

Accelerating Energy Innovation in the 116th Congress: 10 Priorities for 2020

BY: COLIN CUNLIFF | JANUARY 2020

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INTRODUCTION

Accelerated innovation across all the major energy sectors, from electricity to transportation to industry to buildings, should be a critical objective of federal policy to address climate change. Congress made a good start at advancing this goal in 2019, the first term of the 116th Congress. The budget deal for fiscal year (FY) 2020 provided one of the largest single-year boosts in clean energy research, development, and demonstration (RD&D) since the creation of the Department of Energy (DOE) in 1978.¹ Legislators have built on this achievement with a strong slate of bipartisan, bicameral authorizing bills addressing key energy innovation challenges. Many of these bills have already passed out of the relevant committees—the Republican-controlled Energy and Natural Resources committee in the Senate, and the Democrat-controlled Science, Space and Technology committee in the House—with large bipartisan majorities.

While committee passage is laudable, the job will not be complete until a full package is approved by both chambers and signed by the president. A vital next step is for the congressional leadership to give floor time to energy legislation.

ITIF has identified the following 10 priorities for action. This list should not be interpreted as a complete energy innovation agenda. Many other agencies also play a role in energy innovation; many policy tools other than RD&D can accelerate innovation; and many RD&D needs have yet to be addressed.² But these 10 priorities have won the support of large bipartisan majorities at the committee level in at least one chamber, and should form the nucleus of a bipartisan energy package that gets signed into law this year.

Table 1: Status of energy innovation legislation

Bill	Number	Sponsors	Status
ARPA-E Reauth	S. 2714	Van Hollen (D-MD), Alexander (R-TN), Gardner (R-CO), Heinrich (D-NM)	passed SENR by voice vote, 1 no
	H.R. 4091	Johnson (D-TX), Lamb (D-PA), and 58 other members, including 44 Democrats and 14 Republicans	passed HSST by voice vote
CITA	S. 2300	Whitehouse (D-RI), Capito (R-WV), Manchin (D-WV), Braun (R-IN), Booker (D-NJ), Collins (R-ME), Feinstein (D-CA)	passed SENR by voice vote, 2 no
	H.R. 4230	Casten (D-IL), McKinley (R-WV), Johnson (D-TX), Radewagen (R-AS), Fitzpatrick (R-PA), Tonko (D-NY), and 36 other members	passed HSST energy subcommittee by voice vote
BEST	S. 1602	Collins (R-ME), Heinrich (D-NM), Smith (D-MN), Gardner (R-CO), Coons (D-DE), McSally (R-AZ), King (I-ME), and 15 other members	passed SENR by voice vote, 1 no
	H.R. 2986	Foster (D-IL), Casten (D-IL), Herrera Beutler (R-WA), Gonzalez (R-OH), and 44 other members	referred to HSST
NELA	S. 903	Murkowski (R-AK), Booker (D-NJ), Alexander (R-TN), Manchin (D-WV), Risch (R-ID), Whitehouse (D-RI), Crapo (R-ID), Coons (D-DE), Capito (R-WV), Duckworth (D-IL), Sullivan (R-AK), Bennet (D-CO), Graham (R-SC), Portman (R-OH), Gardner (R-CO), and 6 other members	passed SENR by voice vote, 1 no
	H.R. 3306	Luria (D-VA), Riggelman (R-VA), Lamb (D-PA), Wittman (R-VA), and 18 other members	referred to HSST, Energy & Commerce, Oversight & Reform, and Armed Services
LEADING	S. 1685	Cornyn (R-TX), Cassidy (R-LA), Coons (D-DE), Sinema (D-AZ), Gardner (R-CO)	passed SENR by voice vote, 1 no
	H.R. 3828	Crenshaw (R-TX), Cuellar (D-TX), Lucas (R-OK), Gonzalez (D-TX), Flores (R-TX), Lamb (D-PA), Walberg (R-MI), and 11 other members	referred to HSST
Carbon Capture, Use, and Storage	EFFECT Act S. 1201	Manchin (D-WV), Murkowski (R-AK), Capito (R-WV), Cramer (R-ND), Daines (R-MT), and 4 other members	passed SENR 18-2
	FERD Act H.R. 3607	Veasy (D-TX), Schweikert (R-AZ), Lamb (D-PA), Fletcher (D-TX), Johnson (D-TX), Fitzpatrick (R-PA), McKinley (R-WV), Torres Small (D-NM)	passed HSST 22-13
Geothermal	S. 2657	Murkowski (R-AK), Manchin (D-WV)	passed SENR by voice vote, 1 no
	H.R. 5374	Lucas (R-OK), Johnson (D-TX)	passed HSST energy subcommittee

Solar	S. 2668	Sinema (D-AZ), McSally (R-AZ)	passed SENR by voice vote
	H.R. 3597	McAdams (D-UT), Fortenberry (R-NE), Crist (D-FL)	passed HSST 21-13
Wind	S. 2660	Smith (D-MN), Collins (R-ME)	passed SENR by voice vote
	H.R. 3609	Tonko (D-NY), Fortenberry (R-NE), Kennedy III (D-MA), Bacon (R-NE), and 10 other members	passed HSST 21-13
Marine	S. 1821	Wyden (D-OR), Merkley (D-OR), King (I-ME), Schatz (D-HI), Reed (D-RI), Hirono (D-HI)	passed SENR by voice vote, 3 no
	H.R. 3203	Deutch (D-FL), Bonamici (D-OR), and 3 other members	referred to HSST
Smart Manufacturing	S. 715	Shaheen (D-NH), Alexander (R-TN), Hassan (D-NH)	passed SENR by voice vote, 1 no
	H.R. 1633	Welch (D-VT), Reed (R-NY)	referred to HSST, E&C
Grid Mod	S. 2332	Cantwell (D-WA), Heinrich (D-NM), Hirono (D-HI)	passed SENR by voice vote, 2 no
	H.R. 5428	Lamb (D-PA), Herrera Beutler (R-WA), Johnson (D-TX), Fitzpatrick (R-PA)	passed HSST energy subcommittee by voice vote
Vehicle Innovation	S. 1085	Peters (D-MI), Alexander (R-TN), Stabenow (D-MI)	passed SENR by voice vote
	H.R. 2170	Dingell (D-MI), Stevens (D-MI), Cohen (D-TN)	referred to HSST
Tech Transitions	S. 2688	Cassidy (R-LA), Whitehouse (D-RI), Manchin (D-WV), Tillis (R-NC)	passed SENR by voice vote, 1 no

1. ARPA-E REAUTHORIZATION (S. 2714 / H.R. 4091)

The Advanced Research Projects Agency-Energy (ARPA-E) fills key gaps in the U.S. energy innovation system by investing in high-risk, high-impact research the private sector alone would not support. The ARPA-E Reauthorization Act updates the goals of ARPA-E to align with DOE missions, and authorizes funding increases from \$428 million in FY 2020 to \$750 million in FY 2024. Though still below the \$1 billion in annual funding originally envisioned by the National Academy of Sciences when it recommended creation of the agency, this bill goes a long way toward increasing ARPA-E’s contribution to American energy innovation. ITIF analysis has found ARPA-E to be an effective catalyst of energy innovation, and has recommended ARPA-E be reauthorized and its budget expanded.³

2. CLEAN INDUSTRIAL TECHNOLOGY ACT (S. 2300 / H.R. 2986)

Heavy industry (iron, steel, cement, and chemicals production) and hard-to-electrify transportation (aviation, shipping, and long-distance road transport) are responsible for a significant and growing share of global emissions. These sectors are challenging to decarbonize and are underrepresented in the federal energy innovation portfolio. The Clean Industrial Technology Act (CITA) would establish new RD&D programs at DOE that would begin to fill these gaps and make better use of DOE’s current programs—including in carbon capture, hydrogen, advanced nuclear, electrification, and renewable heat—by exploring their applications in harder-to-decarbonize sectors. CITA is consistent with ITIF’s recommendations for tackling these decarbonization challenges.⁴

3. BETTER ENERGY STORAGE TECHNOLOGY ACT (S. 1602 / H.R. 2986)

Long-duration grid-scale energy storage is essential to enable a greater share of electricity to be drawn from renewable resources such as wind and solar. Current technologies are unable to perform this function at an affordable cost. The Better Energy Storage Technology (BEST) Act would create a new RD&D program to develop storage technologies across multiple timescales—from hourly and sub hourly all the way to seasonal—and multiple technologies, including batteries and pumped hydropower. It would create a single, crosscutting office within DOE to leverage existing programs. Additionally, the bill would require DOE to establish at least five energy storage system demonstration projects; create a technical assistance program for states and utilities to plan and evaluate energy storage projects; establish a prize competition for energy-storage materials recycling; create a joint Department of Defense/DOE storage demonstration program; and establish regulatory actions to enable integration of energy storage into the grid. The BEST Act would take important steps to address weaknesses ITIF has identified in its work on energy storage.⁵

4. NUCLEAR ENERGY LEADERSHIP ACT (S. 903 / H.R. 3306)

Nuclear power is an important source of firm, low-carbon electricity today, but few new plants are likely to be built because of cost, safety, and other concerns. The Nuclear Energy Leadership Act (NELA) refocuses DOE's current nuclear-energy research program on advanced, next-generation reactor technologies, including non-light-water reactor designs. The bill i) requires DOE to demonstrate at least two advanced reactor projects by 2025 and an additional two to five advanced reactor projects by 2035; ii) directs DOE to build a versatile test reactor (VTR) user facility to enable testing of advanced reactor fuels and materials; iii) requires DOE to establish a domestic supply of high-assay low enriched uranium (HA-LEU), which many advanced reactor concepts would use for fuel; iv) enables the federal government to enter into long-term power purchase agreements (PPAs) for first-of-a-kind or early deployment nuclear technologies for up to 40 years; and v) directs DOE to establish a 10-year strategic plan for the Office of Nuclear Energy. NELA implements many of the recommendations from the ITIF report *Innovation Agenda for Deep Decarbonization*.⁶

5. CARBON CAPTURE, UTILIZATION, AND STORAGE LEGISLATION

Carbon Capture, Utilization, and Storage (CCUS) has the potential to perform multiple roles in a deeply decarbonized energy system. If these technologies were to be made affordable and safe, they would enable the continued use of fossil fuels for low-carbon electricity generation, and enable process emissions from heavy industry such as cement and chemicals production to be eliminated. These bills would take complementary steps to address innovation challenges related to CCUS technologies.⁷

LEADING Act (S. 1685 / H.R. 3828)

The Launching Energy Advancement and Development through Innovations for Natural Gas (LEADING) Act fills a critical gap in the nation's energy innovation portfolio by creating a new carbon capture RD&D program at DOE for natural gas power plants. Natural gas plants present different technology and integration challenges than coal plants, which have been DOE's exclusive focus in the past. The bill calls for technology demonstrations of carbon capture at

three or more natural gas power plants by 2025. ITIF has previously recommended Congress establish a new carbon capture demonstration program for natural gas.⁸

EFFECT Act (S. 1201) and Fossil Energy R&D Act (H.R. 3607)

The Enhancing Fossil Fuel Energy Carbon Technology (EFFECT) Act and the Fossil Energy R&D Act both reauthorize and update DOE's fossil energy CCUS programs, but are not direct companions.

The EFFECT Act expands and updates DOE's CCUS RD&D programs to include natural gas and coal power plants—though unlike LEADING, it does not set specific targets for technology demonstrations. Additionally, the EFFECT Act directs DOE to work with the National Academies to assess the barriers and opportunities for developing commercial uses of captured carbon dioxide. The bill also creates a new RD&D program to develop technologies to remove carbon dioxide from the atmosphere through direct air capture and storage, bioenergy with carbon capture and storage, enhanced geological weathering, and natural approaches for carbon removal. ITIF has previously recommended Congress create new programs for natural gas carbon capture and direct atmospheric carbon dioxide removal.⁹

The Fossil Energy R&D Act is a complete reauthorization and update of the DOE Office of Fossil Energy. It incorporates the main provisions of the EFFECT Act, including the creation of a new RD&D program for carbon dioxide removal and the expansion of existing CCUS programs to include natural gas. It adds the operation of at least three Carbon Capture Test Centers to provide testing capabilities for both power and industrial CCUS systems; and authorizes FE's programs in advanced energy systems, methane leak detection and mitigation from natural gas systems, methane hydrates research, and rare earth elements recovery from coal-based resources. It would also create a new waste gas utilization program that builds on the recommendations of the recent National Academies report on carbon dioxide and waste gas utilization.¹⁰

6. ADVANCED RENEWABLE ENERGY INNOVATION LEGISLATION

Decades of federal investment have contributed to dramatic cost reductions in certain forms of renewable energy, particularly solar photovoltaics (PV) and onshore wind power, leading to increased adoption of renewables in recent years.¹¹ Renewable energy now accounts for 12 percent of total U.S. primary energy production, but further innovation in next-generation renewables is necessary to realize the full potential of these diverse resources.¹²

Geothermal Energy Legislation (S. 2657 / H.R. 5374)

The United States has enormous untapped geothermal energy resources. Current geothermal power plants are limited to regions of the country with geothermal resources near the earth's surface. Enhanced geothermal systems (EGS) could allow geothermal power plants to tap into deeper sources of heat across wider swathes of the country. Alternatively, geothermal heat pumps can enable direct use of low-temperature, near-surface geothermal resources for building heating and cooling. DOE's recent *GeoVision* report finds that technological advances could enable a 26-fold increase in geothermal energy production by 2050.¹³ But ITIF has found that realizing this potential requires RD&D to harness America's domestic geothermal resources more effectively.¹⁴ The AGILE Act (S. 2657) and Advanced Geothermal R&D Act (H.R. 5374) both reauthorize and update DOE's geothermal programs, but are not direct companions.

The Advanced Geothermal Innovation Leadership (AGILE) Act (S. 2657) directs DOE to establish two Frontier Observatory for Research in Geothermal Energy (FORGE) sites to develop EGS techniques; requires DOE to demonstrate four EGS systems in different geologic settings and different regions of the United States; establishes a research program for geothermal heat pumps; directs the U.S. Geologic Survey to update its geothermal resource assessment; and establishes a prize competition for coproduction of critical minerals from geothermal resources.

The Advanced Geothermal R&D Act (H.R. 5374) updates DOE's geothermal program's authorization and encourages collaboration with industry and the DOE Offices of Fossil Energy and Energy Efficiency and Renewable Energy. The bill reauthorizes DOE's hydrothermal research program, authorizes construction of up to three FORGE sites, and also EGS demonstrations.

Solar Energy R&D Act (S. 2668 / H.R. 3597)

DOE's research programs have contributed to impressive cost declines for utility-scale solar PV (74 percent) and rooftop solar PV (55 percent) in the last 10 years, making solar energy a competitive source for electricity generation in areas of the country with good solar resources and low penetration.¹⁵ But solar energy accounts for only 2 percent of U.S. electricity generation, and continued innovation is necessary to expand utilization of and access to solar power. The Solar Energy R&D Act reauthorizes DOE's solar energy program, and targets innovations in solar PV and concentrating solar power that build on DOE's past success in driving down costs and improving the performance of solar technologies. The bill directs DOE to explore a range of advanced solar energy technologies, including perovskites, thin-film devices, solar fuels, and integration technologies—and also establishes an advanced solar energy manufacturing initiative to support a domestic solar industry.¹⁶

Wind Energy R&D Act (S. 2660 / H.R. 3609)

Since 2008, the cost of onshore wind energy has declined 75 percent, enabling electricity generation from wind to increase by 360 percent over the same time period.¹⁷ Continued cost declines and performance improvements will enable greater use of domestic wind resources. The nascent offshore wind industry is beginning to take off, but additional cost reductions will be needed to make it competitive with other sources of electricity.¹⁸ The Wind Energy R&D Act reauthorizes DOE's wind energy program, and targets innovations in onshore, offshore, and distributed wind power that can drive down costs and expand access to wind energy to more parts of the country. The bill also authorizes projects that demonstrate and validate new wind energy technologies; supports research for wind turbines in hybrid energy systems; provides for offshore research facilities, including offshore support-structure testing facilities; and establishes a wind energy incubator grant program for innovative wind technologies. The bill ramps up investment in wind energy research at 5 percent per year through 2024.

Marine Energy R&D Act (S. 1821 / H.R. 3203)

Marine energy technologies harness the energy from waves, tides, currents, and other free-flowing waters without the use of dams or other impoundments. But marine energy technologies are at an early stage of development due to the fundamental scientific and engineering challenges of generating power from complex dynamics within a corrosive ocean environment.¹⁹ The Marine Energy R&D Act reauthorizes DOE's programs to accelerate innovation in marine technologies, and authorizes the creation of National Marine Energy Centers to advance RD&D of marine technologies to support in-water testing and demonstration. The bill also expands the

goals of DOE's program to include generation and storage of power at sea, and to advance the resilience of coastal communities.

7. SMART MANUFACTURING LEADERSHIP ACT (S. 715 / H.R. 1633)

Industrial energy efficiency, along with decarbonization, is a critical strategy for limiting climate change. Smart manufacturing technologies open diverse new pathways toward greater efficiency. The Smart Manufacturing Leadership Act directs DOE, in consultation with the National Academies, to develop a national plan for the development and deployment of smart manufacturing technologies. The bill also expands the scope of DOE's Industrial Assessment Centers—which currently provide technical assistance to improve the productivity and energy efficiency of small and medium-sized manufacturers—to include smart manufacturing technologies. And the bill creates a new program for DOE to provide grants to states to develop their own smart manufacturing programs.²⁰

8. GRID MODERNIZATION (S. 2332 / H.R. 5428)

Applying information and communications technology to the electricity grid is required to incorporate more distributed and variable energy resources, provide enhanced connectivity between systems and devices, and manage grid operations more effectively. The House and Senate bills reauthorize and update DOE's grid modernization programs to address new innovation challenges, but are not direct companions.

The Senate Grid Modernization Act (S. 2332) reauthorizes the DOE Office of Electricity's energy storage RD&D program. It establishes new programs for i) technology demonstrations on the distribution system; ii) micro-grid and hybrid micro-grid systems; iii) electric grid architecture, scenario development, and modeling; iv) development of voluntary model pathways for grid modernization, in collaboration with states and utilities; v) evaluating grid performance, including reliability; and vi) technical assistance to states and electric utilities for distribution planning.²¹

The House Grid Modernization R&D Act (H.R. 5428) establishes a smart grid regional demonstration initiative; a new RD&D program to enhance grid resilience and strengthen emergency response; a program to develop hybrid energy systems; and a new program to address integration challenges related to distributed energy, variable renewable energy, electric vehicles, and grid-interactive buildings.

9. VEHICLE INNOVATION ACT (S. 1085 / H.R. 2170)

In 2017, vehicles surpassed power plants as the largest sources of emissions in the United States. The Vehicle Innovation Act directs DOE to conduct a comprehensive program of RD&D and commercial application across a wide range of materials, technologies, and processes to reduce emissions from the transportation sector. The focus extends from light-duty cars and trucks to medium- and heavy-duty commercial vehicles to Class 8 freight trucks. The bill also directs DOE to invest in advanced vehicle manufacturing technologies—such as battery manufacturing and advanced materials fabrication—and to partner with companies that manufacture or assemble vehicles in the United States. ITIF has called attention to the United States' lagging position in electric vehicles and batteries in recent research.²²

10. TECHNOLOGY TRANSITIONS ACT (S. 2688)

Technology transition and commercialization are vital elements of the energy innovation process in which DOE has long underperformed. The Technology Transitions Act authorizes the Office of Technology Transitions (OTT) within DOE “to expand the commercial impact of the research investments of [DOE]; and to focus on commercializing technologies that reduce greenhouse gas emissions...” The bill creates a new chief commercialization officer to oversee OTT, and directs DOE to conduct a review of its applied energy programs to avoid duplication and improve coordination. ITIF has long advocated strengthening DOE’s technology commercialization efforts.²³

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About ITIF

The Information Technology and Innovation Foundation (ITIF) is a nonprofit, nonpartisan research and educational institute focusing on the intersection of technological innovation and public policy. Recognized as the world’s leading science and technology think tank, ITIF’s mission is to formulate and promote policy solutions that accelerate innovation and boost productivity to spur growth, opportunity, and progress.

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ENDNOTES

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