WHITEPAPER

Eight ways utilities can access funds and meet the objectives of the Infrastructure Investment and Jobs Act

On August 10, 2021, President Biden signed the bipartisan Infrastructure Investment and Jobs Act of 2021 (IIJA) into law. The legislation increases spending on infrastructure by $550 billion over five years and includes provisions addressing climate change, environmental reviews, the electric grid, and water infrastructure, and domestic content requirements for federal investments.

The IIJA represents a historic investment in our nation's core infrastructure priorities, and it makes a down payment on the funding we need for a low-carbon economy. It also improves permitting processes, addresses long-term spending for capital assets that will improve efficiency and productivity, and helps to reduce emissions.

Of interest for electric utilities, the law provides $65 billion in power grid investments and includes:

- The bipartisan Energy Infrastructure Act of 2022, which allocates funds for grid reliability and resiliency as well as a new "Grid Deployment Authority"
- Critical minerals and supply chains for clean energy technology
- Key technologies like carbon capture, hydrogen, direct air capture, and energy efficiency
- Energy demonstration projects from the bipartisan Energy Policy Act of 2020

The IIJA also provides $47.2 billion in funding for cybersecurity to address critical infrastructure needs, and $7.5 billion for alternative fuel corridors and to build out a national network of electric vehicle charging infrastructure. Both cybersecurity and EV charging are set to be important considerations for utilities over the foreseeable future.

Still, most utility related spending is under Title I of the Act, which covers Grid Infrastructure and Resiliency. Below we've summarized the utility-relevant portions of the law and some corresponding examples of proven, available technologies that utilities can leverage as they work to meet the goals of the individual sections.

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Modern asset health systems like ABB Ability™ Energy & Asset Manager provide utilities with detailed real-time condition monitoring and support for predictive maintenance programs

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Wildfires have emerged as some of the most destructive natural disasters.

Sec. 40101. Preventing outages and enhancing the resilience of the electric grid.

This section directs the Department of Energy (DOE) to establish a grant program to support activities that reduce the likelihood and consequence of impacts to the electric grid due to extreme weather, wildfire, and natural disaster. This section authorizes $5 billion for the period of fiscal years (FY) 22-26.

1. Asset health management

Knowing not only when a particular asset will fail but also how—and how to fix it—is essential for utilities looking to reduce maintenance and downtime while improving reliability. Today's asset health tools offer continuous condition monitoring and predictive maintenance based on historical performance of various types of equipment. Utilities should look to partner with a well-established supplier to take advantage of data and expertise gathered from a large installed base.

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2. Wildfire mitigation

Modern fuses designed to prevent ignition of forest fires have a special body and unique engagement pin and damage sensor to help improve system safety and power quality. Because the smallest spark can ignite a wildfire under certain conditions, these fuses are designed to contain sparks that could otherwise be emitted during fuse operation and potentially fall on dry vegetation, starting a fire.

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3. Microgrids

Interest in microgrids continues to grow. For utilities, they present a multi-faceted solution that can improve local reliability even when major disruptions occur on the main grid. Microgrids can also aggregate a collection of assets (e.g., solar panels, wind turbines, storage devices, load shedding, etc.) into a virtual power plant and earn additional revenue by providing ancillary services back to the grid. Utilities don't have to engineer and build microgrids on their own. Several technology suppliers offer design, engineering and construction services as well as service after installation. It's also a good idea for the microgrid to be engineered holistically from the beginning to ensure all the pieces work as expected and deliver the expected returns.

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Circuit breakers like this GridShield® model from ABB give utilities options in isolating faults and re-routing power.

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The IIJA doesn't address tax credits but does encourage more utility-scale renewables development.

4. Breakers and reclosers
At a basic level, having more breakers on the distribution system gives the system operator more options to isolate disruptions and re-route power to minimize the impact of local outages (which account for the vast majority of service disruptions). Reclosers help to speed the restoration of power from intermittent faults without having to dispatch work crews. Both of these technologies have decades of proven service on utility grids around the world and can deliver a significant bang for the buck in terms of improving reliability and overall grid resilience. Modern, cloud-connected breakers and reclosers offer even more for utilities in terms of monitoring and control and the data they capture can be fed into asset management programs to optimize maintenance spending.

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Sec. 40103. Electric grid reliability and resilience research, development, and demonstration.

This section establishes the "Program Upgrading Our Electric Grid Reliability and Resiliency" to provide Federal financial assistance to demonstrate innovative approaches to transmission, storage, and distribution infrastructure to harden resilience and reliability and to demonstrate new methods to enhance regional grid resilience. It will be implemented through states by public and publicly regulated entities on a cost-shared basis.

It also directs the Secretary of Energy to improve resilience, safety, and reliability and environmental protection in rural or remote areas and—in collaboration with Department of Homeland Security, the Federal Energy Regulatory Commission (FERC), and the North American Electric Reliability Corporation (NERC)—to develop a framework to assess the resilience of energy infrastructure.

This section authorizes $5 billion for the period of FY22-26 for the Energy Infrastructure Federal Financial Assistance program and $1 billion for the period of FY22-26 for rural or remote areas.

5. Wind and solar + storage
Managing the intermittency of renewables isn't the only challenge in making wind and solar work. Power quality issues and protecting equipment from grid-side disruptions are equally important. Energy storage can provide solutions to smooth renewables output, as has been demonstrated by numerous "solar+storage" installations to date. Solar has also benefitted from collection systems operating at higher voltages, reducing energy losses.

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Protection for advanced power generation and distribution applications

6. Distribution automation
More than digital meters, distribution automation extends to all aspects of the local utility's grid. Equipment condition monitoring, fault isolation and restoration, voltage monitoring and support, and more can all be managed largely without human intervention with today's automated distribution systems. Often investments in such systems from a reliability standpoint will yield benefits in system efficiency, optimization, and control. Data gathered by these systems can also be used with analytic tools, for example, to identify areas on the grid that might need voltage support.

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Sec. 40104. Utility demand response.
This section requires state regulators to consider establishing rate mechanisms to allow utilities to recover the costs of promoting demand-response practices in order to encourage electrical utilities to promote demand-response offerings.

7. Demand response
Many if not all utilities will be interested in accessing funds to support demand response (DR). Following the adage that the least expensive megawatt is the one you don't have to generate, DR has become increasingly relevant, in particular with regard to addressing rapid increases in afternoon demand just as solar resources fall off. DR programs can play an important role in mitigating the so-called "duck curve" which in turn paves the way for more solar energy to be integrated into the grid.

Sec. 40107. Deployment of technologies to enhance grid flexibility.

This section amends the Energy Independence and Security Act of 2007 to include smart grid investments that:

- provide flexibility and help quickly rebalance the electrical system;
- facilitate the aggregation or integration of distributed energy resources;
- provide energy storage to meet fluctuating demand;
- provide voltage support;
- integrate intermittent generation sources;
- increase the network's operational transfer capacity; and
- anticipate and mitigate impacts of extreme weather events or natural disasters on grid resilience.

The section also authorizes $3 billion for the Smart Grid Investment Matching Grant Program originally introduced as part of the American Recovery and Reinvestment Act of 2009.

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Digitalization simplifies construction while increasing safety and versatility

8. Digital switchgear
Many of the technologies described earlier (distribution automation, virtual power plants, energy storage) apply equally to this section. Digital switchgear is another candidate. By using multiple sensors to measure temperature and humidity, and by monitoring utilization and operating cycles of electrical devices, digital switchgear can monitor its own health and trigger notifications when conditions change. That way it can predict potential failures before they occur or alert when maintenance is needed, avoiding costly or unnecessary downtime.

Digital switchgear also delivers shorter engineering, commissioning and installation time, a reduced footprint, and up to 30% lower operating costs over the life of the equipment.

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Sec. 40112. Demonstration of electric vehicle battery second-life applications for grid services.

This section directs the Secretary of Energy to establish a demonstration project for second-life applications of electric vehicle batteries as aggregated energy storage installations to provide services to the electric grid.

Utilities may not be involved in these efforts currently, but they may opt to. Most of an EV's battery capacity remains after it can no longer meet the demands of a vehicle application. Demonstration projects have shown that they can be aggregated and connected to the grid for any number of applications from peak shaving to frequency regulation. A decade ago, ABB conducted a research project with General Motors that showed how used batteries collected from Chevy Volt cars could be used for residential or grid storage; today's batteries hold even greater potential thanks to their greater capacity and energy density.

It's also important to note that Sec. 40111 of the IIJA provides for a study of codes and standards for use of energy storage systems in general. Utilities would be well advised to keep abreast of these developments if not participating directly in the standards-making process.

Sec. 40431. Consideration of measures to promote greater electrification of the transportation sector.

This section directs states to consider measures to promote greater electrification of the transportation sector including the establishment of rates that promote affordable and equitable EV charging options, improve the customer experience associated with EV charging including reducing wait times, accelerate third-party investment in public electric vehicle charging, and appropriately recover the marginal costs of delivering electricity to EVs and EV charging infrastructure.

Similar to the previous section, this one does not address utilities directly, but since the electrification of transport represents the single largest boost to demand that the industry has seen in a century, utilities will likely take interest. Many hurdles remain to widespread EV adoption, but equipment suppliers are meeting the challenge with packaged equipment solutions that reduce complexity, more efficient (and faster) higher-power chargers, onboard charger diagnostics, and an array of engineering and design services that can yield savings and avoid rework.

Electrification is already moving into other modes of transport from ferries to non-road vehicles (e.g., specialized airport vehicles, forklifts, etc.), creating still more opportunities for utilities not only to deliver the electricity to power these users but to provide engineering and grid integration services.

A few things to note…

Domestic content requirements will be in force for all grants made under the IIJA, and while some agencies are accepting applications for funds, in most cases applications won't be accepted until late 2022. It's also worth a reminder that there may yet be funding and/or tax incentives for climate-related investments (e.g., extensions of the investment and production tax credits for solar and wind respectively) that could pass Congress under future bills.

The IIJA represents a generational investment in critical infrastructure, and power systems are a major component. As utilities navigate the law's many sections, ABB stands ready to provide expertise and insight into how utilities can optimize their IIJA investments.

ABB Inc.
305 Gregson Drive
Cary, NC 27511

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