



CLEAN TECH FUNDING PRIMER

A Guide for Early-Stage and Pre-Commercial Companies Developing Renewable Energy or Other Innovative “Clean” Technologies

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To the casual observer, it may appear as though federal government support for clean energy and related innovative technologies is on the wane. The Trump Administration's deregulatory agenda, including the rollback of the Clean Power Plan and withdrawal from the Paris Climate Agreement, threatens to reduce the focus on leveraging and collaborating with the federal government to drive much-needed and desired clean technology deployment. But this isn't the full story.

Congressional support for clean tech research and development (R&D) remains strong, as evidenced by level or increasing budgets for most of the relevant programs at federal agencies, including the U.S. Department of Energy (DOE) and Department of Defense (DoD). And despite earlier efforts to slow the pace of disbursing funds for grant recipients and other awardees, grant money at most agencies is now flowing at a rate in line with historical norms. Billions of dollars are available through grants, cooperative agreements, procurements and other transactions.

This primer is not a comprehensive guide to all federal funding opportunities. Rather, **it is geared toward early-stage and pre-commercial companies developing renewable energy or other innovative "clean" technologies** that save energy, reduce emissions or mitigate environmental damage. It is intended to serve as a companion to Holland & Knight's [Innovative Energy Financing Primer](#), which addresses government financing options including loans, loan guarantees, green banks and more. We encourage readers to view these publications as complementary, and note that opportunities for federal funding and federal financing may not be mutually exclusive.

For more information on opportunity assessment, project development assistance, government contracting and devising an effective strategy for leveraging non-dilutive government resources and procurement opportunities to commercialize and broadly deploy energy-related technology, contact Holland & Knight's Government Energy Finance Team. Holland & Knight's team has worked with companies to secure more than \$100 million in federal grants across dozens of projects and has worked on loan guarantee projects worth billions of dollars that have obtained conditional commitments from the programs set forth in this primer. Our team also has successfully leveraged government programs to obtain private sector financing.



Department of Energy

Office of Energy Efficiency and Renewable Energy

Application Process for All Energy Efficiency and Renewable Energy (EERE) Programs: Companies can apply for grants individually, or as part of a partnership or consortium with other eligible recipients, including universities and nonprofits. Note that many solicitations within EERE require cost sharing from non-federal sources.

The application process may include multiple phases, and require the submission of a letter of intent and a concept paper prior to the full application. Letters of intent do not commit a company to submit an application, but if they are required, then an applicant must submit one by the deadline to be eligible to submit a full application.

Concept papers are brief (5 pages or less) descriptions of the proposed project. This submission allows applicants to submit their ideas with minimal time and expense. If an applicant fails to submit an eligible concept paper, the applicant will not be eligible to submit a full application. After review, EERE will provide applicants with either an “encouraged” or “discouraged” notification, so the applicant can make an informed decision whether to expend additional resources to prepare a full application. An applicant who receives a “discouraged” notification may still submit a full application, though Holland & Knight would recommend doing so only after an iterative consultation process and subsequent encouragement from the department.

Full applications are typically due about two months after the concept paper deadline. These require significant amounts of technical detail and market analysis, and applicants should expect to spend considerable time preparing a successful application.

Advanced Manufacturing Office

Overview: The mission of the Advanced Manufacturing Office (AMO) is to “catalyze research, development, and adoption of energy-related advanced manufacturing technologies and practices to drive U.S. economic competitiveness and energy productivity.” It aims to improve the energy and material efficiency, productivity and competitiveness of manufacturers across the industrial sector. It achieves these goals by bringing together manufacturers, not-for-profit entities, research organizations and institutions of higher education to identify challenges, catalyze innovations and develop cutting-edge material, process and information technologies needed for an efficient and competitive domestic manufacturing sector.

By targeting efficient manufacturing technologies, AMO seeks to drive energy productivity improvements in the U.S. manufacturing sector, efficiently utilize available domestic energy resources and support the manufacture of clean energy products, with benefits extending across the economy.

Current Status: AMO received \$320 million in funding for Fiscal Year (FY) 2019, an increase of \$15 million over FY 2018. Within those funds, Congress directed AMO to allocate specific amounts to certain technologies and industries, including:

- \$20 million for a competitive solicitation to accelerate development of manufacturing processes to lower battery energy storage costs
- \$20 million for nanocellulosic feedstock materials made from forest products
- \$20 million for design and engineering of materials operating in harsh environments
- \$4.2 million for improvements in the steel industry

AMO's research portfolio encompasses these four broad categories:

- electric machines (advancements in electronics and motors for energy applications)
- combined heat and power
- next-generation manufacturing processes
- next-generation materials

Awards: Grants vary widely in both size and duration; in recent years, individual awards have ranged from \$150,000 to \$4.5 million and typically run from one to five years. However, the specifications of each grant or cooperative agreement are subject to successful negotiations with DOE.

Insights: While AMO received a modest 5 percent increase in funding from FY 2018, its appropriated level of \$320 million is a whopping 24 percent above the FY 2017 level. This is noteworthy for two reasons: First, Congress continues to demonstrate its strong support for the program and for advanced manufacturing more broadly,

even as the president requested cutting funding to a mere \$75 million for FY 2019. Second, Congress enacted a small funding reduction for the Advanced Manufacturing Research and Development Facilities line item, meaning that there should be slightly more money available for awards made by other programs within AMO, including to companies within the Advanced Manufacturing Research and Development Projects program.

Given these developments, Holland & Knight anticipates that AMO will make at least 50 awards this year through competitive solicitations for advanced manufacturing technology development across the categories listed above. More notably, it is expected that the uptick in manufacturing assistance will continue in 2020 and beyond for a variety of reasons associated with the market and U.S. competitiveness.



Bioenergy Technologies Office

Overview: The mission of the DOE Bioenergy Technologies Office (BETO) is to enable the cost-effective and sustainable production of drop-in biofuels, high-performance bioproducts and baseload biopower from domestic biomass feedstocks and waste resources in order to improve U.S. energy security, reliability and resilience.

BETO takes direction from the Energy Independence and Security Act of 2007, which set goals and mandates for ethanol, advanced and cellulosic ethanol, and biodiesel. In addition to issuing grants, the office partners with other federal agencies, national labs, universities and the private sector to share and promote best practices and further the U.S. bioenergy industry.

Current Status: BETO received \$226 million in funding for FY 2019, a 2 percent increase over the previous year. And as with other clean energy programs, Congress mostly ignored the president's request for BETO, which proposed cutting the program to \$37 million. Of the \$226 million, Congress directed funds for certain activities, including:

- \$32 million for algal biofuels, of which \$2 million is to fund carbon capture R&D using algae-to-energy technologies
- \$57.5 million for demonstration and market transformation
- \$95 million for conversion technologies

Awards: Awards from BETO for early-stage R&D typically fall in the \$1 million to \$2.5 million range, though some past solicitations have offered up to \$5 million or more. However, the majority of awards in this range have gone to consortia with two or more partners, often with a university as the lead.

For demonstration projects, BETO has offered grants of up to \$30 million. For commercial-scale biorefineries, awards have ranged as high as \$80 million.

Insights: While some of the awards BETO has offered are eye-popping, no project has received more than \$10 million in BETO grant funding since the end of the stimulus program. What that means is that there is more money to go around to support startup companies and early-stage R&D.

After a slow start in 2017, during which only \$45 million in funding was awarded, BETO significantly increased the scale and pace of its grant awards in 2018, including the selection of 36 projects to receive \$80 million for early-stage bioenergy R&D. Holland & Knight expects this trend to continue through 2019 given the Trump Administration's focus on rural development and the congressional focus on broader climate initiatives.

Building Technologies Office

Overview: Buildings and homes consume roughly 40 percent of all energy in the U.S., and it's the mission of the Building Technologies Office (BTO) to find ways to increase efficiency and cut costs. BTO invests in R&D of innovative energy-saving technologies, identifies and mitigates barriers to commercialization, and helps develop codes and standards.

The average American family saves almost \$500 each year because home appliances, equipment and lighting have become more efficient, due in part to the support of BTO research, education and policies. New homes and new commercial buildings save another 30 percent on heating and cooling bills because of better windows, insulation and sealing. Along with the U.S. Environmental Protection Agency (EPA), BTO also helps run Energy Star, the most successful voluntary energy efficiency program in the world.

Current Status: BTO received \$226 million for FY 2019, an increase of 2 percent over the previous year. In the annual appropriations bill, Congress gave considerable direction to DOE for how to spend that money. Among the programs and activities specifically mentioned are:

- \$95 million for Emerging Technologies, including
 - \$18 million for HVAC and refrigeration R&D
 - \$14 million for building envelope R&D
 - \$30 million for building-grid integration R&D
- \$20 million for early-stage research and commercialization of residential natural gas applications, such as heat pumps, water heating, and combined heat and power

Awards: In recent years, BTO has awarded grants for R&D in lighting, HVAC, refrigeration, sensors and controls, and building envelopes. These awards tend to be relatively small (less than \$1 million), and focus more on early-stage research than some of the other offices within DOE. That said, BTO also prioritizes the ability of early-stage projects to integrate with existing commercial and residential buildings, so companies should make sure to emphasize their medium- to long-term commercialization potential.

Insights: Given its mandate, solicitations from BTO can be broad, creating opportunities for a wide array of companies with applications that can be used to increase energy efficiency. A recent sample of solicitations illustrates the breadth of BTO's purview, with announcements of grant opportunities for grid resilience, air-sealing technologies, solid-state lighting, advanced building materials and building energy modeling.

BTO is also committed to bringing innovative technologies from the [National Laboratories](#) to the marketplace. Companies of all types and sizes seeking government collaboration should look for opportunities to partner with a relevant national lab, irrespective of geography; these partnerships provide an avenue for increased federal assistance for commercializing new technologies.

Geothermal Technologies Office

Overview: DOE's Geothermal Technologies Office (GTO) researches, develops and validates innovative and cost-competitive technologies and tools to locate, access and develop geothermal resources in the U.S. It does this by partnering with industry, universities and the national labs across four focus areas: enhanced geothermal systems, hydrothermal resources, low-temperature and co-produced geothermal energy, and systems analysis.

The current domestic installed geothermal capacity is more than 3.8 gigawatts (GW). Current estimates of technically recoverable resource potential include an estimated 30 GW of new undiscovered hydrothermal resources and 100-plus GW of new geothermal energy accessible through enhanced geothermal systems. However, more technological innovation is required for industry to convert these resources into useful energy services. GTO's mission is to support early-stage R&D to strengthen the body of knowledge upon which industry can accelerate the development and deployment of innovative geothermal energy technologies.

Current Status: Geothermal technologies received \$84 million in the FY 2019 appropriations bill, an increase of \$3 million over last year. Unlike with some other programs, Congress provided little direction, beyond providing \$6 million for Systems Analysis and more nebulous instructions to "continue its efforts to identify prospective geothermal resources in areas with no obvious surface expressions." That allows DOE to continue existing research and explore new and promising lines of inquiry, such as subsurface thermal energy storage that would allow geothermal energy to play a larger role in grid reliability services.

Awards: GTO has made fewer grants in recent years than most of the other offices within EERE, due to the nature of its awards. However, that seems to be changing; after there were no geothermal Funding Opportunity Announcements (FOAs) in 2016 and only one in 2017, there were three in 2018 and more are expected in 2019 (see Insights below).

GTO makes grants to universities, national labs and corporations, in addition to smaller companies engaged in early-stage R&D. While the larger grants can be several million dollars or more, those going to earlier-stage companies tend to be in the range of \$750,000 to \$1.5 million.

Insights: We anticipate an FOA to support improved grid reliability and resilience by focusing on improving the ability for geothermal power to operate flexibly and provide essential grid reliability services. As this falls under the Systems Analysis subprogram, Holland & Knight expects the FOA to award up to \$6 million in funding across several projects, in line with what Congress directed.

We also expect additional FOAs that build on previous solicitations that examined the feasibility of developing and deploying low-temperature, deep-well geothermal systems for direct heating and cooling applications, and perhaps an FOA for geothermal desalination or water purification technologies.

Solar Energy Technologies Office

Overview: DOE's Solar Energy Technologies Office (SETO) supports early-stage R&D to improve the affordability, reliability and performance of solar technologies on the grid. The office invests in innovative research efforts that securely integrate more solar energy into the grid, enhance the use and storage of solar energy, and lower solar electricity costs; to that end, SETO has established a goal to halve the cost of solar energy by 2030. However, given the overwhelming success of the SunShot initiative – which was established in 2011 with the goal of making solar power competitive with other electricity sources, and met its goal three years ahead of schedule in 2017 – the office is shifting its focus to R&D that helps integrate solar power onto the grid.

Current Status: SETO received \$246.5 million in the FY 2019 appropriations bill, an increase of \$5 million over the prior year's level. The manner in which Congress allocated those funds is an illustration of the current state of solar power in the U.S. – photovoltaic panel costs have plummeted but efficiency gains remain untapped; soft costs are now the biggest hurdle to price parity with wind power and fossil fuels; and grid integration and domestic manufacturing capacity could put a crimp in the growth of the solar market.

To those ends, Congress directed SETO to allocate funding as follows:

- \$72 million for Photovoltaic R&D
- \$45 million for Systems Integration
- \$35 million for Balance of Systems Soft Cost Reduction, with \$5 million for the National Community Solar Partnership program
- \$30 million for Innovations in Manufacturing Competitiveness
- \$5 million for competitively selected projects focused on advanced solar thermal desalination techniques

Awards: SETO offers both multiyear and single-year awards, which are often made to consortia involving the national labs, academia and industry. The multiyear projects can be substantial, on the order of \$10 million or more, while the one-time awards can range from \$50,000 to several million dollars.

Insights: Even though the SunShot program has been wildly successful, that does not mean that SETO's work is complete, or that additional research and development isn't needed in the sector. Each of the subprograms within SETO – Photovoltaics, Concentrating Solar Thermal Power, Systems Integration, Soft Costs and Technology to Market – issues FOAs to advance the goals of the office. While Photovoltaic R&D continues to receive the greatest amount of funding for FY 2019, we believe the other subprograms will see a larger share of SETO funding in the years to come, for several reasons.



First, if the Trump Administration's tariffs are not as effective at increasing domestic solar manufacturing capacity as initially hoped, there will likely be a push to commercialize new, proven innovative technologies. Second, the phasedown of the investment tax credit (ITC) for solar energy means there will be less federal government support for consumers looking to install solar panels, as well as an increased focus on bringing down soft costs to make solar more competitive, and SETO is expected to continue to play an integral role in that process. Third, solar's recent and projected growth means systems integration is going to become a frontline issue for utilities across the country, and SETO's R&D in that area will be increasingly important.

Vehicle Technologies Office

Overview: The Vehicle Technologies Office (VTO) at DOE supports R&D of efficient and sustainable transportation technologies that improve fuel economy or otherwise reduce dependence on petroleum. The specific technologies include, but are not limited to, advanced batteries, lightweight materials, high-efficiency engines and alternative fuels.

Among VTO's activities of interest to early-stage companies is the U.S. DRIVE (Driving Research and Innovation for Vehicle Efficiency and Energy Sustainability) program, a voluntary government-industry forum for information sharing and acceleration of technical progress that focuses on vehicles, fuels and cross-cutting solutions such as enhanced electric vehicle-grid interaction. VTO runs a similar program for medium-duty and heavy-duty trucks, called the 21st Century Truck Partnership.

Current Status: The Vehicle Technologies Program received \$344 million for FY 2019, a slight increase above the \$337.5 million it received last year. Like many other programs within EERE, VTO's broad support in Congress allowed it to receive additional funding even as the Trump Administration proposed large cuts (in this case, to \$68.5 million). This funding includes earmarked money for the following congressional priorities:

- \$163 million for Battery and Electrification Technologies
- \$38 million for electric drive R&D, of which \$7 million is to enable extremely fast charging and advanced battery analytics
- \$30 million for Materials Technology

Awards: VTO awards typically range from \$500,000 to \$3 million and usually require a non-federal cost share. The lower end of the range tends to be in support of early-stage R&D, while awards for demonstration and deployment can reach as high as \$5 million. In the past, some solicitations have been jointly offered between DOE and the Pentagon, especially for technologies such as batteries that have many potential uses across industries and sectors.

Insights: No longer seen as a niche market or a far-off development, the electrification of the vehicular transportation sector is approaching a tipping point. Los Angeles is leading a coalition of 30 cities to replace municipal fleets with electric vehicles (EVs); replacing those 115,000 vehicles is worth approximately \$10 billion, and the increased demand should help lower costs for other cities, businesses and individuals.

Moreover, in an era of flat or declining electricity demand, utilities view EV deployment as central to their future business model. The legacy auto manufacturers are churning out more and more electric models in order to not lose market share to EV newcomers such as Tesla. And both policymakers and industry experts expect batteries to be the next frontier in the clean energy revolution, hopefully following the same downward cost trajectory we've seen in wind and solar energy over the last decade.

All of this points to continued interest in vehicle technologies for the foreseeable future, particularly in advanced battery technologies. But technologies that can accelerate deployment of EVs and other advanced vehicles, such as fast-charging infrastructure and lightweight materials, will also be well-positioned to take advantage of VTO grants in the years to come.

Water Power Technologies Office

Overview: The Water Power Technologies Office (WPTO) supports innovative technologies that use water to generate electricity, including wave energy, tidal, current, ocean thermal, conventional hydropower and pumped storage. In addition to R&D, the program works to break down market barriers to wide-scale deployment and helps build out infrastructure to test new technologies.

WPTO works with the national labs, industry, universities and other federal agencies to conduct R&D activities through competitively selected, directly funded and cost-shared projects.

Current Status: WPTO received \$105 million in FY 2019, level with the previous year's funding. The lion's share of that money, \$70 million, is set aside for marine and hydrokinetic technology research, which includes energy generated from waves, tides, and river and ocean currents. From within that funding, Congress called for WPTO to spend \$30 million on "a balanced portfolio of competitive solicitations to support industry- and university-led research, development, and deployment of marine and hydrokinetic technologies."

The remaining \$35 million in WPTO's budget is for conventional hydropower and pumped storage, including \$5 million for a competitive funding opportunity for industry-led research, development and deployment of cross-cutting energy converter technologies for run-of-river and tailrace applications to better utilize underdeveloped low-head and other hydropower resources.

Awards: WPTO awards typically range from \$500,000 to \$4 million, can last up to three years and often require a non-federal cost sharing arrangement.

Insights: After issuing no solicitations in 2017, following a very active four years in President Barack Obama's second term, WPTO made five funding opportunity announcements in 2018. Holland & Knight expects Congress to push DOE to pick up the pace in making awards, perhaps returning to levels last seen in 2016. We also expect WPTO to continue to invest in research in pumped storage and other mechanisms for increasing the flexibility of conventional hydropower.

While most of the projects funded by WPTO are for early-stage R&D and demonstration projects, the scale of investment needed for pilot projects means there may occasionally be larger amounts of funding on offer. For example, in December 2016 DOE announced, and in early 2017 awarded, \$35 million to construct a wave energy test facility. The selected proposal was led by Oregon State University, which will also own and operate the test site with support from private-sector companies. Holland & Knight's clients have had a significant amount of success and very positive ongoing experiences with WPTO, so companies in the space are encouraged to reach out to and collaborate with the program.

Wind Energy Technologies Office

Overview: The Wind Energy Technologies Office (WETO) invests in basic science R&D activities that enable the innovations needed to advance U.S. wind systems, while continuing to address market and deployment barriers, including siting and environmental impacts. WETO's R&D activities are aimed at improving performance, lowering costs and reducing market barriers for U.S. wind energy.



WETO works with national laboratories, industry, universities and other agencies to conduct R&D activities through competitively selected, directly funded and cost-shared projects. Its efforts target both land-based and offshore wind power at the utility scale as well as transmission and distribution systems, and focus on novel research not being undertaken by the U.S. wind industry due to perceived cost, risk or focus on near-term investment returns.

Current Status: Like WPTO, WETO received level funding in FY 2019, at \$92 million. WETO also received more congressional direction than any other office within EERE, including:

- \$10 million for a solicitation for offshore wind demonstration projects
- \$30 million for early-stage research on materials, manufacturing methods and advanced components that will enable accessing high-quality wind resources
- \$10 million for distributed wind
- \$30 million for the National Wind Technology Center, including the manufacturing and systems integration of multiple energy generation, consumption and storage technologies with the grid
- support for deployment and testing of commercial-scale floating wind turbines

Awards: WETO awards tend to be somewhat smaller than those for other technologies, with individual awards for R&D typically coming in at less than \$1 million. There are occasional exceptions, however, such as the June 2018 announcement of an \$18.5 million award to fund an offshore wind R&D consortium. The consortium, to be managed by the New York State Energy Research and Development Authority, will include offshore wind industry members that will use the research findings to further advance technologies that can reduce the cost of offshore wind in the U.S. market.

Insights: Electricity from utility-scale onshore wind is now competitive with new fossil fuel generation in many parts of the U.S., and wind energy costs are projected to decline further in coming years. While this trend may slow a bit with the phasedown of the production tax credit that has long supported the U.S. wind industry, onshore wind is likely to be among the largest sources of new generation capacity for the foreseeable future.

Despite these developments, many opportunities remain relatively underutilized. For example, the U.S. lags far behind Europe in offshore wind development. While many states and the Trump Administration are trying to change that, the complexity of offshore wind project development will leave the U.S. trailing other countries in the near term despite the significant amount of progress that has been made in the past year. Floating turbines have the potential to greatly increase accessible wind resources, but more work remains to bring down costs and overcome engineering and logistical hurdles. Lastly, wind lags behind solar in distributed and microgrid applications, presenting opportunities for entrepreneurs willing to engage in that market.

Other DOE Clean Energy Programs

Carbon Capture Program

Overview: The Carbon Capture Program is run out of the National Energy Technology Laboratory (NETL) and consists of two core research areas: pre-combustion capture (wherein carbon dioxide is removed from the fuel) and post-combustion capture (removing carbon dioxide from the flue gas stream). Within those research areas, NETL funds projects ranging from conceptual engineering and materials design through pilot-scale demonstration projects on the order of 25 megawatts (MW).

Current Status: The Carbon Capture Program received \$100.6 million for FY 2019, level with last year's funding level. Despite a push from the administration to reduce funding for carbon capture, it was one of the more active grant-giving programs at DOE in 2018.

Awards: With a mandate that covers a wide range of technological readiness levels, the Carbon Capture Program's solicitations can run from less than \$5 million to \$40 million or more, spread across the selected projects. For awardees, this translates to grants as low as \$16,000 for an engineering design study to \$10 million for a demonstration project. For early-stage R&D, awards typically range from \$1 million to \$3 million.

Insights: Members of Congress from coal-producing states acknowledge that there will be a limited market for coal (and even natural gas) in a carbon-constrained world without cost-effective carbon capture, utilization and storage. The passage of an expansion to the Section 45Q tax credit in 2018 further incentivizes carbon capture development and has made it increasingly attractive to financiers and investors. The fact that the Carbon Capture Program's office resides in the Fossil Energy program at DOE and is administered by NETL also serves to make it less of a target for congressional opponents of DOE grant programs, giving the program a broad and diverse base of support.

Holland & Knight expects this program to be highly active in the coming years despite limited activity during the past five to 10 years.

Federal Energy Management Program

Overview: The Federal Energy Management Program (FEMP) helps the federal government – the largest energy consumer in the country (roughly \$16 billion per year) – increase the penetration of energy efficiency and renewable energy across the 350,000 buildings and 600,000 vehicles in the government's purview. FEMP supports federal agencies meet their energy-related goals, including:

- a 40 percent reduction in direct greenhouse gas (GHG) emissions below the 2008 baseline by 2025
- a 25 percent reduction in energy intensity below the 2015 baseline by 2025
- a 30 percent renewable energy consumption by 2025
- a 30 percent reduction in vehicle fleet per-mile GHG emissions below the 2014 baseline by 2025

Among its services, FEMP offers assistance to federal agencies to develop and implement energy savings performance contracts (ESPCs) and utility energy service contracts (UESCs), host and finance on-site renewable energy projects, and procure off-site renewable energy or renewable energy credits.

Current Status: While not a grant-making office itself, FEMP is the primary federal entity that provides energy management technical assistance for agencies and plays an important role in helping the government reduce its energy intensity and energy-related emissions. The program received \$30 million in funding for FY 2019, up from \$27 million in FY 2018, further demonstrating that reducing the government's energy bills has bipartisan support in Congress.

Insights: Unlike most of the programs listed in this primer, FEMP should not be considered a direct source of government funding, and companies shouldn't expect to see many solicitations coming from the program. Rather, companies should think of FEMP as a go-between when federal agencies are looking to increase renewable energy purchases or energy efficiency at their facilities. FEMP can be a valuable resource for companies trying to determine when and where opportunities to contract with federal agencies may arise.

Hydrogen and Fuel Cells Technologies Program

Overview: DOE's role under the Hydrogen and Fuel Cell Technologies Program (HFCTP) is to focus on early-stage R&D that enables industry to develop and deploy hydrogen and fuel cell technologies which are cost competitive with conventional technologies. To improve transportation energy affordability, strengthen national security, support energy dominance and enable future economic growth, DOE performs and supports early-stage R&D on several advanced transportation technology options in the Hydrogen and Fuel Cell Technologies, Vehicle Technologies and Bioenergy Technologies Programs.

And while the focus is on transportation, the research concurrently benefits stationary fuel cells – such as backup power, reversible fuel cells, or small-scale tri-generation of fuel, heat and power that provide resiliency and flexibility across multiple sectors. In all cases, the key issue is the need for significant reductions in cost and improvements in performance and durability. The scope is technology-neutral and feedstock-flexible, emphasizing low- and medium-temperature fuel cells applicable to transportation, as well as enabling electricity and fuel distribution reliability and flexibility through cost-competitive hydrogen production, delivery and storage technologies.

Current Status: HFCTP received \$120 million for FY 2019, an increase of \$5 million over FY 2018. In funding HFCTP, Congress provided significant direction for how DOE should spend the money, including:

- \$21 million for Technology Acceleration, which works to accelerate the transition from R&D to commercial-stage applications
 - \$3 million for manufacturing R&D
 - \$7 million for industry-led efforts to demonstrate a hydrogen-focused integrated renewable energy production, storage and transportation fuel distribution/retailing system
- \$39 million for Hydrogen Fuel R&D, which focuses on hydrogen production and storage

These figures are roughly level with last year's amounts, indicating a desire for continuity within DOE's hydrogen and fuel cell program offices.

Awards: The Fuel Cell Technologies Office has historically been one of the more active grant-making offices within EERE. Over the course of FY 2018, the office made 28 awards across six solicitations, with grants ranging from \$600,000 to \$2.5 million; the majority of these awards went to universities, but roughly one-third of the awardees were private companies.

Insights: Along with increased appropriations for hydrogen and fuel cell R&D, the extension of the tax credit for fuel cells in February 2018 demonstrates Congress' continued commitment to the technology. Although the conversation in Washington, D.C., has typically centered on residential and commercial-scale fuel cells and hydrogen as a transportation fuel, Holland & Knight expects that to shift in the coming years, with grid-scale solutions becoming a bigger selling point for fuel cells and related technologies. In the wake of Hurricanes Maria, Harvey and Michael, and with increased attention to the numerous and multifaceted vulnerabilities on the nation's electric grid, it is suggested that fuel cell companies focus on their ability to provide resilience and redundancy to the grid.

Office of Nuclear Energy

Overview: DOE's Office of Nuclear Energy (NE) has three objectives that guide its activities:

- enhance the long-term viability and competitiveness of the existing U.S. reactor fleet
- develop an advanced reactor pipeline
- implement and maintain national strategic fuel cycle and supply chain infrastructure

NE's umbrella is broad, including everything from R&D on advanced reactor technologies and spent fuel recycling to helping coordinate the nation's international nuclear energy policy.



The office issues dozens of funding opportunity announcements each year, offering companies of every size and those working in every facet of the nuclear energy industry the chance to access federal funds.

Current Status: Congress provided NE with \$1.326 billion for FY 2019, a significant increase over the \$1.205 billion from the previous year. With such a sizeable pool of money, Congress gave NE many directives for how to spend it. Among those that are of interest to early-stage companies are:

- \$10 million for hybrid energy systems (i.e., technologies that allow for tighter coupling of nuclear and renewable energy sources)
- \$100 million for Advanced Small Modular Reactor R&D to support technical, first-of-its-kind engineering, design and regulatory development of next-generation light water and non-light water small modular reactors
- \$65 million for R&D to support efforts to develop a versatile fast test reactor
- \$47 million for the Light Water Reactor Sustainability Program
- \$111 million for Advanced Reactor Technologies
- \$125 million for the Advanced Fuels Program
- \$64 million for Used Nuclear Fuel Disposition R&D
- \$31 million for Nuclear Energy Advanced Modeling and Simulation

Awards: In 2018, NE issued quarterly solicitations for cost-shared projects across three pathways: first-of-a-kind demonstration projects, advanced reactor development projects and regulatory assistance grants. For first-of-a-kind demonstration projects, DOE made available \$10 million to \$40 million to fund one or two projects over three years. For advanced reactor development, DOE expected to make grants of up to \$10 million each for three to six projects per year for two years.

Insights: NE has such strong congressional support in part because of powerful members who have long backed the nuclear energy industry, including the ranking Republican on the Senate Appropriations subcommittee with jurisdiction over NE. For this reason, Holland & Knight expects the amount of federal funding available for grants to only grow in the coming years.

For example, the program that received the largest year-over-year increase for FY 2019 is Reactor Concepts Research, Development, and Demonstration, which went from \$237 million to \$323 million. Through cost-shared early-stage R&D and related technical assistance, NE can use this funding to help enable industry stakeholders to accelerate the timeline for commercialization of new, advanced and more financeable reactor technologies.

Smart Grid

Overview: The Grid Modernization Initiative (GMI) is a department-wide collaboration at DOE, with funding and direction provided by the Office of Electricity Delivery and Energy Reliability (OE) and EERE. GMI focuses on the development of new architectural concepts, tools and technologies that measure, analyze, predict, protect and control the grid of the future, as well as on enabling the institutional conditions that allow for more rapid development and widespread adoption of these tools and technologies. The initiative's focus is on improving or increasing the resilience, reliability, security, affordability, flexibility and sustainability of the nation's electric grid.

Current Status: In 2018, the Trump Administration proposed, and Congress approved, a plan for DOE to split OE and all of its programs into two new offices: 1) Cybersecurity, Energy Security, and Emergency Response, and 2) Electricity Delivery. When the division is complete, the former will deal with protecting critical infrastructure from cyber and physical threats, while the latter will work to improve the reliability and resilience of the electric grid. Following the split, Holland & Knight expects GMI to continue in more or less its current form, though with the Office of Electricity Delivery as the new co-lead partner office.

Awards: Because it draws on several programs within DOE, there are multiple funding sources for smart grid projects, including EERE Exchange and the National Energy Technology Laboratory. Awards issued through the GMI typically range from \$250,000 to \$4 million.

Insights: Following OE's split in FY 2019, the programs that will be housed in the new Office of Electricity Delivery received the same or slightly more funding than they did when they were housed in OE in FY 2018. However, there is some concern that, going forward, physical security and, especially, cybersecurity concerns surrounding the grid will take precedence over the more "parochial" issues of transmission and distribution reliability and resilience.

We saw this to some extent in the Trump Administration's FY 2019 budget request, which proposed cutting the cybersecurity budget by 8 percent, but proposed cutting the transmission, distribution and energy storage line items by a combined 74 percent. Congress rejected those proposed cuts, but a high-profile cyberattack in the future could lead to the cannibalization of smart grid-related programs.

Holland & Knight has also heard the argument that these programs should be left to the states or to the utilities. For all of these reasons, we are less bullish on the future availability of GMI grants. This doesn't mean that companies in this sector shouldn't seek collaboration in the federal government – instead, they should look to GMI as one area for collaboration. That said, there has been consistent interest in smart grid applications from DOE's Advanced Research Projects Agency – Energy (see more in the ARPA-E section below) and DoD, among others, so we don't anticipate a total loss of interest in smart grid from the federal government.

Advanced Research Projects Agency – Energy

Overview: The Advanced Research Projects Agency – Energy (ARPA-E) was created in 2007, but received its first funding in the 2009 stimulus bill. Modeled after the Defense Advanced Research Projects Agency (DARPA) – which has been credited for playing an integral role in the development of radar and the internet, among many other technological developments – the motivation behind the creation of ARPA-E was the need for high-risk, high-reward R&D specific to energy generation, transmission and consumption. Due to real or perceived risks, the private sector would be unlikely to fund the projects undertaken by ARPA-E, but these projects are chosen precisely because they have the potential to result in substantial advancements in a particular field.

While its mission of promoting advances in clean energy overlaps with that of EERE, what sets ARPA-E apart is its focus on fomenting transformative changes in the energy space. The companies, universities and consortia it funds are either developing entirely new technologies or trying to find radical new ways to put existing technologies to use.

Current Status: ARPA-E has fairly strong bipartisan support in Congress, especially among members of the Senate Appropriations Committee, who have in recent years ignored requests from some of their colleagues and the Trump Administration to eliminate the agency altogether. That said, ARPA-E has seen its funding levels fluctuate by hundreds of millions of dollars from one year to the next, from a high of \$400 million in 2009 to \$180 million in FY 2011.

For FY 2019, Congress provided \$366 million, ARPA-E's highest funding level since 2009. The pending 2020 retirement of Sen. Lamar Alexander (R-Tenn.), a vocal supporter of ARPA-E and the current chairman of the subcommittee that sets the agency's annual budget, makes this an area to watch in the coming years.

Awards: Due to the technology and financial risks associated with the projects it supports, ARPA-E's awards have a wide range – from \$500,000 over one year to \$10 million over three years. There is usually a cost share component to the awards as well, typically ranging from 5 percent to 20 percent, though awards to (or consortia led by) a small business receive a 12-month grace period for cost share requirements.

ARPA-E's solicitations are not open-ended, but they can remain open for several years, meaning there can be as many as three dozen active FOAs at any one time. In addition, every three to four years, ARPA-E will issue an open funding opportunity for technologies that were not captured in an existing FOA.

Insights: ARPA-E is unique in many ways, including its focus on transformational change, its open-ended solicitations, its willingness and ability to issue grants worth millions of dollars to the most promising technologies, and its annual summit. The summit brings together pre-commercial companies – not all of which are awardees – and investors, policymakers and government researchers. The goal of the summit is to accelerate ARPA-E’s mission of moving innovative technologies from the lab to the market and to supplement its grant-making activities.

Awards from ARPA-E rightly bring with them a certain amount of cachet and validation of a company’s technology, but they are also highly competitive. In addition, companies often struggle to reach commercialization even after they successfully complete a program with ARPA-E. DOE officials are currently seeking to develop bipartisan solutions to address this issue, but in the interim, companies should not hesitate to apply for ARPA-E funding when applicable opportunities arise.

Additional Information

- **Cooperative Research and Development Agreements (CRADAs):** While not a grant opportunity, CRADAs afford companies with additional opportunities to partner with national labs. In a standard CRADA, researchers from the private sector and the lab(s) identify areas of mutual interest, and if DOE approves the arrangement, both parties contribute equally to the labor, funding and facilities necessary for the research to move forward. Importantly, intellectual property considerations are among the factors companies need to negotiate with DOE before entering into a CRADA.
- **Procurement:** While companies from every sector can offer their goods and services to the government through the standard General Services Administration (GSA) procurement process, there are additional avenues available to clean energy equipment and service providers. In addition to the FEMP program, discussed earlier, clean energy companies can consider partnering with an energy service company, or ESCO, that is contracted by the federal government to provide energy efficiency services to agencies.
- **Small Business Awards:** Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) awards are offered at a dozen federal agencies engaged in R&D, including the Departments of Agriculture, Defense, Energy and Transportation, as well as the EPA, National Oceanic and Atmospheric Administration (NOAA), National Science Foundation (NSF) and the National Aeronautics and Space Administration (NASA). These agencies are required to set aside at least 3.2 percent of their R&D budgets for grants to small businesses, and they typically do so by designating topics for solicitations that are open only to small business applicants. For example, the DOE SBIR solicitation for FY 2019 includes topics from offices across the department, including every office discussed in this primer. An important consideration for companies considering applying for SBIR/STTR funding: Initial (Phase I) awards are typically capped at \$150,000 over six months, and Phase II awards – which are typically about \$1 million over two years – are available only to Phase I awardees.
- **Other Transaction Authority:** While DOE has the authority to pursue “Other Transactions,” outside of the traditional grant-making and procurement processes, it is only recently that agency staff have made a concerted effort to pursue this authority. Other agencies, especially DoD, have been more active in this area, and further discussion on this topic can be found in the section on funding opportunities at the DoD.
- **Technology Investment Agreements:** Technology Investment Agreements (TIAs) are a form of Other Transaction Authority granted to DOE. TIAs are a means by which DOE can enter into a financial arrangement with a company when a standard arrangement – a cooperative agreement, contract or grant – is unavailable or infeasible.

Department of Defense

Other Transaction Authority

Overview: Other Transaction Authority (OTA) is a streamlined set of procedures that certain federal agencies can use to procure or invest in innovative technologies or research. It is more flexible, and often faster, than the traditional approaches of government contracting, grants or acquisitions. A legally binding instrument similar in many ways to a commercial sector contract, it is not subject to many of the rules that typically govern interactions between federal agencies and the private sector. For example, OTAs do not need to comply with government rules requiring full and open competition for contracts above \$25,000.

Along with DOE, the Department of Transportation (DOT), NASA and several other agencies, the Department of Defense (DoD) has been granted OTA by Congress so that the department can specifically target promising technologies and enter into financial arrangements with them without having to justify the use of the more time-consuming and burdensome approaches government agencies typically use. Because DoD utilizes OTAs more frequently than any other agency apart from NASA and has spent billions of dollars on OTAs in recent years, we are including discussion of OTAs in this section.

There are restrictions, of course, on when and how OTAs can be utilized. For DoD, those restrictions include the following: a determination that traditional arrangements are not feasible; a requirement that the recipient fund half the project; and an assurance that the research being funded is not duplicative to any ongoing research elsewhere at DoD. But because the authority granted DoD is so broad, with any technology or prototype that could enhance mission effectiveness or improve the military's performance considered eligible, OTAs are an appealing option for a wide array of companies.

Current Status: DoD's expanded use of OTAs in recent years, and the lack of transparency associated with individual decisions as well as the agency's execution of its authority writ large, has brought with it additional scrutiny. The Government Accountability Office (GAO), often referred to as the "congressional watchdog," is taking an increased interest in DoD OTAs to ensure that taxpayer money is spent wisely. In particular, GAO will analyze whether the department's use of OTAs is warranted in some instances or whether a traditional form of contracting would have been feasible given the circumstances.

That said, additional oversight is unlikely to significantly hamper DoD's and other agencies' reliance on OTAs; rather, expect DoD to proceed more methodically to ensure it is following both the letter and the spirit of the authorizing statute.



Awards: Due to the aforementioned lack of transparency, there is little publicly available information on what companies or consortia are receiving money, and what they are promising to deliver in return. Even the total amount of money DoD is spending on OTAs is unclear, and estimates vary widely. What we can say with reasonable certainty, though, is that DoD has spent billions of dollars on about 75 OTAs per year over the last three years, suggesting the average OTA from DoD is likely between \$10 million and \$100 million.

Insights: The most common way for companies to access OTA funding is through a consortium. For example, the Consortium for Energy, Environment and Demilitarization (CEED) is comprised of nearly 300 companies and universities that possess a wide range of expertise across all aspects of energy, environment and related fields. When DoD has a particular need and issues a request for white papers, the consortium can decide which of its member(s) is best suited to respond; should one or more companies be awarded the project, the funding can typically be disbursed within 90 days.

Joining a consortium is usually highly cost-effective and provides significant advantages compared to individual companies fending for themselves. Attorneys in Holland & Knight's Government Contracts Group and other professionals at the firm have represented companies across several industries that have competed for OTA funding, and have gained valuable insights and experience that can be put to use in helping navigate the complex but potentially lucrative ecosystem of OTAs.

Defense Production Act Office

Overview: Title III of the Defense Production Act (DPA) of 1950 gave the president "broad authority to ensure the timely availability of essential domestic industrial resources to support national defense and homeland security requirements through the use of highly tailored economic incentives." In practice, the DPA program seeks out, evaluates and mitigates potential shortfalls of materials critical to the military. Once an area of need is identified, the DPA Office works with the private sector through grants, procurement contracts, loans and loan guarantees to rectify the actual or potential shortfall.

Roughly half of the DPA Office's resources are devoted to sustaining production of critical materials, with the other half going toward commercializing R&D investments and scaling emerging technologies. Companies are invited to submit white papers to the DPA Office that fit under one of those three broad categories.

Current Status: In February 2018, the DPA Office issued a Broad Agency Announcement (BAA) in effect through February 2023. The BAA is essentially a five-year solicitation for the "expansion of productive capacity and supply using contracts, grants, cooperative agreements and other transactions." The BAA is therefore the vehicle by which interested companies can submit their proposals to the DPA Office for funding consideration.

Awards: While the BAA provides for unsolicited white papers across an extremely broad range of subjects, the white papers should be able to describe how the technology involved will: strengthen the domestic industrial capacity of critical materials, including through the development of ways to use those materials more efficiently; help develop commercial applications for government-sponsored R&D; or aid in significantly scaling up emerging technologies useful for national defense.

The size and duration of the awards will vary greatly depending on the technology, the need, the contracting vehicle and other considerations, but can reach into the tens of millions of dollars.

Insights: Successful proposals to the DPA Office need to demonstrate that the technology in question is essential for national defense, which necessarily limits the number and type of companies that will pursue this opportunity. However, for this program, DoD is inviting companies to make that argument, and with a white paper as the only initial requirement, there is actually a fairly low barrier to entry for prospective applicants.

Persuasive companies have the opportunity to convince DoD that their products are essential, even if the military has survived without them thus far. And with the considerable financial resources of the Pentagon, all companies that can envision their technologies providing even modest value to the military are encouraged to seriously consider the DPA program as a funding vehicle.

Strategic Environmental Research and Development Program

Overview: The Strategic Environmental Research and Development Program (SERDP) and the Environmental Security Technology Certification Program (ESTCP) are DoD's environmental research programs. The SERDP works with DOE and EPA to invest in basic and applied research and advanced development. ESTCP, meanwhile, identifies and demonstrates cost-effective technologies that address DoD's highest priority environmental requirements. The independent programs are jointly managed to increase coordination and prevent duplication of effort.

Both programs offer annual solicitations in the form of BAAs, which broadly cover the five program areas within both offices – including installation energy and water, environmental restoration, and resource conservation and resiliency – from research to the demonstration of field-ready technology. Priority is given to needs that cut across the military services, but these are not always unique to DoD. For example, technologies to improve energy efficiency at military installations can have wide-ranging applications in the civilian sector.

Current Status: Regardless of what is happening elsewhere in the federal government, DoD is still moving forward with its efficiency, resiliency and environmental goals. We therefore anticipate that these two programs will continue in their current form.

Awards: The most recent solicitations from both programs had \$12 million each available for multiple awards. In the past, there have been upwards of 100 awardees, so awards are likely to average approximately \$100,000 apiece.

Insights: While nominally part of DoD, the mission and activities of SERDP and ESTCP are more closely aligned with those of DOE and EPA. Companies considering applying under either BAA should approach the application process as they would at a civilian agency, though with a military dimension. Companies with technologies that could potentially be useful to the Pentagon should consider these funding sources, even if they hadn't considered military applications until now.



Defense Innovation Unit

Overview: The Defense Innovation Unit (DIU) may be the closest thing to a venture capital firm within DoD. Headquartered in Silicon Valley, it was launched in 2015 to accelerate the military's utilization of emerging technologies. DIU provides non-dilutive capital to early-stage companies that address problems in the national defense space. Many of the companies that DIU has added to its portfolio to date have been IT-focused, but some of those have energy applications as well, and at least one falls squarely in the environmental sphere. Importantly, DIU's portfolio companies are also backed by some of the biggest venture capital firms in the country.



Current Status: When it was founded, DIU was known as DIUx (the “x” stood for Experimental). However, in 2017, DoD removed the “x” and made the program permanent. DIU currently has a staff of about 75 military and civilian personnel with a broad range of military and private sector experience. It has a relatively small budget, but it leverages partners inside and outside of DoD to make investments and fund prototype projects.

Awards: In 2017, DIU entered into 48 prototype agreements for a total of \$104 million, \$84 million of which came from 30 other offices within DoD. Many of those awards were in the form of OTAs, including DoD's first follow-on production contracts using OTA. This new authority was granted to DoD in 2016 as a way to allow successful prototype projects to serve as justification for follow-on production contracts without the need for further competition.

Insights: DIU's use of OTA is expected to accelerate in the coming years, as the program gains experience and takes further advantage of its ability to issue follow-on production contracts after a successful prototyping project. DIU has been clear in its intention to ramp up its process of prototyping and then rapidly transitioning to production, suggesting increased reliance on OTAs. Note that the ability to enter into a follow-on production contract after a successful prototype OTA is available to any DoD office.

DIU accepts unsolicited proposals, and it is often able to make a decision and provide funds within 90 days. Combined with DIU's interconnectivity with other offices throughout DoD, this makes DIU an attractive option for companies with a specific subset of technologies.

If innovative companies are interested in pursuing opportunities with DIU, there are several other programs similar to DIU – such as the National Security Technology Accelerator (NSTXL) – that they should consider as well.

Service Energy Initiatives

Overview: All five service branches – the Army, Navy, Air Force, Marine Corps and Coast Guard – manage their own energy needs, and all have energy efficiency, renewable energy and/or resiliency targets. Beyond supporting energy generation and utilization at bases and in the field, some of the branches have sizeable R&D budgets as well, with perhaps the best-known example being the Navy’s investment in biofuels in support of its “Great Green Fleet” or the Obama Administration’s 3GW procurement goal.

Although the offices that stand at the center of these initiatives largely remain the same, their goals, objectives and strategic initiatives do vary to a somewhat significant degree. First and foremost, resiliency and military readiness is now at the forefront of Installation Energy Offices. The following provides a high-level overview and underlying contractual developments that are key to understanding the opportunities with these offices moving forward.



Installation Energy

The Office of the Assistant Secretary of Defense for Energy, Installations and Environment was recently restructured, with the new Office of the Assistant Secretary of Defense for Sustainment now overseeing four Deputy Assistant Secretaries: for Infrastructure, Facilities Management, Environment and Energy. The Army, Navy and Air Force also have their own Assistant Secretaries for Installations, Environment and Energy. Across all service branches, DoD’s energy strategy is designed with an eye toward improving the readiness and effectiveness of service members, increasing security and reducing cost to the taxpayer. For those reasons, DoD is making concerted efforts to increase its utilization of distributed generation, energy storage, microgrids, and conservation and efficiency measures.

In practice, this means that shares of the \$3 billion to \$4 billion per year that DoD spends on energy at its installations around the world are increasingly available to clean energy technology and service providers. For example, the Army is developing “islandable” projects that can provide energy and water to supply critical missions for a minimum of 14 days in the event of a major supply disruption, which usually entails increasing on-site generation and energy storage that is not dependent on fuel deliveries (i.e., renewables, batteries and fuel cells), as well as microgrids that can operate independently of the larger electricity transmission and distribution system.

In addition, the Air Force and Navy are advancing their initiatives for resilience and advanced energy readiness. Unlike similar efforts undertaken during the Obama Administration, this is not being done through Power Purchase Agreements (PPAs) but instead through other contracts that are easier to expedite and that incorporate resiliency solutions such as energy storage.

Companies that can help the service branches meet their goals of cost-effective, resilient and clean energy should be sure to keep a watchful eye on the federal procurement websites for opportunities through formal contractual vehicles as well as other funding agreements, such as Intergovernmental Service Agreements (IGSAs).

Utility Privatization

The service branches have the authority to convey or transfer DoD utility assets – including electric, natural gas, water, wastewater, and thermal – to a municipal, cooperative or private utility, or to any other entity they so choose. In practice, this entails the service branch soliciting proposals for third parties to take over the management, operations and maintenance of utility services on installations. In this way, the military is able to take advantage of private sector expertise and financing while reducing risk exposure and cost to the taxpayer, while the contracted company gains a reliable, long-term revenue stream.

To date, roughly one quarter of all utility systems across DoD installations have been privatized, and another quarter could be privatized in the near future. (The other half are either owned and operated by non-DoD entities, or are exempt from privatization for economic or security reasons.) Among the branches, the Army has been the most aggressive in privatizing utility services, but the Air Force and Navy are both gearing up to be more active in this area. The Air Force’s utilities privatization policy states that the program’s goal is to permanently convey utility systems on Air Force installations to private or public utility companies via the award of a long-term utility services contract, and the Navy is currently in the process of assessing utility systems for potential conveyance.

The Defense Logistics Agency has released a [schedule of anticipated utility privatizations](#) of anticipated utility privatizations over the next four years. Interested companies should be on the lookout for updates and additions, as well as for solicitations for the installations and utility services listed. For pre-commercial companies, forging a partnership with the local utility can help get your foot in the door for consideration for future solicitations from DoD and throughout the government. The team at Holland & Knight has extensive experience on these and other energy procurements and stands ready to help.

National Science Foundation

Unlike most of the other agencies and programs in this primer, NSF primarily funds basic science research and early-stage R&D, almost exclusively at (or in conjunction with) universities. But for university researchers still developing or tweaking their technology offerings, or for those looking to commercialize their technology, NSF grants can offer a lifeline (or at least additional runway). Generally speaking, NSF accepts unsolicited proposals at any time, and the size of awards can vary from \$100,000 to \$3 million or more. Grant opportunities run the scientific gamut from astrophysics to zoology, but two categories are likely to be of particular interest to those in the clean tech space.



Energy, Power, Control, and Networks

The Energy, Power, Control, and Networks (EPCN) Program supports innovative research in modeling, optimization, learning, adaptation and control of networked systems, including those in electricity generation, transportation and energy storage. In particular, the program covers the following areas:

- Solar, Wind, and Storage Devices Integration with the Grid
- Monitoring, Protection and Resilient Operation of Grid
- Power Grid Cybersecurity
- Market Design, Consumer Behavior, Regulatory Policy
- Microgrids
- Energy Efficient Buildings and Communities
- Advanced Power Electronics and Electric Machines
- Electric and Hybrid Electric Vehicles
- Energy Harvesting, Storage Devices and Systems
- Innovative Grid-Tied Power Electronic Converters

Environmental Sustainability

The goal of NSF's Environmental Sustainability program is to promote sustainable engineered systems that support human well-being and that are also compatible with sustaining natural (environmental) systems. The program supports engineering research that seeks to balance society's need to provide ecological protection and maintain stable economic conditions. Among the research areas supported by the program are:

- Green Engineering, including efforts to increase the sustainability of manufacturing processes, green building design and water recycling
- Earth Systems Engineering, or large-scale engineering research to reduce GHG emissions and adapt to climate change, and which could include direct air capture and geoengineering research

Partnerships for Innovation

For researchers that have already received NSF grants, the agency provides additional support through its Partnerships for Innovation (PFI) Program for those projects demonstrating potential commercial applications. The Technology Translation track offers up to \$250,000 for 18 months and can be used for proof-of-concept, prototyping or other demonstration projects. For more complex projects that cut across multiple disciplines or institutions, NSF offers up to \$550,000 for 36 months to achieve the same goals.

Holland & Knight has worked with companies that have achieved significant success with this business-friendly program. Interested entrepreneurs and tech developers are strongly encouraged to assess if they have a technology solution that will be of interest to NSF and can fit into its technology parameters.

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To stay updated on news, analysis and strategies related to accessing government grants, loans and contracts from states and federal agencies, including the Department of Energy, Department of Agriculture and Department of Defense, visit Holland & Knight's [Government Energy Finance Blog](#).

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