

February 14, 2022

The Honorable Jennifer Granholm
Secretary
U.S. Department of Energy
1000 Independence Ave, SW
Washington, DC 20585

Dear Secretary Granholm,

Congratulations on establishing the new Office of Clean Energy Demonstrations. The creation of OCED just a few weeks after it was authorized and funded by Congress is an excellent achievement. As we said in our November 2021 letter, OCED will be unlike any other office at DOE, bridging the gap from R&D to the commercial market by providing funding and financial, market, and program management expertise to demonstrate innovative clean energy technologies on a large scale.

We write to further elaborate on a few of the principles outlined in our original letter and white paper, based on our continuing engagement with the Congress, DOE's program offices, and stakeholders across the country. In the attached white paper, we provide three additional recommendations on risk management, stakeholder and community engagement, and industry technical assistance, which we see as essential to the success of OCED and the eventual full deployment of the technologies. ITIF would like to acknowledge the contributions to this document from a diverse group of clean energy technology policy experts from the Bipartisan Policy Center, Breakthrough Energy, C3 Solutions, Carbon Capture Coalition, ClearPath, Clean Air Task Force, Energy Futures Initiative, Environmental Defense Fund, Natural Resources Defense Council, Nuclear Innovation Alliance, and Third Way.

We would be pleased to meet with you or members of your staff to discuss our additional recommendations in more detail and explore ways in which we can support DOE in building an OCED with the tools and expertise it needs to successfully solicit, select, and manage large-scale demonstration projects.

Sincerely,

David Hart, Director, and Jetta Wong, Senior Fellow, Center for Clean Energy Innovation, ITIF

CC: Deputy Secretary, David Turk; Under Secretary for Science and Innovation, Geraldine Richmond; Acting Under Secretary for Infrastructure, Kathleen Hogan; Acting Director of the Office of Clean Energy Demonstrations, Kelly Cummins; Director of the Loan Programs Office, Jigar Shah; Director of the Office of Technology Transitions, Vanessa Chan; Acting Assistant Secretary for the Office of Energy Efficiency and Renewable Energy, Kelly Speakes-Backman; Acting Assistant Secretary for the Office of Electricity, Patricia Hoffman; Acting Assistant Secretary for the Office of Nuclear Energy, Kathryn Hoff; Acting Assistant Secretary for the Office of Fossil Energy and Carbon Management, Jennifer Wilcox; Director of the Office of Management, Ingrid Kolb; Secretarial Advisor on Equity and Deputy Director for Energy Justice, Shalanda H. Baker; Chief Human Capital Officer, Erin Moore; and Principal Deputy Director for the Office of Policy, Carla Frisch.

Attached: DOE Office of Clean Energy Demonstration: Additional Recommendations

Risk Management Strategies

Original Recommendations from ITIF Letter to DOE

To achieve the principles and implementation recommendations identified in the November 2021 ITIF letter to DOE OCED should develop risk management strategies that can be incorporated into the project management responsibilities of the office. These strategies will help ensure a balanced and diverse technology portfolio, reduce perceived and political risk of OCED projects, and build public trust by making the OCED project management process as transparent as possible (specific original principles and implementation recommendations are at the end of paper).

Problem

Given the short timeframe available to meet the goal of net-zero carbon emissions by 2050, our government must invest in a broad swath of clean energy projects, including some that are likely to fail, to support an aggressive pace of energy innovation. Allowing for risk in OCED's portfolio is essential for the office's success. Innovation is intrinsically an uncertain process and therefore some degree of failure is unavoidable. At one extreme, with a high degree of uncertainty, the failure rate of research projects is estimated to be as high as 85-90%.¹ At the other extreme, the failure rate of the complete portfolio of LPO projects is only 3%. All investments require some degree of risk, whether it be investments in venture-backed clean energy companies,² experimental drug trials,³ or even highly-liquid corporate bonds.⁴ If OCED were to have no projects that failed, that would be a signal that is taking far too little risk to accomplish its mission.

Recommended Strategies

Portfolio approach to managing risk

OCED should measure success at the portfolio-level, rather than at the project-level. The familiar and widely publicized failure of the Solyndra loan guarantee ignores the many successful loans made by LPO, including the loan made to Tesla, now one of the world's most valuable automobile companies. For this reason, OCED should avoid discussion of "success" and "failure" of individual projects and instead focus on investing in a portfolio of projects that allows for some degree of risk.

¹ [Research funding: the problem with priorities](#), Nature Materials, 2, 639, October 2003.

² A 2016 study found that over 80% of U.S. venture-backed clean energy companies failed from 2006 to 2011 -- B. Gaddy et. al., [Venture Capital and Cleantech: The Wrong Model for Clean Energy Innovation](#), MIT Energy Initiative, July 2016.

³ A 2019 study found that 50% of all experimental drugs developed by biopharmaceutical companies fail in Phase III trials -- A. Seyhan, [Lost in translation: the valley of death across preclinical and clinical divide – identification of problems and overcoming obstacles](#), Translational Medicine Communications, November 2019.

⁴ The U.S. high-yield default rate was around 1% in 2021 -- <https://www.morningstar.com/articles/1073195/2021-the-year-in-bond-funds>.

A recent report from Deloitte lays out some principles to consider when designing a portfolio-driven approach to innovation in the public sector, including:⁵

- Investing in easily implemented innovation while simultaneously exploring disruptive technologies
- taking on longer-horizon, higher-risk initiatives offset by shorter-term, more certain projects
- ensuring efforts are complementary to each other, but not redundant

The report also cites the example of USAID's Bureau for Global Health as an example of a government organization that uses a portfolio approach to managing its innovation efforts: 70-90% of projects funded under its portfolio have a low to moderate level of innovation (and risk), and are focused on improving upon relatively well understood technologies, and 10-30% of projects funded under its portfolio have a high level of innovation (and risk), and are focused on inventing new solutions.⁶ OCED could consider structuring a portfolio of projects with similar levels of risk tolerance.

Milestone-based approach

OCED should adopt an approach that continually manages risk over the course of a project's progression. Accordingly, OCED could consider developing a milestone-based model⁷ for selection and management of some energy demonstration projects funded by OCED, was authorized in the Energy Act of 2020.⁸ The NASA COTS program could serve as a useful template for OCED to follow as it prepares to support numerous large-scale demonstrations.⁹ OCED should consider adopting the approach in DOE Order 413.3B for implementing milestone-based projects, given the well-established guidelines and procedures under this Order.

As an example, the stages for a milestone-based approach could be defined as follows: 1) Selection; 2) Pre-Front-End Engineering and Design (FEED) feasibility; 3) FEED; 4) Construction; 5) Commissioning; and 6) Operations. As another example, a report from the Nuclear Innovation Alliance (NIA)¹⁰ suggests the following stages for an advanced reactor demonstration program: 1) Early nuclear reactor design and development; 2) NRC licensing application pre-application interactions and application preparation; 3) Final regulatory approval and design finalization; and 4) Advanced reactor construction.

Similar to how the Office of Nuclear Energy's (NE) Advanced Reactor Demonstration Program (ARDP) milestone approach¹¹ was proposed, OCED should allow applicants to propose and negotiate their own milestone agreements, including the ability for applicants to propose their own milestones. Each stage

⁵ <https://www2.deloitte.com/us/en/insights/industry/public-sector/innovation-portfolios-public-sector-organizations.html>

⁶ Ibid.

⁷ Payment for milestones is one manner in which venture capital firms manage their investments that helps to simplify the task of evaluating progress as well as reduce the oversight requirements on the firm. See: <https://www.nuclearinnovationalliance.org/search-spacex-nuclear-energy>

⁸ See Section 9005 of [H.R. 133, the Consolidated Appropriations Act, 2021](#)

⁹ Report on the [NASA Commercial Orbital Transportation Services \(COTS\) program](#), February 2014.

¹⁰ <https://www.nuclearinnovationalliance.org/search-spacex-nuclear-energy>

¹¹ Advanced Reactor Demonstration, [DE-FOA-0002271](#)

should have clearly defined criteria related to technical, funding, hardware, and other relevant milestones required to be met before advancement to the next stage. These milestones should be developed at the project's onset with a diverse committee of experts guiding the process, and free from political influence.

Transparency: perceived risk and political risk

Under a milestone-based approach, projects may fail for a variety of reasons at each stage. Some examples include the failure to meet predetermined performance and cost targets, failure to adjust to a changing market, or failure to address regulatory barriers. Clearly articulating the criteria used for project selection, management, and performance evaluation to advance projects through each stage will help establish the credibility of the office externally with the public and with Congress and will help establish a culture of managed risk internally within the office. To aid in this, OCED could consider creating a public tracker that lists information about the stages of various demonstration projects being funded by OCED and the reasons for project termination, if and when that occurs, as an accountability mechanism.

It is important to note that the milestone-based approach will be successful only if DOE adheres to its own rules. A December 2021 GAO report found that under the Obama Administration, DOE did not adhere to its own cost controls for carbon capture demonstration projects that were designed to limit taxpayers' financial exposure, resulting in almost \$300 million spent above what was planned, even though projects were not meeting key milestones.¹² By measuring these projects against clearly established scopes, schedules, and budgets, and sticking to these criteria, DOE could have better managed its financial exposure. If DOE was transparent about the criteria to advance a project, it would be able to better defend itself from political interventions and support its staff making difficult go/no-go decisions on multi-million-dollar projects. A high degree of transparency would also help inspire more confidence in OCED's funding decisions by Congress and could be supported by periodic GAO reviews.

OCED might also consider hiring staff solely dedicated to external-facing public affairs and communications, similar to how the Office of Science and Office of Energy Efficiency and Renewable Energy have standalone Communications offices. In addition to serving common communications needs such as promoting funding opportunity announcements, a communications function for OCED should also be charged with developing communication methods and materials that help maintain transparency and establish public trust.

Implementing Partners

In implementing a milestone-based approach to funding demonstration projects, OCED should consider partnering with staff from NASA who are familiar with the successful COTS program. OCED should also consider partnering with the Loan Program Office for input on incorporating considerations of financial feasibility and market-readiness into the selection process.

¹² U.S. Government Accountability Office, GAO-22-105111, [Carbon Capture and Storage: Actions Needed to Improve DOE Management of Demonstration Projects](#), December 2021.

Specific Implementation Recommendations from November 2021

The Risk Management recommendations will help OCED implement the following recommendations outline in the November 2021 letter to DOE.

Project Management Responsibility (Internal Process, Policy, and Structure): The OCED should solicit, select, and manage demonstration projects – owning the full lifecycle.

- In FY2022, the Implementation Tiger Team should evaluate the potential applicability of DOE Order 413.3B, Program and Project Management for Acquisitions of Capital Assets as an effective management tool for large-scale demonstrations.
- In FY2022, the OCED should establish an acceptable failure rate for the whole portfolio of projects conducted by the office. (As an example, the Senate proposed legislation for a Clean Energy Deployment Administration which included a 10% project default rate. Failures should be tolerated if managed appropriately. Information and lessons learned gathered from those failures should be used to benefit future projects.
- The OCED may carry-out its projects as Milestone-based demonstration projects (42 U.S. Code § 7256c) including termination criteria, risk/cost thresholds, and hardware, technical and financial milestones.

Technologies: The OCED should be technology inclusive, and it should focus on any clean energy technology that needs to be demonstrated at a large-scale and could feasibly play a significant role in achieving net zero emissions by 2050. When assembling its portfolio, OCED should consider energy technologies with applications across sectors, including power, transportation, buildings, and industry.

- In addition to authorized programs, OCED should ensure it manages a broad-based and balanced portfolio. Technologies demonstrated should address a broad range of energy end uses and approaches to greenhouse gas emissions reductions. The portfolio may also be balanced geographically and by degree of risk. Technology risk should be balanced with market and financial viability. Some technologies may be quickly transitioned to commercial application while others may need multiple or longer-term demonstrations.

Strong Stakeholder and Community Engagement

Original Recommendations from ITIF Letter to DOE

To achieve the principles and implementation recommendations identified in the November 2021 ITIF letter to DOE strong stakeholder engagement will be required. The recommendations below will clarify the need for a Federal Advisory Committee and solicitation requirements and propose additional technical assistance for communities (specific original principles and implementation recommendations are at the end of paper).

Problem

The United States has seen historic disinvestment and disproportionate climate and pollution impacts in low-income communities and communities of color. Minority and low-income populations are more likely to live in communities that bear the brunt of the pollution associated with energy consumption, leading to reduced air and water quality, health concerns, and overall decreases in quality of life. To combat these problems, efforts must be made to involve these communities in the siting and development of new energy infrastructure, to give them agency over what powers their communities and to prevent future pollution.

Communities and the public at large often don't know what federal assistance is available to them for energy and economic development. Local communities may not know about new opportunities for federal funding, or may be wary of government involvement or new energy development. It is important for project applicants, utilities, and federal, state, and local entities to understand the needs and interests of communities when considering starting a clean energy demonstration project nearby. Furthermore, engaging with the community is a way to incorporate local knowledge, recognizing that communities have better information about their energy and environmental needs than out-of-town businesses and governments.

Recommended Strategies

Federal Advisory Committee for OCED

As an alternative to creating a new FACA to prevent bureaucratic barriers from slowing down progress, advisory capabilities for OCED community engagement should be housed under the Secretary of Energy Advisory Board in its first year. After its first year, it should be reassessed whether OCED needs its own FACA. The FACA is not meant to conduct stakeholder engagement, it is meant to provide recommendations on *how* to conduct stakeholder engagement. OCED should separately have dedicated staff that conducts stakeholder engagement activities.

Stakeholder Engagement Solicitation Criteria

OCED should require incoming proposals to include a plan for stakeholder engagement and should consider this information as part of the evaluation process for a proposed project, with community engagement experts judging the quality of incoming proposals on this criterion.

Community Technical Assistance

OCED should provide technical assistance for communities that are interested in demonstration projects, have been identified as good sites for demonstration projects, or have received funding from OCED for a demonstration project. Special attention should be paid to EJ communities who may not have the resources to apply for or seek out funding and assistance, but would benefit from such resources as it pertains to demonstration projects. In addition, educational resources should be provided to such communities that may not know what technical assistance is available, to invite them to apply. This should be done in consultation with DOE's Office of Economic Impact and Diversity. OCED should consider partnering with the national labs to provide this TA, as appropriate. OCED should propose allocating funding for TA for communities in the President's FY23 budget request. Some possible mechanisms or case studies for direct technical assistance can be found in:

- A. IJIA Sec. 40321, which creates financial and technical assistance for siting nuclear reactors;
- B. Sen. Markey's LIFT Act, which would create a \$15 billion fund to provide \$500,000 grants to EJ communities for project pre-development and technical assistance;
- C. DOE's Communities LEAP program, which will provide \$16 million of Technical Assistance to help EJ communities transition to cleaner energy sources
- D. OCED should also recommend/require that applicants integrate community engagement or DEI principles (for example, in this [SuperTruck III FOA](#))

Regardless of the mechanism, OCED should provide direct technical assistance, including project pre-development assistance and education on project risks, risk mitigation, and co-benefits, to communities.

Additionally, OCED should follow the following principles and best practices when engaging with communities and providing technical assistance:¹³

- A. Principles
 1. Stakeholder relationships allow OCED to consider and adjust projects and programs to reflect public values, concerns, and ideas
 2. Informing and involving the public early in the process strengthens these relationships and improves the quality of public input
 3. Communities should participate as respected contributors in decision-making and should be provided with the resources for assessment, planning, evaluation, or other analysis as necessary through TA.¹⁴
 4. Community engagement should continue through the lifetime of the project to ensure continued relationships and accountability

¹³ "Waste Isolation Pilot Plant Stakeholder Outreach Plan," Department of Energy, https://wipp.energy.gov/WIPPCommunityRelations/documents/Rev.7_StakeholderPlan.pdf

¹⁴ Adapted from <https://www.ejnet.org/ej/principles.pdf>

- B. Best practices for stakeholder outreach
1. Equitably incorporate diverse people, voices, ideas, and information to lay the groundwork for quality outcomes and democratic legitimacy.
 2. Be clear and open about the process by making information publicly available and provide a public record of the organizers, sponsors, outcomes, and range of views and ideas expressed.
 3. Ensure each participatory effort has real potential to make a difference and that participants are aware of that potential, including through ensuring access to meetings (i.e., via early notification, timing, location, language, technology, etc.)
 4. Promote a culture of participation with programs and institutions that support ongoing quality public engagement.
 5. Educate communities about what projects entail, and what benefits the community will see as a result of the project.

Implementing Partners

In implementing the stakeholder recommendations OCED should work with the Applied Energy Offices, the Office of Economic Impact and Diversity, and if appropriate, the Department of Commerce Economic Development Administration.

Specific Implementation Recommendations from November 2021

The Stakeholder Engagement recommendations will help OCED implement the following recommendations outline in the November 2021 letter to DOE.

Strong Stakeholder Engagement: The OCED should have its own stakeholder engagement function. It should engage a diverse set of industry, technical, finance, NGO, labor, state government, and community stakeholders. Specifically, disadvantaged and frontline communities must be involved in shaping projects and gain the benefits of the demonstration of new technologies, while mitigating any local impacts.

- In FY2022, to ensure appropriate engagement, the OCED should establish a Federal Advisory Committee, which among other duties, would advise the office on **engagement strategies**, **suggest community best practices** for the development of demonstration projects, and recommend **community engagement criteria** to include in solicitations. The FACA would follow all normal conflict of interest policies.
- OCED should hire staff with expertise in working with vulnerable communities to inform outreach and engagement strategies with such communities.

Scaling Technology Through Industry Tech Assistance Support

Original Recommendations from ITIF Letter to DOE

To achieve the principles and implementation recommendations identified in the November 2021 ITIF letter to DOE a Scaling Technology Through Industry Tech Assistance program should be developed and implemented by OCED. The program will help ensure applications to OCED focus on large-scale demonstrations ready for commercialization, increase the variety of technologies submitted to the OCED, strengthen stakeholder engagement, validate that a market and customer exists for the technology, and reduce potential technical risks (specific original principles and implementation recommendations are at the end of paper).

Problem

DOE R&D funding is based on a technology push model. In order to scale new technology to be ready for demonstration and widespread deployment, companies need to have a more mature understanding of their market and customer demands – matching DOE’s technology push model with technology pull principles of the private sector.¹⁵ Therefore, before applying for a large-scale demonstration award, companies, especially those that traditionally have not engaged with DOE or the federal government, may need additional support to conduct activities in two main areas:

1. Market and customer/community analysis and engagement
2. Technology risk and performance based on customer requirements

Market and Customer/Community Analysis and Engagement

One of the most critical elements of commercialization is ensuring that there is a market and/or customer for a new product. With quickly changing markets and new evolving technology solutions deployed every day, it is essential that companies have up to date information on markets and potential customers. In fact, we know from Inspector General and Government Accountability Office reports that this was a critical factor in the failures of the Department of Energy’s Integrated Biorefinery Program (IBR). For example, a 2013 IG report found that “deteriorating market and financial conditions” were outside the control of DOE or the biorefinery project developers. This made it difficult to attract private sector partners and eventually contributed to the failure of the IBR Program.”¹⁶

Additionally, DOE has learned from many energy and infrastructure projects that getting community buy-in is a necessary step before the development of a traditional energy project, let alone a new energy technology. The experiences of wind developers in the northeast fighting over viewsheds, solar developers in the southwest working to protect tortoises, and hydropower developers around the country negotiating with farmers over water use, demonstrate how community concerns can make or break project development. Project developers must be responsible for constructively engaging with

¹⁵ National Academies of Sciences, Engineering, and Medicine 2021. *Enhancing Federal Clean Energy Innovation: Proceedings of a Workshop*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/25973>.

Norman Augustine, Email conversation on final draft of BPC Scaling Innovation Report, August 31, 2021.

¹⁶ DOE Inspector General, *Audit Report on "Follow-up Audit of the Department of Energy's Financial Assistance for Integrated Biorefinery Projects,"* Washington, DC, 2013. Available at: <https://www.energy.gov/sites/prod/files/2013/09/f2/IG-0893.pdf>

communities, yet don't always prioritize this and in some cases, especially when it comes to small new companies, do not have the time or resources for this kind of engagement. Likewise, communities often do not speak the same language as technology developers, nor do they have the technical expertise to evaluate a new energy technology project (see recommendation 2). The country can't afford to embark on multibillion dollar projects that could be shut down or delayed by unsupportive communities.

Technology risk and performance based on customer requirements

Technology companies should be well on their way to a commercial project by the time they are ready to apply for a large-scale demonstration grant from OCED. Yet, the valley of death between a prototype and commercial product is very steep with many obstacles. To be commercially viable, final designs ideally based on real-world facilities must be developed. Changes in materials used in new technologies must be tested, components of technologies must be integrated, and test cycles on integrated systems must be conducted. All these technical aspects may come after a pilot-scale, but before a large-scale demonstration and are often a result of new market demands, customer requirements, or lessons learned from the pilot. Therefore, companies may need additional assistance to evaluate these technical risks before moving to large-scale demonstration.

Additionally, technology projects may need to be tweaked based on customer requirements. For example, in *Flying Laboratories, Prototyping, and Dem/Val: The Crucial Role of Technology Demonstration in Advancing Military Innovation and Its Relevance for the Department of Energy*, by Dorothy Robyn, the development of the F-22 Raptor prototype to replace the F-15 fighter jet went through rigorous testing which refined performance requirements of the Air Force (i.e., the customer) that affect cost, weight, and technical risk. These Prototype Air Vehicles (PAVs) were built to “demonstrate that the projected performance was achievable, and the technology was mature.” These additional “trade studies” were critical to the final system specifications and conducted after the development of the prototype and before full-scale development.¹⁷

Recommendation

DOE should support several small grants (\$300-500k) for companies working to conduct the activities described above, and other challenges identified in collaboration with the applied energy programs. Some of these activities could be funded by OCED through national lab vouchers or contractors while other activities may need to be developed by the company and potentially with additional partners (i.e., customers or communities). This funding should not require a cost-share. It should be issued in FY2022 and be focused on developing the right partnerships, resources, and information to apply for the large-scale funding opportunities in OCED (i.e., storage, hydrogen, carbon, industrial). Deliverables should feed directly into the OCED application process. For example, customer and market analysis should clearly demonstrate a demand for a product or even a partnership which could end in a purchase order.

The benefit of this activity is that these funds will support a larger and more diverse group of companies preparing for large-scale demonstration. For example, a reduced or even eliminated match requirement

¹⁷ Bipartisan Policy Center. *Flying Laboratories, Prototyping, and Dem/Val: The Crucial Role of Technology Demonstration in Advancing Military Innovation and Its Relevance for the Department of Energy*, written by Dorothy Robyn, (Washington D.C. 2020).

could help small companies, which do not have a large balance sheet, participate in the program and ensure that they have a strong application going into an OCED solicitation. After they receive this kind of support, companies should be more prepared to apply for large funding opportunities and have stronger project partnerships in place to ensure adoption and smooth development of the demonstration projects.

Example Breakdown of Tech Assistance Support (numbers are arbitrary):

- Hydrogen Total \$20 M (40 companies)
- Storage Total \$30 M (60 companies)
- Carbon Total \$20 M (40 companies)
- Industrial Total \$30 M (60 companies)

Funding

OCED should lead this funding opportunity to ensure its potential applicants are developing the right information which will be required by OCED solicitations. Additionally, starting out with this kind of solicitation will help OCED build its internal capacity, which will in turn help OCED prepare for issuing the larger demonstration awards. The authorized technologies in the OCED from the IJJA and the Energy Act of 2020 should be prioritized for funding under this program and appropriations from IJJA should be used to fund this activity. In future years, to accomplish this, OCED should use a portion of its annual appropriations.

Implementation Partners

OCED should lead this funding opportunity with collaboration from OTT and the Applied Program Offices. Additionally, it should work with DOE laboratories to understand how applicants can tap into lab capabilities.

Specific Implementation Recommendations from November 2021

The Scaling Technology Through Industry Tech Assistance program will help OCED implement the following recommendations outline in the November 2021 letter to DOE.

Focus on large-scale demonstration: The OCED should focus on very large and complex projects that seek to validate the cost and performance characteristics of technologies and systems at commercial scale.

- OCED should prioritize projects that have market pull and a clear path to deployment after the large-scale demonstration.

Project Management Responsibility (Internal Process, Policy, and Structure): The OCED should solicit, select, and manage demonstration projects – owning the full lifecycle.

- The OCED selection process should start with an Independent Merit Review Panel. A majority of the reviewers should come from the private sector, additional reviewers should represent the Applied Programs, labs, and community groups. Selection criteria should include a mix of local engagement qualifications, technical feasibility, financial viability, a demonstrable market, and project management plans. Additionally, eligible projects must be led by the private sector.

Technologies: The OCED should be technology inclusive, and it should focus on any clean energy technology that needs to be demonstrated at a large-scale and could feasibly play a significant role in achieving net zero emissions by 2050. When assembling its portfolio, OCED should consider energy technologies with applications across sectors, including power, transportation, buildings, and industry.

- In addition to authorized programs, OCED should ensure it manages a broad-based and balanced portfolio. Technologies demonstrated should address a broad range of energy end uses and approaches to greenhouse gas emissions reductions. The portfolio may also be balanced geographically and by degree of risk. Technology risk should be balanced with market and financial viability. Some technologies may be quickly transitioned to commercial application while others may need multiple or longer-term demonstrations.

Strong Stakeholder Engagement: The OCED should have its own stakeholder engagement function. It should engage a diverse set of industry, technical, finance, NGO, labor, state government, and community stakeholders. Specifically, disadvantaged and frontline communities must be involved in shaping projects and gain the benefits of the demonstration of new technologies, while mitigating any local impacts.

- In FY2022, to ensure appropriate engagement, the OCED should establish a Federal Advisory Committee, which among other duties, would advise the office on engagement strategies, suggest community best practices for the development of demonstration projects, and recommend community engagement criteria to include in solicitations. The FACA would follow all normal conflict of interest policies.

Private Sector Engagement: Enhanced private sector collaboration and coordination should be a priority of the OCED. This should include engagement with the end users of these technologies to ensure that there is truly a commercial application.

- OCED should identify opportunities to appropriately provide information to the private sector on large-scale demonstration projects and the projects should be valued for their ability to provide critical data to the private sector and other stakeholders so the project can be improved upon and replicated.