



Photo Source: Bureau of Reclamation, 2012

About HDR's Advisory Services

The Advisory Services team has over 250 management consultants with premium, strategic advice that is rooted in the practical, solid-state service that our infrastructure clients around the world have come to expect. We have expertise in funding and finance, economics and decision analysis, strategic planning and policy, sustainability and resiliency, strategic communications and business improvement.

Advisory Services professionals review infrastructure policy developments and prepare summaries of key provisions to help keep our clients informed of the changing landscape in Washington, D.C.

To review past Advisory Services Policy Briefs and sign up for future updates on federal policy and funding programs, please visit our [website](#).

Energy Provisions

Infrastructure Investment and Jobs Act Advisory Services Policy Brief #10

The Infrastructure Investment and Jobs Act (IIJA), also known as the Bipartisan Infrastructure Law, invests over \$1 trillion in infrastructure, ranging from traditional road and bridge projects to broadband access and investments in energy infrastructure. This policy brief focuses on the \$62 billion of the bill directed to the U.S. Department of Energy (DOE) to invest in energy infrastructure rehabilitation projects, research and development, and market support.

Energy and Climate Goals

President Biden set ambitious goals related to climate change and energy upon taking office. He recommitted the United States to the Paris Climate Accords¹, and through Executive Orders (EO) signed in mid- to late 2021^{2,3}, further set out to reduce carbon emissions and combat climate change. The EOs set the following timeline of climate and energy goals:

- 50–52 percent reduction in greenhouse gases (GHGs) by 2030
- Carbon-pollution-free power sector by 2035
- Net-zero emissions by 2050

1 [Executive Order 14008, Tackling the Climate Crisis at Home and Abroad](#)

2 [Executive Order 14057, Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability](#)

3 [Executive Order 14030, Climate-Related Financial Risk](#)



Furthermore, the [Executive Order on Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability](#) sets the following targets:

- **2027:** 100 percent zero-emission light-duty vehicle acquisitions
- **2030:** 100 percent carbon-free electricity
- **2030:** 65 percent emissions reduction from overall federal operations
- **2032:** 50 percent building portfolio emissions reduction
- **2035:** 100 percent zero-emission vehicle acquisitions
- **2045:** Net-zero emissions building portfolio
- **2050:** Net-zero emissions from federal procurement no later than 2050, including a Buy Clean Policy to promote use of construction materials with lower embodied emissions
- **2050:** Net-zero emissions from federal operations

The timeline set by the EO, along with October's [Agency Climate Adaptation and Resilience Plans from Across Federal Government](#), set forth goals to be implemented through funding from the IIJA and potential funding through the annual federal budget process that included climate provisions, also known as the Build Back Better plan. Understanding this background helps provide context for the energy investments in the IIJA that support efforts to achieve those ambitious goals.

Current Domestic Energy Capacity, Consumption, and Sourcing

Consider that the DOE cites independent [estimates that indicate](#) electricity transmission capacity will need to increase 60 percent by 2030 and triple by 2050. Additionally, our existing infrastructure is overdue for upgrades, repair, and replacement. For example, more than 70 percent of transmission lines are over 25 years old and are potentially vulnerable to extreme weather events.

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Transmission infrastructure is the backbone of a reliable, resilient, and clean electricity system. Significant transmission investments are needed to achieve our ambitious clean energy goals; however, today these investments face numerous barriers.

– U.S. Representative Kathy Castor (FL-14)

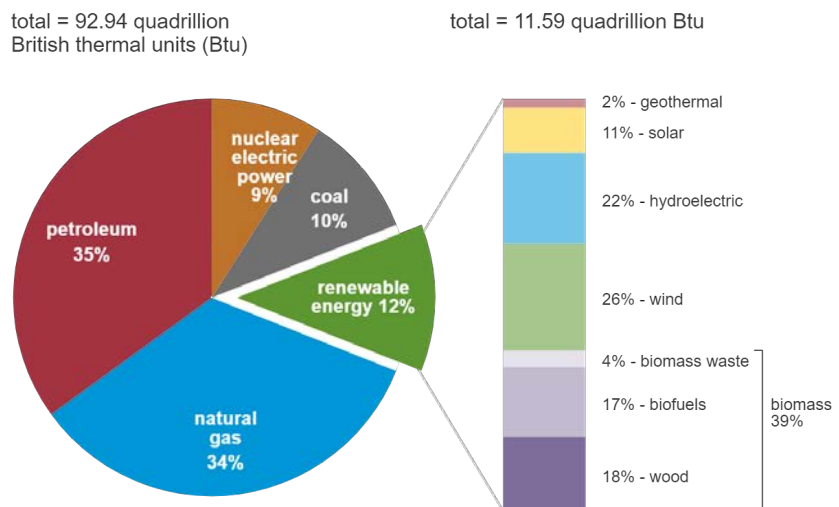


As we consider the need to expand the capacity of our grid to provide reliable energy, we must also look at the opportunities to increase carbon-free electricity. Renewable energy made up only 12 percent of energy consumed in the United States in 2020⁴. If we seek to transition fully to renewable energy, even if energy consumption levels remain flat, renewable energy generation will be required to increase from 11.59 quadrillion Btu to approximately 82 quadrillion Btu to maintain the grid demands, as shown as **Figure 1**.

Natural gas, crude oil, coal, and natural gas plant liquids (NGPL) made up over 75 percent of domestic energy generation in 2020, as shown in **Figure 2**. Shifting energy generation from carbon-emitting sources will require a substantial effort and change from current practices. The IIJA invests in energy generation from sources defined as clean, such as biomass, hydropower, and hydrogen.

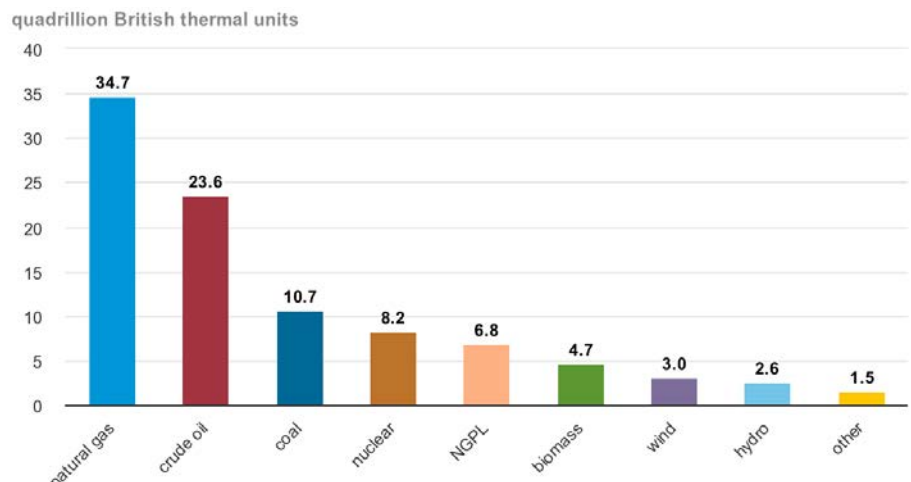
⁴ [U.S. energy facts explained - consumption and production - U.S. Energy Information Administration \(EIA\)](#)

Figure 1. U.S. primary energy consumption by energy source, 2020

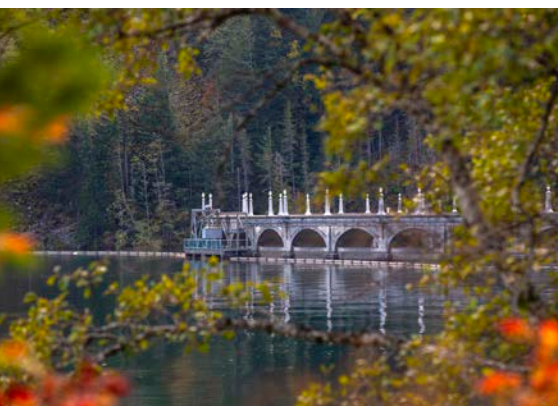


Source: U.S. Energy Information Administration, *Monthly Energy Review*, Table 1.3 and 10.1, April 2021, preliminary data
Note: Sum of components may not equal 100% because of independent rounding.

Figure 2. U.S. primary energy production by major sources, 2020



Source: U.S. Energy Information Administration, *Monthly Energy Review*, April 2021, preliminary data
Note: NGPL is natural gas plant liquids; other is geothermal and solar; hydro is conventional hydroelectric.

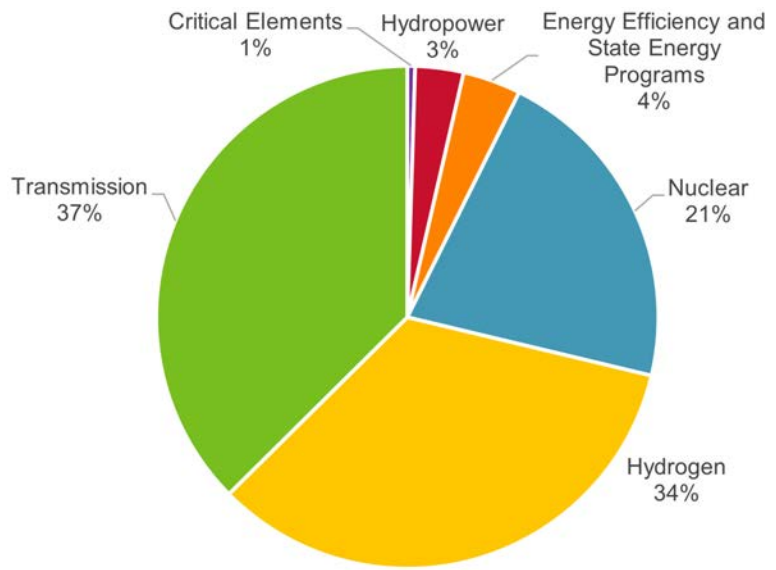


Energy Investments in the Infrastructure Investment and Jobs Act

To jumpstart the shift in generation and consumption, the IIJA invests substantially in the DOE to rehabilitate our aging energy infrastructure and begin the path toward creating the transition to a clean energy economy. In total, \$62 billion is directed to the DOE. Within the \$62 billion, investments are made in hydropower, nuclear energy, strengthening our electric grid, research and development for battery storage, and hydrogen fuel technology, as shown in

Figure 3.

Figure 3. Funding Allocation



Hydropower

The bill authorizes \$100 million to rehabilitate and upgrade water storage and hydroelectric capacity at the John W. Keys II Pump Generating Plant in the Columbia Basin.

The \$100 million will be available after September 16, 2024, and expenditures may be used by the Administrator of the Bonneville Power Administration (BPA) for the following investments:

1. Replace Obsolete Equipment
2. Maintain Reliability and Improve Efficiency in System Performance
3. Create More Hydroelectric Capacity in the Pacific Northwest

The bill also provides \$10 million to study the value of increasing the coordination of hydropower and water storage facilities in British Columbia and the Pacific Northwest United States.



HYDROPOWER PRODUCTION INCENTIVES

The IIJA provides a large investment in hydropower, authorizing the Secretary of Energy to commit \$125 million in 2022 for new appropriations toward hydroelectric production projects and \$75 million on efficiency improvement projects, both available until spent. There is also \$553.6 million for upgrading projects relating to grid resiliency or dam safety, which include the following categories:

- Adapting to grid changes
- Ancillary services (black start capabilities, voltage support, and spinning reserves)
- Integrating other variable sources of generation
- Managing sediments
- Fish passage
- Water quality
- Downstream sediment
- Recreational access
- Dam stability
- Spillway improvements

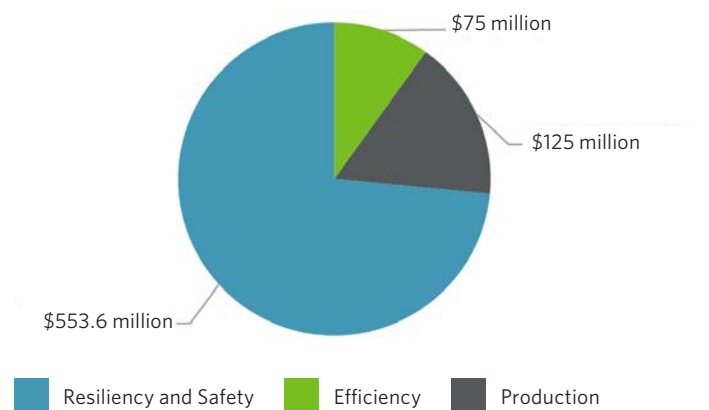
These incentives are limited to \$5 million annually and a maximum of 30 percent of the overall project cost. See **Figure 4**.

PUMPED STORAGE

The IIJA authorizes \$2 million annually beginning in 2022 through 2026, and no later than September 2023, to provide financial assistance for pumped storage demonstration projects. The projects will include “project design, transmission studies, power market assessments, and permitting for a pumped storage hydropower project.” Electric utilities, cooperatives, investor-owned, Indian tribe, state energy office, higher education institute, or a mix of entities are eligible to receive funding. Awards must be matched by the grant recipient at an equal to or greater amount received, must produce at least 1,000 megawatts, provide electricity to a market, and be able to store electricity generated by renewable projects on tribal land.

Additionally, the bill gives the Secretary of the Interior authority to develop small conduit hydropower or pumped storage using Bureau of Reclamation reservoirs, provided that the reservoir request was filed before August 9, 2013.

Figure 4. Hydropower Incentives



Nuclear

The IIJA invests \$6 billion for years 2022 to 2026 in the Civilian Nuclear Credit Program to prevent operating nuclear reactors from prematurely decommissioning due to economic factors. The funds are to be given to reactors that can provide a detailed plan on economic sustainability after the four years of credits expire.

While the IIJA does not provide funding for development of new nuclear power, the bill supports potential nuclear power generation development in the future to offset carbon emissions and enhance grid resiliency. The bill amends the Energy Act of 2005 to research and report findings on the viability of small or micro-reactors, which produce no greater than 50 megawatts.

The reported findings will address:

- Carbon reduction capabilities
- Ability to power facilities during a three-day grid failure
- Natural event resilience
- Private industry replacement of diesel generation

Critical Elements

The IIJA provides funding to boost the U.S. market for critical elements and materials to meet the increasing demand of battery power and help develop battery energy storage potential. Current clean energy generation such as solar or wind power does not provide consistent hourly generation. Finding a way to capture and store surplus energy will help offset the need for carbon-emitting fuel sources.

Figure 5 shows California’s energy generation for January 26, 2022, as an example⁵. Renewable generation peaks during the day, allowing usage of natural gas and electricity generated out of state (imports in the graph below) to significantly decline. However, in the evening, gas and imports become necessary again. Advancing battery technology, which relies on critical elements, can allow states, utilities, or residents to store surplus energy not used during the daytime for use in off-hours.

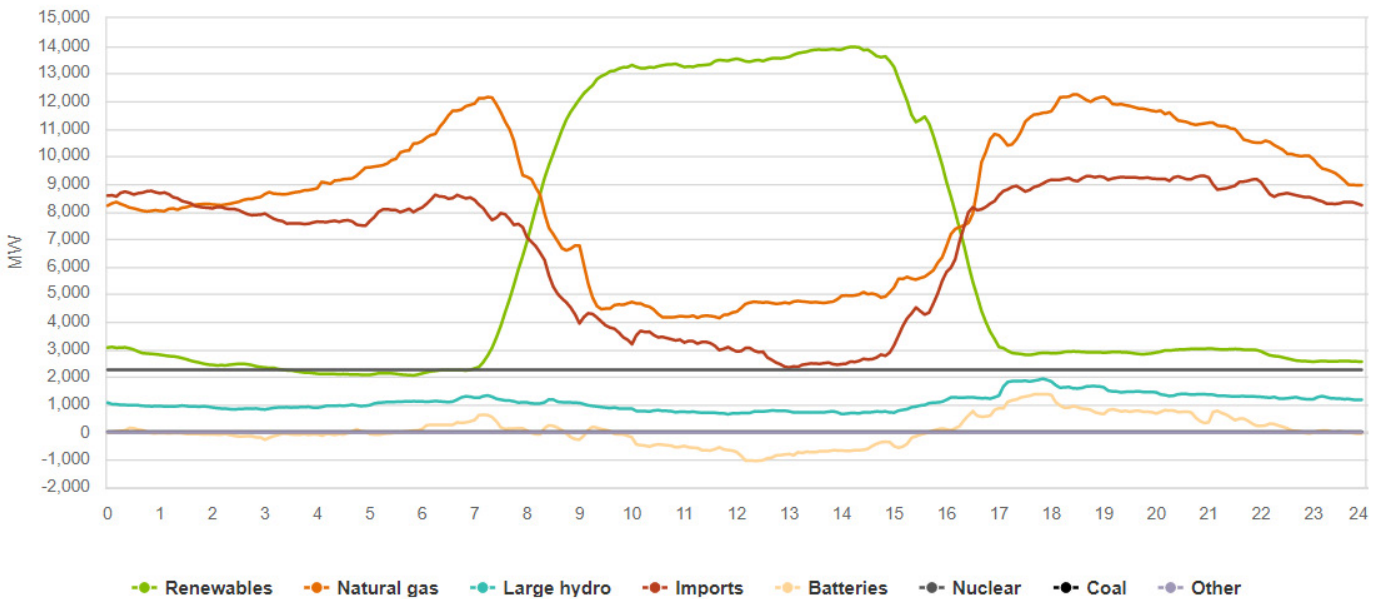
Traditionally, the United States has relied on imports for the rare earth elements required in the production of semiconductors, microchips, and battery technology. Last year, the U.S. imported 80 percent of rare earth elements from China.⁶

To increase the U.S. critical element market, the IIJA directs the U.S. Geological Survey to map the domestic surface and subsurface to look for potential deposits and mining sites, prioritizing abandoned mine areas and mine waste lands. This mapping data will be compiled on a publicly available geospatial website within the next 10 years.

The bill provides \$140 million, beginning in 2022, to develop, design, and construct a new academic-partnered facility to support energy and minerals research. The purpose of this research plant is to develop and demonstrate the potential technological and economic viability of battery technology. An additional \$200 million of grant funding is available to develop and construct domestic battery manufacturing and recycling plant(s).

Beyond grant awards, the IIJA also expands the authority of the DOE’s Loan Program Office to finance “[p]rojects that increase the domestically produced supply of critical minerals, including through the production, processing, manufacturing, recycling, or fabrication of mineral alternatives.”

Figure 5. California’s energy generation for January 26, 2022



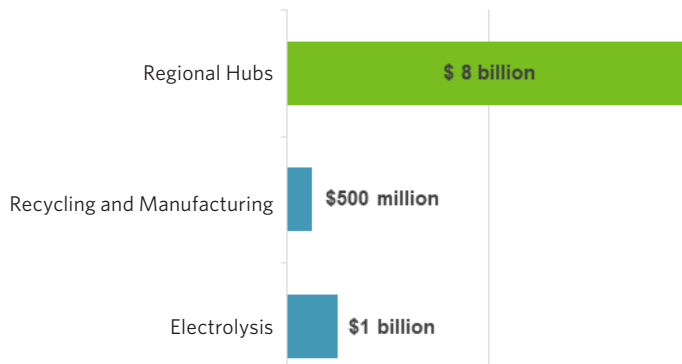
5 <http://www.aiso.com/TodaysOutlook/Pages/supply.html>

6 <https://pubs.usgs.gov/periodicals/mcs2021/mcs2021-rare-earths.pdf>

Hydrogen

The IIJA provides funding for the development of clean hydrogen energy as a potential energy source that could transition [heavy trucking and industrial sectors toward carbon-free operations](#). The transportation and industrial sector made up 35 and 36 percent of domestic energy consumption, respectively, in 2020.⁷ Overall, 78 percent of the industrial sector and 94 percent of the transportation’s energy consumption came from carbon-emitting sources. To begin offsetting those figures to clean energy, the IIJA redefines hydrogen as “clean hydrogen” and contains \$9.5 billion in funding to research, develop, and accelerate hydrogen technology. A breakdown of the funding to hydrogen is shown in **Figure 6**.

Figure 6. Hydrogen Funding



REGIONAL CLEAN HYDROGEN HUBS

The IIJA also provides funding and a roadmap to develop a market and supply chain for clean hydrogen. This includes creating four regional hubs of producers, consumer networks, and hydrogen infrastructure to support a new hydrogen energy economy under the direction of the Secretary of Energy. Hubs will locate in different regions of the United States and have unique focuses depending on the local resource and economic markets. The legislation provides \$8 billion beginning in 2022 through 2026 to develop these hubs.

The regional hubs will demonstrate and research different production factors, which will include:

- Production of clean hydrogen from fossil fuels
- Production of clean hydrogen from renewable energy
- Production of clean hydrogen from nuclear energy

Each hub will research and demonstrate end-use sectors, which will include:

- Electric generation sector
- Industrial sector
- Residential and commercial heating sector
- Transportation sector



⁷ https://www.eia.gov/totalenergy/data/monthly/pdf/flow/css_2019_energy.pdf

CLEAN HYDROGEN MANUFACTURING AND RECYCLING

The legislation authorizes \$500 million for the Secretary of Energy to award multiyear grants to entities for research and development of hydrogen manufacturing and recycling technologies. Grant awards will occur within three years of enactment (by November 2024) and will be prioritized to entities in regions of major gas-producing hubs, which will advance the following outcomes for clean hydrogen:

- Improving cost-effectiveness
- Minimizing environmental impacts of disposal
- Removing barriers to research
- Developing alternative technologies or materials
- Advancing consumer acceptance programs

CLEAN HYDROGEN ELECTROLYSIS

Electrolysis is the process of splitting water to isolate hydrogen atoms for fuel use. The IIJA provides funding for the creation of a program to develop electrolysis technology and establishes a goal to reduce the cost of hydrogen produced to less than \$2 per kilogram by 2026. The current cost of fuel cell hydrogen per kilogram is \$12-\$16. The program is authorized with \$1 billion beginning in 2022 and remains available until 2026. The funds will be awarded to eligible entities through competitive grants, contracts, and cooperative agreements.

Transmission Line Development

To meet the energy and clean economy goals by 2035 and 2050, respectively, the grid and transmission line infrastructure requires expansion and rehabilitation. IIJA funding supports the grid and transmission line upgrades deemed necessary to achieve the capacity and resiliency required to handle the increased electricity generation. Not only is construction and repair required, but upgrades to existing lines to harden against extreme weather and other natural events are also needed. As demonstrated during

events such as the Dixie Fire and Texas power outages and grid failures in 2021, our energy infrastructure system is not designed for extreme weather events.

PROGRAM UPGRADING OUR ELECTRIC GRID AND ENSURING RELIABILITY AND RESILIENCY

The program is authorized at \$5 billion, beginning in 2022, under the direction of the Secretary of Energy, to provide federal financial assistance to states, tribes, local governments, and public utility commissions to demonstrate:

- “Innovative” approaches to transmission, storage, distribution, and resiliency
- New approaches for enhanced grid resiliency

An additional \$1 billion is dedicated to entities in rural areas to support rural energy cost-effectiveness, upgrading transmission lines, reducing emissions, increasing efficiency, or modernizing the grid and generation facilities.

POWER MARKETING ADMINISTRATION TRANSMISSION BORROWING AUTHORITY

The IIJA provides \$10 billion in borrowing authority for the Bonneville Power Administration to construct and replace infrastructure in the Federal Columbia River Power System. The \$10 billion authorized can be outstanding at any time over the next five years, but the loan balance must be under \$6 billion by 2026.

TRANSMISSION FACILITATION PROGRAM

The Transmission Facilitation Program (TFP) supports transmission line upgrades or new construction of nationally significant corridors to increase resiliency or connect clean energy sources. The IIJA authorizes \$2.5 billion through the TFP to provide loans to qualifying transmission line projects, which include new transmission lines that are either 1,000 MW or upgrading an existing line of 500 MW, or connecting an isolated microgrid to existing infrastructure corridors.





SMART GRID INVESTMENT MATCHING GRANT PROGRAM

The [Smart Grid Investment Matching Grant Program](#) (SGIG) is authorized at \$3 billion. Created through the Energy Independence and Security Act of 2007, the SGIG has invested \$8 billion providing federal matching for 99 smart grid upgrade or jump-start projects. The projects historically addressed challenges relating to customer service, advanced metering, electric distribution, transmission systems, and equipment manufacturing. The IIJA expands the program to include security plans or security upgrade projects.

BUILDING A BETTER GRID INITIATIVE

Following passage of the IIJA, the DOE has launched the [Building a Better Grid Initiative](#) to build critical electrical infrastructure and make the grid more resilient.



DOE’s new Building a Better Grid initiative is a job booster spurred by the Bipartisan Infrastructure Law and collaboration with communities to upgrade the nation’s grid, connect more Americans to clean electricity and broadband, and reliably move clean energy to where it’s needed most.

– Secretary of Energy Jennifer M. Granholm

The Building a Better Grid Initiative will utilize other programs such as the Smart Grid Investment Matching Grant Program and Western Area Power Administration Transmission Infrastructure Program to deploy more than \$20 billion in federal financing and grants. The program will work with states, tribal nations, and stakeholders to identify priority needs and provide financing to transmission and grid improvement projects.

Other Programs

Energy Efficiency and Conservation Block Grant Program

The Energy Efficiency and Conservation Block Grant Program (EECBG) is the largest community level investment in energy efficiency and clean energy projects in the federal government.⁸ Created in 2009 as part of the American Recovery and Reinvestment Act and funded at \$3.2 billion, the program provides block grants to cities, communities, states, U.S. territories, and Indian tribes to develop, promote, implement, and manage energy efficiency and conservation projects that ultimately create jobs. The IIJA provides an additional \$550 million in secure loans and grants for projects relating to the purchase and installation of projects relating to energy efficiency, renewable energy, and zero-emission transportation projects, beginning in 2022 and remaining until spent.

State Energy Program

The IIJA commits \$500 million, beginning in 2022 to be spent through 2026, in grant funding for the State Energy Program (SEP) to “develop and implement clean energy programs and projects that will create jobs.” States, cities,

U.S. territories, and Indian tribes can apply for loans and grant funding from the DOE for projects that align with the program’s vision and receive awards of up to \$15 million. Since 2010, the SEP has provided \$300 million in grants.⁹ Additionally, the IIJA adds language to the Energy and Policy Conservation Act to mandate consideration of transmission and distribution planning in State Energy Conservation Plans and include transportation energy efficiency, carbon emission reduction, and electrification of vehicle fleets as qualifying programs under SEP.

Carbon Capture and Sequestration Programs

The IIJA also invests in programs to manage carbon emissions that result from burning fossil fuels for energy. Carbon management programs within the bill include carbon capture, utilization and storage research, development and demonstration, carbon transport and storage infrastructure permitting, carbon utilization development and carbon removal. Carbon management is the subject of a future HDR policy brief that will provide greater detail about each of these management strategies.

⁸ [Energy Efficiency and Conservation Block Grant Program | Department of Energy](#)

⁹ [About the State Energy Program | Department of Energy](#)



What Does This Mean and How Can We Help?

The energy provisions provided through the IIJA will allow HDR to support our clients as they pursue and execute the projects aimed at guiding the nation to 100% carbon pollution-free electricity by 2035. A large portion of funds have been authorized from the IIJA beginning in 2022, and a number of programs and investments are beginning to be announced or kicked off. Over the next five years, the IIJA will support 60 new programs in the DOE.¹⁰

The vast majority of funding supports strengthening our grid through improving and expanding our transmission infrastructure, developing hydrogen as a reliable source of energy and improving our nuclear energy capacity. HDR is well suited to assist our clients in capturing and executing the work in these areas and more. Our expertise is broad and diverse, bringing together experts in planning, outreach, environmental, regulatory and engineering services.

We work alongside public and private utilities, power developers, private corporations, government establishments and other entities to meet strategy, planning, regulatory compliance, design, construction, asset management and decommissioning needs. We also partner with clients facing ambitious low-carbon emissions goals, such as those identified by the Biden administration and encouraged by the IIJA, to economically integrate renewable energy infrastructure.

HDR has the right teams to navigate the extensive power grid related provisions in the bill related to a safe and reliable grid. Our team provides expertise in substation, distribution, and transmission design, regulatory services, and asset management. Our grid modernization services include energy storage planning and design, a critical feature for reliable grids and renewable integration. HDR has a strong presence in the hydropower industry and is currently working with clients on grant funding strategies focused on modernizing infrastructure.

With a significant focus on hydrogen as a fuel source, our teams are involved in hydrogen advancements as an important component of the nation's clean energy future. Our innovative team is ready to assist clients on strategies and plans, designs and studies.

Our staff are also navigating the rapidly changing carbon capture and transport industry. This transformation requires strategic planning, advancement of new technologies and regulatory guidelines, designs and implementation. We are working with clients on carbon capture and transport strategies and studies.

Our energy-related services include:

- Asset and Portfolio Management
- Environmental Studies and Compliance
- Energy Resiliency & Sustainability
- Distributed Energy Resources & Small-Scale Generation
- Energy Storage including Battery Storage
- Hydropower and Pumped Storage
- Hydrogen Production and Power Plants
- Hydrogen Pipelines and Facilities
- Combined Heat & Power
- Distributed Energy Management Systems
- [Renewable Energy Design and Integration](#)
- [Resiliency](#) & Grid Hardening
- Substations & Switchyard Design
- Transmission and Distribution System Analysis & Planning
- Transmission Line Design
- Relay Protection & Control
- Smart Grids & Microgrid
- [Electric Vehicle Charging Infrastructure Planning & Design](#)
- Carbon Capture and Transport

¹⁰ [Department of Energy, Bipartisan Infrastructure Law](#)

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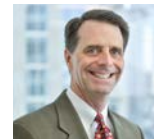
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