



The Bipartisan Infrastructure Law: Opportunities in Energy Transformation

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\$1 Trillion Infrastructure Bill

\$550 billion in new spending over five years



No More
Lead Pipes



High-Speed
Internet Access



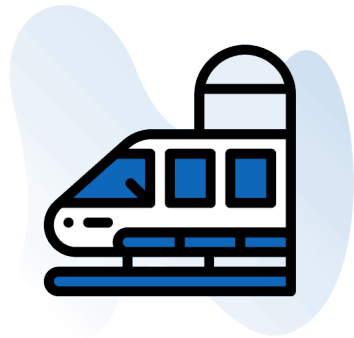
Better Roads
and Bridges



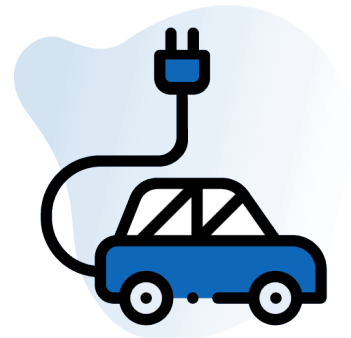
Investments in
Public Transit



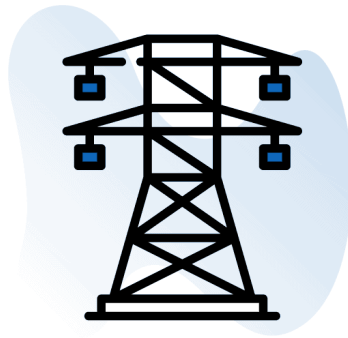
Upgrade Airports
and Ports



Investment in
Passenger Rail



Network of Electric
Vehicle Chargers



Upgrade Power
Infrastructure



Resilient
Infrastructure



Investment in
Environmental
Remediation

Bipartisan Infrastructure Law Surpasses ARRA in Size & Scope

- **EERE: \$16.24b**

- Existing programs and new initiatives such as hydro incentives for grid resilience, pumped hydro; technical assistance to states and local governments in building codes, smart manufacturing, workforce training
- Competitive RD&D in battery materials, manufacturing, and recycling; H2; wind, water, solar and geothermal (to name a few)

- **OE/CESER: \$8.6b**

- Focus on next-generation grid resilience and smart grid investment grants; transmission facilitation; cyber grants for rural and municipal utilities
- Advanced energy grid risk modeling
- Cyber RD&D and operational support to industry



Infrastructure Bill: EERE \$16.24 billion

Technical Assistance & Program Support Opportunities

Programs Targeted to States, Tribes & Local government

- Energy Efficiency Revolving Loan Fund: \$250m
- Weatherization: \$3.5b
- Energy Efficiency Conservation Block Grant Program: \$550m
- Grants for Implementing Building Codes: \$225m (\$45m/year)
- Grants for Smart Manufacturing Leadership: \$50m
- EE/Renewable Retrofits for Public Schools: \$500m (\$100m/year)
- Formula Grants to State Energy Programs \$500m
- Energy Auditor Training Program for States: \$50m

Labor, Manufacturing, Higher-ed and Non-profit Sectors

- Building Training and Assessment Centers: \$10m
- Grants for Career Skills Training: \$10m
- Industrial Research & Assessment Centers: \$150m (\$30m/year)
- Implementation Grants for Small & Medium-sized Manufacturers \$500m (\$80m/year)
- Non-profit Energy Efficiency Materials Retrofits: \$50m
- Pumped Hydro Wind & Solar Integration Initiative: \$10m
- Advanced Energy Manufacturing & Recycling Grants: \$750m (\$150m/year)

Rebates & Incentive Payments

- Extended Product System Rebates (electric motors): \$10m
- Energy Efficient Transformer Rebates: \$10m
- Hydroelectric Production Incentives: \$125m
- Hydroelectric Efficiency Improvement Payments: \$75m
- Hydro Incentives for Enhanced Grid Resilience, Dam Safety and Environmental Performance: \$553.6m (\$276.8m/year for 2 years)

Infrastructure Bill EERE: \$16.24 billion

Competitive RD&D Opportunities

Batteries	Hydrogen	Hydropower	Other Renewables
- Battery Materials Processing Grants: \$3b (\$600m/year) - Battery Manufacturing & Recycling Grants: \$3b (\$600m/year) - Lithium-Ion Battery Recycling Prize: \$10m - Battery Recycling RD&D: \$125m - EV Battery Recycling & Second Life-Applications Program: \$200m (\$40m/year)	- Clean Hydrogen Manufacturing Recycling RD&D: \$500m (\$100m/year; applied labs as leads) - Clean Hydrogen Electrolysis Program: \$1b (\$200m/year)	- Hydro R&D: \$36m - Marine RD&D: \$70.4m (including testing infrastructure and facilities) - National Marine Energy Centers: \$40m	- Enhanced Geothermal Systems Demonstrations: \$84m - Wind Energy RD&D \$60m - Wind Energy Technology Recycling RD&D: \$40m - Solar Energy RD&D: \$40m - Advanced Solar Manufacturing RD&D: \$20m - Solar Technology Recycling RD&D: \$20m

Grants to Federal Facilities for Efficiency: \$250m (Net Zero?)



Additional Applied Programs

Programmatic Support & Competitive RD&D Opportunities

OE & CESER: \$8.65b

OE: \$8.1b

- Grid Resilience Grants: \$5b (\$1b/year; states and tribes eligible)
- Transmission Facilitation Program: \$50m (\$10m/year to administer \$2.5b in borrowing authority)
- Smart Grid Investment Grants: \$3b (\$500m/year)
- Advanced Energy Infrastructure Risk Modeling: \$50m

CESER: \$550m

- Cyber RD&D: \$250m (\$50m/year)
- Operational Support for Cyber resilience: \$50m
- Municipal & Rural Utility Tech Assistance: \$250m (\$50m/year)

Nuclear Energy: \$6b

- Civilian Nuclear Credit Program: \$6b (\$1.2b/year)

Infrastructure Bill: Fossil Energy & Carbon Management \$7.49b

CCUS

- Carbon Utilization Program: \$310m (\$40-70m/year through '26)
- Carbon Capture Technology Program: \$100m (\$20m/year)
- Carbon Storage Validation & Testing: \$2.5b (\$500m/year)
- Carbon Infrastructure Financing Loan Program: \$2.1b

Direct Air Capture

- Regional Direct Air Capture Hubs: \$3.5b (4 regions; \$700m/year)
- Pre-commercial Direct Air Capture Technology Prize: \$15m
- Commercial Direct Air Capture Technology Prize: \$100m

Rare Earths & Critical Materials

- Rare Earth Elements Demonstration Facility: \$140m
- Rare Earth Mineral Security R&D: \$127m (\$23-\$28m/year)
- Critical Materials Innovation Program: \$700m (requires consortia and potential hub; \$100-\$230m/year)
- Critical Material Supply Chain Research Facility: \$75m (\$40m-\$35m for FY22-23)

Office of Clean Energy Demonstrations: \$21.456b

[T]he Office of Clean Energy Demonstrations...shall conduct administrative and project management responsibilities for the demonstration projects ...[and] shall consult and coordinate with technology-specific program offices to ensure alignment of technology goals and avoid unnecessary duplication

Office of Clean Energy Demonstrations

- Energy Storage Demonstration Pilot Grant Program: \$355m (\$88.75m/year through FY25)
- Long Duration Demonstration Initiative & Joint Program: \$150m (\$37.5m/year, in partnership w DOD)
- Advanced Reactor Demonstration Program: \$2.477b (\$677m for FY22; \$600m/year through FY25)
- Carbon Capture Large-Scale Pilot Projects: \$935m (\$150m-\$387m for FYs22-25)
- Carbon Capture Demonstration Projects: \$2.537b (6 projects: 2 each from coal, natural gas, industry; \$500m-\$937/year through FY25)
- Industrial Emission Demonstration Projects: \$500m (\$100m/year for FY22-23; \$150/year for FY24-25)
- Clean Energy Demos on Current and Former Mine Land: \$500m (\$100m/year through FY26)
- Regional Clean Hydrogen Hubs: \$8b (\$1.6b/year through FY26, applied labs lead)
- Grid Upgrade/Resilience Program: \$5b (\$1b/year through FY26)
- Energy Improvement for Rural/Remote Areas: \$1b (\$200m/year through FY26)



Office of Electricity - Grid Resilience Grants: \$5b (\$1b/year)

Key features:

- Subdivided into grants to grid operators (\$500m/year); Formula grants to states and tribes (\$500m/year), that may be subsequently allocated to entities eligible for the first pot, within their respective jurisdictions. (Formula does not yet exist!)
- Grants must be additional to existing planned “hardening” efforts; **and** must reduce the risk of any power lines causing a wildfire; **or** increase the ability to reduce the likelihood and consequences of disruptive events, defined as events where the grid is disrupted, preventively shut off, or cannot operate safely due to extreme weather, wildfire, or a natural disaster.
- Small utility set-asides in each pot; 15 percent matching requirement for states/tribes; 5 percent available for technical assistance; 5 percent available for admin.



Office of Electricity - Grid Resilience Grants: \$5b (\$1b/year; continued)

Formula Considerations:

- Total population and area of a state or territory
- Probability of events based on number of disasters and disruptive events over past 10 years;
- Some quantification of impact of those disasters since 2011
- Amount of per capita expenditures made in public and private funds over past 10 years to mitigate potential for disruptive events.

• Key Questions:

- PMAs eligible?
- How to determine potential battery storage usage?
- How to prevent all the money from being spent on vegetation management?

Office of Electricity - Smart Grid Investment Grants: \$3b (\$600m/year)

Key features: Re-ups the 2009 ARRA program, with a few new technologies explicitly included in scope--

- Data analytics that enable smart grid functions
- Investments to enable flexible loads from buildings
- Communications networks
- Advanced transmission technologies to enable additional transfer capacity
- Technologies to redirect power, reduce black-outs and enable power shut-off in face of extreme weather events.
- Definition of 'smart grid functions' expanded, including to include vehicle/grid integration, use of data analytics enabling autonomous control, etc.



Office of Electricity - Program to Assess & Model Energy Infrastructure Risk (\$50m)

Objective: Increase functional preservation of electric grid, natural gas and oil operations in the face of natural and human-made threats and hazards

Key Features:

- Explicitly includes natural gas as well as oil networks within OE scope. Eligible activities--
 - Develop capabilities to identify vulnerabilities and critical components that pose major risks to grid security if destroyed or impaired;
 - Provide modeling at the national level to predict impacts from natural or human-made events;
 - Add physical security to the cybersecurity maturity model;
 - Conduct exercises and assessments to identify and mitigate vulnerabilities to the electric grid, including providing mitigation recommendations;
 - Conduct research on hardening solutions for critical components of the electric grid;
 - Conduct research on mitigation and recovery solutions for critical components of the electric grid; and
 - Provide technical assistance to States and other entities for standards and risk analysis.



Cyber Security Office: Cyber RD&D (\$250m, \$50m/year)

A program in 5 parts

1.) To develop advanced cyber applications and technologies:

- to identify and mitigate vulnerabilities, including interdependencies, weather and fuel supply; inverter-based systems; unpatched software and hardware; and
- to advance security of field devices and third-party control systems, including grid networks, market functions, specific grid elements including metering, demand response and storage; forensic analysis of infected systems, secure communications and application of in-line edge security solutions.'

2.) To leverage grid-architecture to assess risk to the energy sector (including communications and controls);

3.) Conduct pilot demonstration projects for new approaches;

4.) Develop workforce curricula; and

5.) Improve supply chain security, particularly for new digital components and power electronics.



Cyber Security Office: Energy Sector Operational Support for Cyber resilience (\$50m)

The Secretary may develop and carry out a program—

(A) to enhance and periodically test—

- (i) the emergency response capabilities of the Department; and
- (ii) the coordination of the Department with other agencies, the National Laboratories, and private industry;

(B) to expand cooperation of the Department with the intelligence community for energy sector-related threat collection and analysis;

(C) to enhance the tools of the Department and E-ISAC for monitoring the status of the energy sector;

(D) to expand industry participation in ES-ISAC; and

(E) to provide technical assistance to small electric utilities for purposes of assessing and improving cybermaturity levels and addressing gaps identified in the assessment.



Cyber Security Office: Rural/Muni Cybersecurity Grant and TA Program (\$250m, \$50m/year)

Key features:

- Public utilities, consortia of public utilities and small IOUs eligible
- Funds awarded via grants and cooperative agreements, pursuant to criteria or formulae developed by the Department
- Purpose is to deploy advanced cyber technologies for electric utilities, and increase participation in cyber risk information sharing programs
- Preferences given to utilities with limited resources, owning defense critical energy infrastructure or assets critical to the reliability of the bulk power system



Office of Clean Energy Demos: Energy Storage Demonstration Pilot Grant Program (\$355m)

Key features:

- By September 2023, DOE directed to fund 3 energy storage demos
- At least one demonstration must advance long duration (10 to 100 hours) or seasonal energy storage concepts
- State energy offices, tribes, universities, utilities and storage companies are eligible entities
- Projects must demonstrate regional diversity, with broad set of possible use cases: critical infrastructure security; reliability, especially in rural areas; optimization of transmission and distribution systems for maintenance deferral; support fast charging; increase feasibility of microgrids)



Office of Clean Energy Demos: Long Duration Demonstration Initiative & Joint Program (\$150m)

Key features:

- Establishes a Joint Program between DOE and DOD for purposes of advancing long-duration storage solutions
- DOE directed to leverage existing test bed infrastructure, DOE and DOD facilities—but allows for new infrastructure where appropriate
- Prioritizes regional diversity, and investing in a portfolio of projects of smaller and larger scales, different physical, environmental and market conditions



Office of Clean Energy Demos: Program Upgrading Our Grid & Ensuring Reliability and Resiliency (\$5b)

Key features:

- Competitive financial assistance to states, 2 or more states, public utility commissions, local governments and tribes
- Purpose: to collaborate and coordinate with electric sector owners and operators to
 - ✓ Demonstrate innovative approaches transmission, storage and distribution infrastructure to harden and enhance resiliency and reliability; and
 - ✓ Demonstrate enhanced regional grid resilience, implemented through states and public and rural electric cooperative entities on a cost-shared basis



Office of Clean Energy Demos: Energy Improvement for Rural/Remote Areas (\$1b, \$200m/year)

Key features:

- Rural/remote defined as city, town or unincorporated areas with not more than 10,000 inhabitants
- Purpose: to improve resilience, safety, reliability and availability of energy; and improve environmental protection from adverse impacts of energy generation.
- In consultation with DOI, DOE may provide federal financial assistance for purposes of:
 - ✓ overall cost-effectiveness of energy generation, transmission, or distribution systems;
 - ✓ siting or upgrading transmission and distribution lines;
 - ✓ reducing greenhouse gas emissions from energy generation by rural or remote areas;
 - ✓ providing or modernizing electric generation facilities
 - ✓ Developing microgrids; and
 - ✓ Increasing energy efficiency.

Key Takeaways & Observations

- These are only the DOE programs! Department of Transportation, Interior, and Commerce will have key roles in transportation electrification, offshore energy production and blue economy.
 - New Joint DOE/DOT Office is expected to issue initial guidance as soon as this week.
- States are also poised to play a key role and may secure significant investment. This is true across new infrastructure resilience programs, as well as existing programs and mechanisms.
 - States may require assistance in executing their role in developing infrastructure plans and programs.
- Recycling—in batteries and a broad array of energy-related materials and technologies—is emerging as a key theme.
- The opportunity space for Washington is potentially vast. Identifying highest value R&D and Demonstration opportunities will be key.

PNW Possibilities

- Individual communities or utilities
 - Energy resilience grants
 - Energy storage demonstrations
 - Smart Grid investment grants
 - Transmission Facilitation grants for system upgrades to facilitate clean generation
- Regional possibilities
 - Multi utility demos for energy storage
 - ✓ Long duration
 - ✓ Coordinated resilience resources including storage, microgrids etc.
 - ✓ Transactive control of demand and DERs for resilience and clean energy, linked to WA CETA agenda
 - Resilience and smart grid upgrades for classes of rural and tribal utilities
 - Hydrogen hubs