Charles Bott, Bika Carter, Lynn Orr, and Ann Kelleher, and thanked José Zayas Castro, as it will be his last meeting before he rotates off.

She announced the next meeting of the Advisory Committee will take place on September 19-20th.

The meeting adjourned at 1:00 p.m.