

2 WATER POWER TECHNOLOGIES OFFICE OVERVIEW

Statutory Authorities

The following is a brief summary of the most recent relevant congressional authorizations for WPTO activities under the Hydropower and Marine Energy Programs.

Energy Act of 2020, Division Z of the Consolidated Appropriations Act, 2021

(Public Law 116-260 - December 27, 2020)

Section 3001 (Water power research and development) reauthorized DOE's marine energy and hydropower research, development, demonstration, and commercial application (RDD&CA) activities, including the National Marine Renewable Energy Centers (NMRECs) and research on reducing potential environmental impact and pumped storage hydropower technologies. It also amended relevant authorizing language from Energy Independence and Security Act of 2007 (Public Law 110-140—December 19, 2007). The Energy Policy Act of 2005 (Public Law 109-58—August 8, 2005), also contains prior authorization language, though the definitions and direction set forth in the Energy Act of 2020 are now seen as the most relevant.

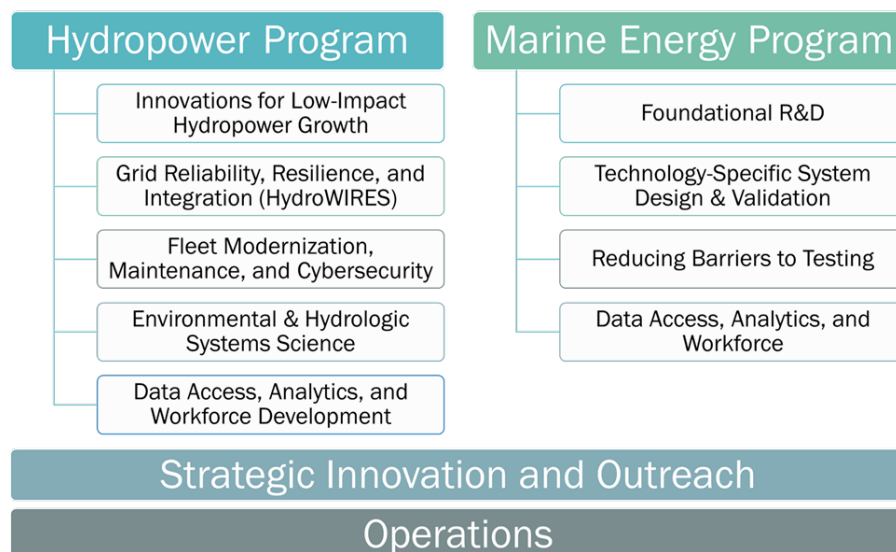
Office Mission, Values, and Structure

The mission of WPTO is to enable research, development, and testing of new technologies to advance marine energy, and next-generation hydropower and pumped storage systems, for a flexible, reliable grid. To reduce marine energy costs and fully leverage hydropower's contribution to the grid, WPTO invests in early-stage research and technology design; validates performance and grid-reliability for new technologies; develops and enables access to necessary testing infrastructure; and disseminates objective information and data for technology developers and decision makers. WPTO works with national laboratories, industry, universities, and other federal agencies to conduct R&D activities through competitively selected, directly funded, and cost-shared projects. In pursuing these objectives, WPTO always endeavors to:

- Catalyze innovation in technology and science.
- Steward natural resources and support the public good.
- Expand access to affordable, reliable, and secure energy.
- Invest taxpayer funds wisely and to drive the greatest impact.
- Collaborate and actively seek input from stakeholders and partners.
- Advance diversity, equity, and inclusion goals wherever possible for our teams and our projects.
- Demonstrate transparency and share results widely.

WPTO works to support DOE and EERE objectives of combating the climate crisis, creating millions of new clean energy jobs, and promoting energy and environmental justice. WPTO consists of two R&D programs: the Marine Energy Program and the Hydropower Program. The office also has two teams who work across the programs: the Operations team and the Strategic Innovation and Outreach team (Figure 4).

Figure 4. WPTO's Organizational Structure



WPTO considers external engagement a top priority and strives to engage a diverse array of stakeholders, such as researchers, technology developers, regulators, and the general public. Active collaboration and communication with key stakeholders enable WPTO to achieve its mission more effectively by identifying critical challenges in water power research, outlining opportunities for accelerating industry development, and informing the strategy and direction of the office's portfolio. WPTO's Engagement and Outreach Strategy represents values that are essential to WPTO's success and inherent to its role as a publicly-funded entity, such as appropriately and transparently incorporating public and expert feedback into our R&D and maximizing the impact of DOE's investments for the public good.

WPTO's Engagement and Outreach Strategy includes four key goals:

- **Transparency:** Demonstrate good stewardship of taxpayer funds by persistently and transparently communicating how WPTO funds are utilized and evaluating project impacts.
- **Feedback:** Gather feedback from stakeholders to inform and improve WPTO projects and strategy.
- **Dissemination:** Maximize the impact of WPTO-supported research by effectively disseminating results of projects and tracking usage of various products.
- **Objective and accurate information:** Provide access to accurate and objective information and data that can help to accelerate industry development and inform decision makers.

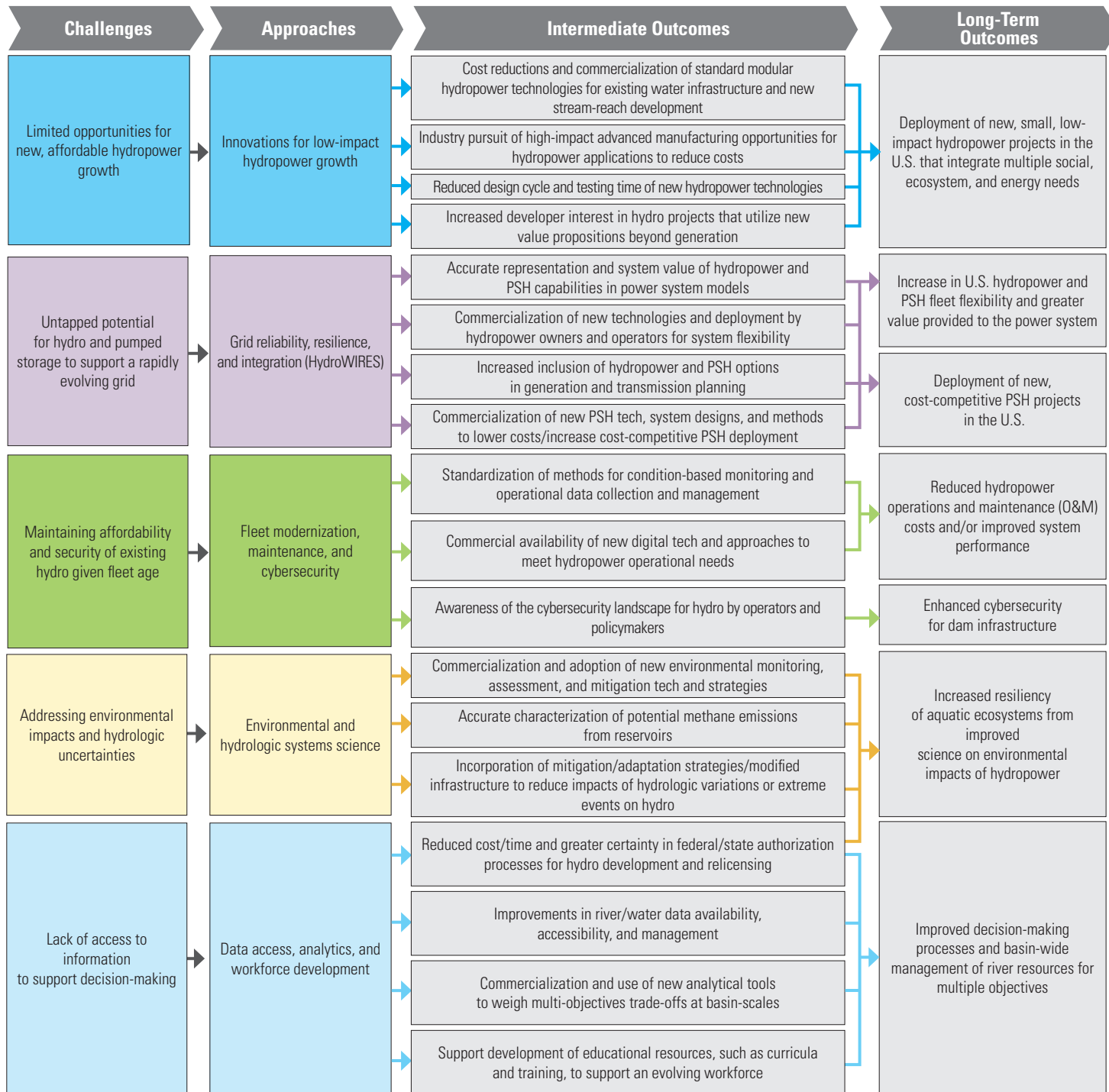
Program Logic Models

WPTO developed program-level logic models to:

- Generate a clear and shared understanding of and focus on program goals.
- Support program planning, implementation, and management.
- Create a solid foundation for future program evaluations.

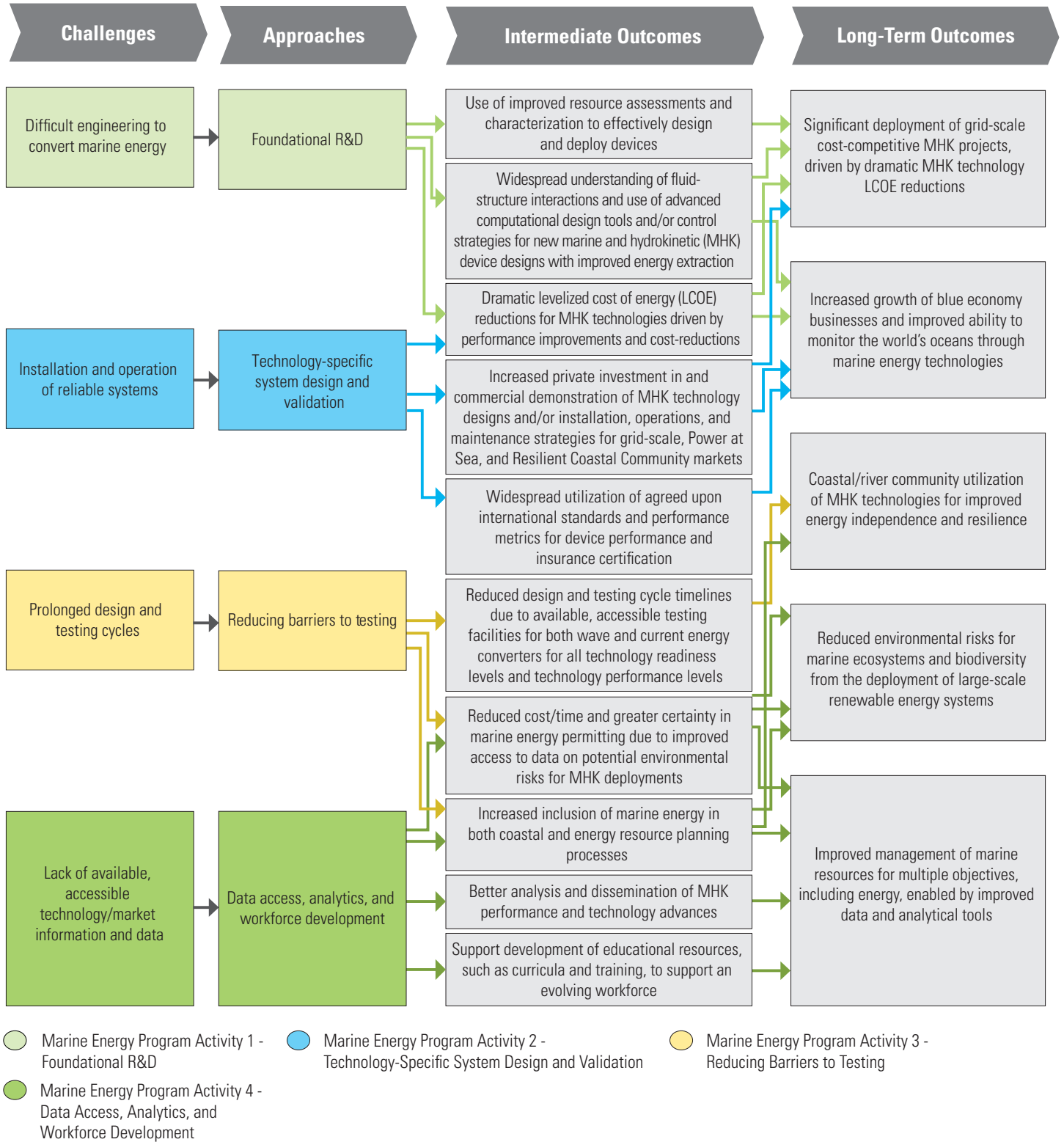
A logic model is a visual representation of the key elements in a "theory of change" or the sequence of activities intended to bring about significant changes across society. The longer-term targeted "outcomes" and "impacts" identified within a logic model are directly linked to the nearer-term results or "outputs" the program is expected to achieve. This progression of linkages summarized in Figure 5 and Figure 6 supports the framework for WPTO's strategy and this MYPP.

Figure 5. Hydropower Program High-Level Logic Model



- Hydropower Program Activity 1 - Innovations for Low-Impact Hydropower Growth
- Hydropower Program Activity 2 - Grid Reliability, Resilience, and Integration (HydroWIRES)
- Hydropower Program Activity 3 - Fleet Modernization, Maintenance, and Cybersecurity
- Hydropower Program Activity 4 - Environmental and Hydrologic Systems Science
- Hydropower Program Activity 5 - Data Access, Analytics, and Workforce Development

Figure 6. Marine Energy Program High-Level Logic Model



Budget

Water power R&D has taken place at DOE consistently since Fiscal Year (FY) 2008 after the Energy Independence and Security Act of 2007 directed DOE to establish the “Water Power Program.” Prior to FY 2016, water power research was conducted in the former Wind and Water Power Technologies Office. In FY 2016, in response to

congressional direction, WPTO was established as a standalone office dedicated to marine energy and hydropower R&D. The time period for the 2019 Peer Review included the first three years of WPTO as an independent office within EERE.

Funding for DOE’s water power R&D has increased since FY 2008, as shown in Figure 7. Congressional appropriations have directed portfolio allocations with roughly two-thirds of the budget historically focused on marine energy R&D and one-third on hydropower. Figure 8 shows historical budgets for EERE’s Renewable Power Offices since FY 2008 (with Water Power Program budgets indicated separately from Wind Power Program budgets during the period when the offices were combined).

Figure 7. Water Power Technologies Office Budget from FY 2008 to FY 2021

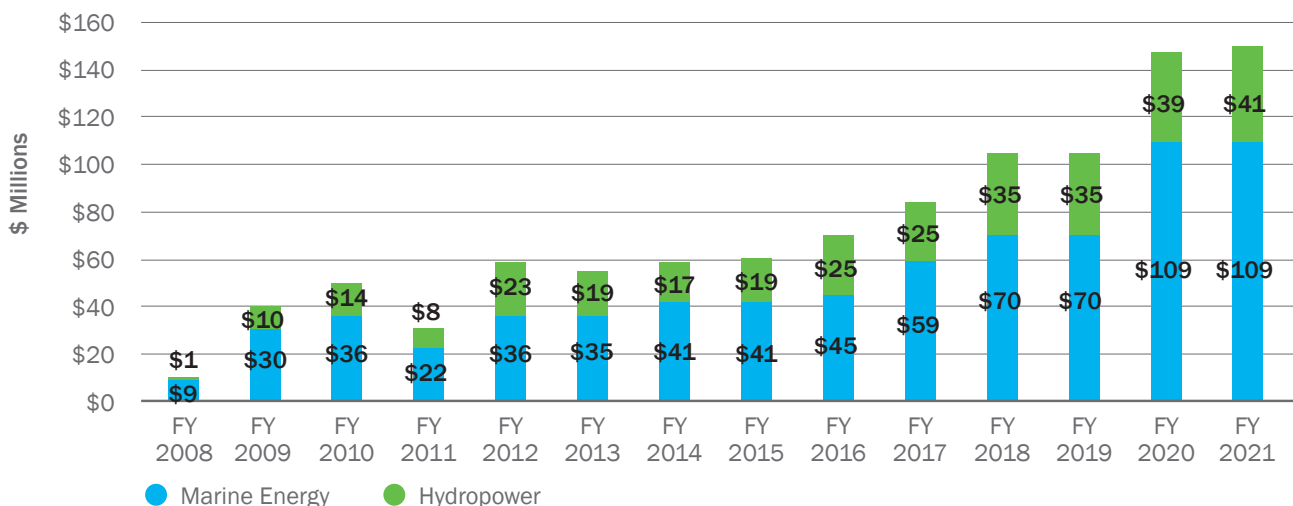
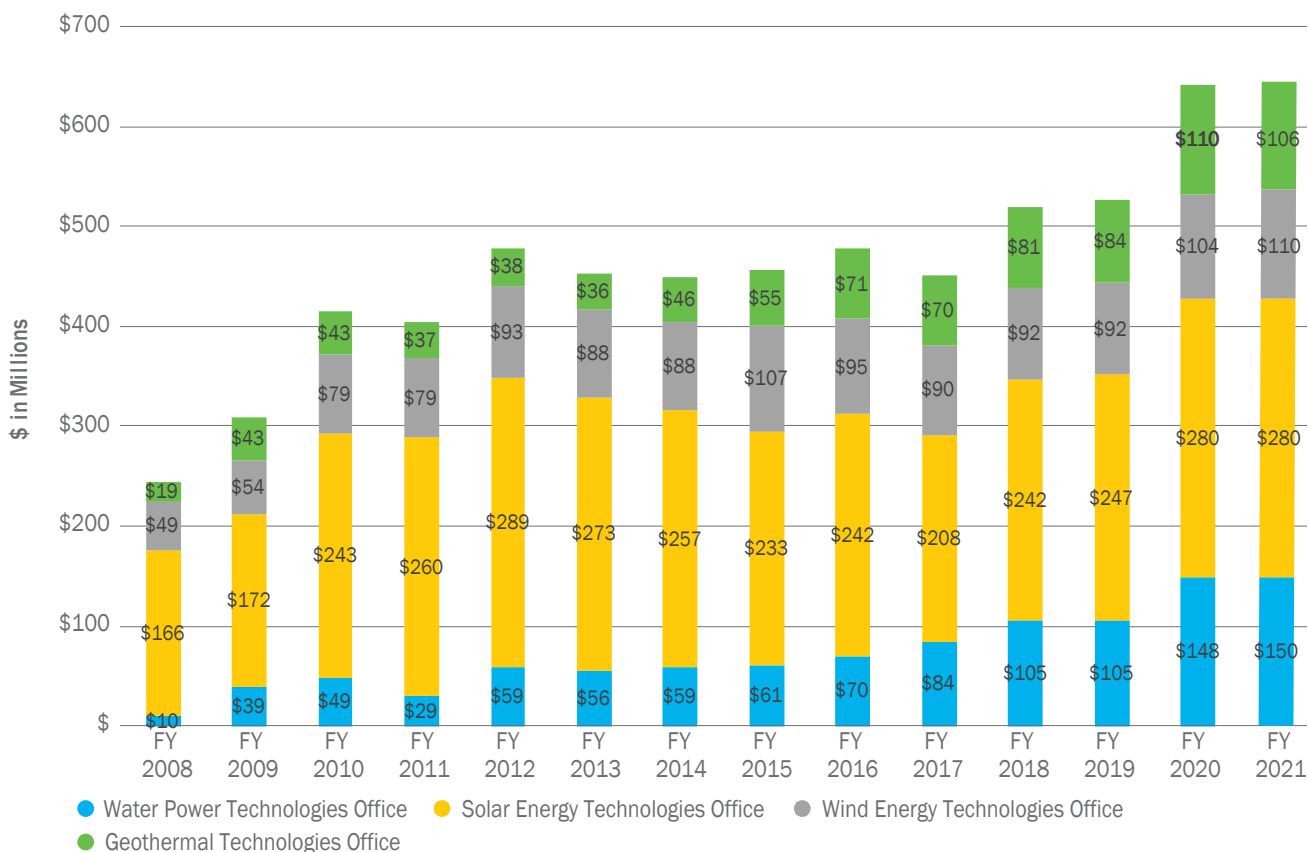


Figure 8. Office of Renewable Power Budget from FY 2008 to FY 2021



Funding Mechanisms

WPTO leverages a variety of funding mechanisms and increasingly focuses on developing and utilizing innovative approaches to support R&D in different ways. The following describes the main mechanisms WPTO leverages to fund R&D.

- **Financial Assistance:** These are regularly occurring, public, competitive solicitations that aim to identify and fund innovative ideas and solutions to WPTO-identified challenges.
 - **Funding Opportunity Announcements (FOAs):** WPTO provides notice of available funding for R&D projects that address areas of interest identified by the office. Applications submitted through FOAs are evaluated by independent reviewers based on publicly shared criteria. Selected applications result in cooperative agreements through which DOE provides multi-year funding with a cost-share commitment from the awardee (though some applicants can be exempted from the EERE cost-share requirements, like academic institutions). Cooperative agreements are similar to grants but provide for more substantive involvement between the federal awarding agency and the awardee.
 - **The Small Business Innovations Research (SBIR) and Small Business Technology Transfer (STTR) Programs** are competitive programs limited to small businesses to support prototyping and commercialization activities. Both programs offer zero cost-share grants through a three-phased approach focused on products and services with commercial potential.
- **Prizes and Competitions:** Since 2010, the United States government has run nearly 1,000 prizes and challenges in more than 100 federal agencies, and with solvers spanning the gamut between students and hobbyists to small business owners and academic researchers. Prizes are organized with defined goals and within a defined timeframe. Compared to funding made available through traditional DOE financial assistance mechanisms, prizes usually offer smaller amounts of funding within a faster timeline. Prizes and challenges can be powerful tools to disrupt traditional thinking in a sector, and introduce, expand, and evolve what is possible. Prizes and challenges enable federal agencies to:
 - Pay only for success and establish an ambitious goal without having to predict which team or approach is most likely to succeed.
 - Reach beyond the “usual stakeholders” to increase the number of perspectives working to develop solutions for a specific problem.
 - Foster interdisciplinary collaboration and perspectives, reflective of the modern research environment.
 - Inspire the next generation of scientists, engineers, and entrepreneurs to work on difficult and important problems.
 - For more information on federal government prizes, challenges, and competitions, go to [Challenge.gov](https://www.challenge.gov), a one-stop shop for the American people to learn about open innovation challenges.
- **National Lab-Led R&D:** These research agreements take the form of contracts (also known as AOPs) with DOE national laboratories that define the scope, schedule, milestones, and cost for work. WPTO funds national lab partners to conduct research and analysis, as well as to develop tools and resources that broadly benefit of the water power field. Ongoing, multi-year efforts funded at DOE labs are also subject to external merit review requirements, similar to financial assistance awards.
- **National Lab Support to Others:** There are number of different mechanisms that leverage the expertise and resources of the national laboratories to support work being conducted by industry or academia.

- “FOA support” occurs when labs receive funds to directly support a WPTO FOA awardee. Labs are currently ineligible to apply for most WPTO FOAs, but they may be requested by a FOA recipient to partner on an awarded project. In these cases, WPTO provides funding to the lab directly.
- The [Small Business Vouchers program](#) has previously provided funding to the national laboratories to support small businesses in helping test, develop, and validate their innovations by tapping into national laboratory intellectual and technical assets.
- The [Technology Commercialization Fund](#) helps industry to commercialize or license lab-developed technologies. This is a congressionally mandated program which comprises 0.9% of annual DOE program budgets and requires cost share.
- Notices of opportunity for technical assistance are public, competitive processes for targeted and specific types of technical assistance provided by the national laboratories. See information on recently selected recipients from December 2019 [here](#).
- **The EAct 2005 Section 242 Hydro Incentive Program:** The Hydro Incentive Program provides funding for projects adding hydroelectric power generating capabilities to existing dams throughout the United States. This is a congressionally mandated program appropriated to the Hydropower Program.
- **Other mechanisms** include a variety of contractual mechanisms to conduct work, including directed funding and contracting agreements. Interagency agreements involve the transfer of funds between agencies for interagency work.
- All **other** funded work that does not fall within one of the categories above normally involves program-led analyses, stakeholder engagement and feedback activities, program and project reviews, and dissemination efforts.

Assessing Performance and Evaluating Success

WPTO assesses its progress, decisions, goals, and approaches by continuously monitoring and evaluating performance at both project and program levels.

Project Evaluations

WPTO also ensures that all projects and funded activities are managed utilizing the best practices and guidance from EERE. Active project management and other standardized processes used to monitor and manage project performance include the following:

- Quarterly project progress reports are submitted by all funded organizations, outlining financial and technical status, identifying problem areas, and highlighting achievements. The office performs a quarterly assessment of progress against the planned scope and schedule as well as financial performance against cost projections. The assessment is documented in a quarterly management report.
- Face-to-face or virtual meetings are held between DOE technical project officers and contractors with the project principal investigator or project team at least two times per year.
- Go/no-go reviews, conducted by a combination of WPTO staff and external, independent reviewers, are utilized for larger, longer-term, and higher dollar-value projects. These reviews provide recommendations to inform go/no-go decisions for projects. Go/no-go reviews are generally aligned with defined budget periods defined in the contractual assistance agreement or AOP for each project. Milestones and associated completion criteria are set at the beginning of a budget period for project. Projects are required to present not only progress to date, but also plans for the remainder of the project. At a pre-determined point in the project, progress is evaluated against previously-established review criteria resulting in one of three possible outcomes: (1) review criteria are met resulting in a “go” decision to continue with the project as originally scoped, (2) review criteria are not met resulting in project termination (“no-go”), or (3) review criteria are partially met, resulting in required changes to the project; for example, by changing the scope of the effort or by extending the timeline to completion.

Program and Office Evaluations

The Office of Management and Budget monitors performance of WPTO programs against established technical annual and long-term performance targets, as specified in the [Government Performance and Results Act \(GPRA\)](#). Each EERE office is responsible for establishing and monitoring quarterly milestones aligned to these targets, as well as reporting on annual performance targets established in congressional budget requests.

WPTO and other Renewable Power Offices in EERE utilize modeled levelized cost of energy (LCOE), in addition to other metrics, to set targets and evaluate R&D progress. Modeled LCOE will continue to be used as a standardized way of measuring progress, as it is useful for comparing costs to other energy technologies and evaluating the degree to which assumptions are comparable. However, there are many documented shortcomings in a sole focus on LCOE as a measure of energy technology performance and value. In a rapidly changing and evolving U.S. grid, there is an increasing focus on flexibility, energy storage, and other ancillary services. WPTO is closely integrated in crosscutting DOE initiatives like the [Grid Modernization Initiative](#) and [Energy Storage Grand Challenge \(ESGC\)](#), which are working to develop methods to better assess technology capability and performance utilizing new and different metrics.

Another important mechanism to evaluate progress are regular public peer reviews to evaluate individual R&D projects as well as performance and strategy of the entire Office. These rigorous, independent reviews take place every two to three years in alignment with [EERE Guidance and Best Practices](#) to ensure and enhance the management, relevance, effectiveness, and productivity of projects, and to evaluate overall office strategy. Industry, national laboratories, academic institutions, and nongovernmental organizations that have received support are all required to participate in the review process. Panels of independent reviewers are tasked with reporting their findings to DOE, which are then made public.¹⁸ The feedback obtained from each peer review is utilized to inform future funding and programmatic decisions.

For more information on accomplishments and reviews of recent work, please also see the [most recent WPTO Accomplishments Report](#) and the [2019 Peer Review Report](#).

¹⁸ WPTO Peer Review website: <https://www.energy.gov/eere/water/water-power-program-peer-reviews>.