WORLD RESOURCES INSTITUTE

COVID-19 RESPONSE
SPECIAL EXPERT NOTE SERIES

Access the entire series at: wri.org/coronavirus-expert-notes

BUILD BACK BETTER — REBOOTING THE U.S. ECONOMY AFTER COVID-19

Grid Modernization: Creating Jobs, Cutting Electric Bills, and Improving Resiliency

AUTHOR: DEVASHREE SAHA, SENIOR ASSOCIATE, WRI UNITED STATES
CONTACT: CHRISTINA DECONCINI, CDECONCINI@WRI.ORG

Summary

As Congress contemplates how to provide economic relief and create desperately needed employment opportunities for millions of Americans suffering as a result of the economic havoc resulting from the COVID-19 pandemic, lawmakers have the opportunity to ensure that we build back better, in ways that create millions of well- paying jobs and advances a low-carbon economy. These objectives can and do go hand in hand. In fact, we know that smart climate action is not only good for but essential to economic growth.[1]

Modernizing America's electric grid infrastructure presents a unique opportunity to not only upgrade decades-old infrastructure systems but also to create hundreds of thousands of jobs in the near term and generate sustained, economy-wide benefits over the long term. Transmission investment ranging between $12 billion and $16 billion annually through 2030 could stimulate $30 billion to $40 billion in annual economic activity and create 150,000 to 200,000 full-time jobs each year. To that end, we recommend that Congress fund the required investment in grid modernization to put people to work and enable an efficient, reliable, and resilient clean electricity pipeline from generation to consumer.

Proposal:

- **Make existing renewable energy tax credits refundable and extend safe-harbor deadlines.**
- **Extend the federal renewable energy tax incentives for five years and make energy storage systems and transmission projects eligible for the Investment Tax Credit.**
- **Reauthorize DOE's Smart Grid Investment Grant program and fund it at $20 billion to promote investments in smart grid technologies, tools, and techniques.**
- **Expand low-cost loans and grants to rural electric co-ops to expand electricity transmission and broadband access through USDA's Rural Utilities Service (RUS).**
- **Authorize the Department of Transportation to provide $5 billion annually over 10 years in Transportation Infrastructure Finance and Innovation Act (TIFIA) loans to**

transmission projects that emphasize the integration of renewable energy.

- **Leverage the DOE's Loan Guarantee Program to incentivize investment in transmission infrastructure.**
- **Make strategic investments in energy storage deployment.**

Background

Every part of the U.S. economy is facing significant disruptions from the COVID-19 outbreak, including the electric grid and utility sector tasked with the critical job of keeping the lights on. Among other things, the pandemic has highlighted the essential role of electricity in our lives, as millions resort to telework, students use online teaching platforms, and hospitals depend on uninterrupted electricity to operate the ventilators and medical equipment to treat sick patients. A reliable and affordable supply of electricity is essential to prevent even further economic disruptions.

The U.S. electric grid is suffering from several deficiencies and needs to be upgraded to meet future challenges. While some of these challenges are inflicted by the recent COVID-19 crisis, other challenges have existed for a long time and need course correction. The good news is addressing these challenges will create much needed jobs.

The economic contraction is already leading to reduction in power demand.[2] If this continues, this could force companies to cut smart grid investments and delay new power plant projects, putting the jobs of 3.6 million workers employed in the clean energy industry at risk. The fast-growing renewable energy sector is not going to be immune from the downturn. Wood Mackenzie Power & Renewables has estimated that installation of 2 to 5 GW of utility-scale solar capacity could be delayed in 2020.[3] EIA is also expecting declines in new wind and utility-scale solar capacity in 2020, by 5% and 10%, respectively, in comparison to its previous forecasts.[4] Bloomberg New Energy Finance is predicting that the solar sector, which currently employs 248,000 workers, could be halved by COVID-19.[5] The wind industry association, AWEA, has estimated that 25 GW of wind projects are at risk, representing a loss of $35 billion in investment and over 35,000 jobs.[6]

Although the electric grid is the cornerstone of modern life, not enough investment has happened in the transmission and distribution system in recent decades. Major long-distance transmission lines are notoriously difficult to build due to a wide variety of siting, regulatory, and financing hurdles.[7] As a result, the U.S. electric grid is aging, less flexible and resilient than needed. With a growing need to advance energy efficiency, integrate increasing amounts of renewable energy, and keep pace with new demands for electricity, including from electrification of the transportation and building sectors, modernizing the electric grid infrastructure is an important investment opportunity for our nation's future and could put tens of thousands of people to work. Analysis by the Brattle Group shows that $30–$90 billion of incremental transmission investments by 2030, with an additional $200–$600 billion needed between 2030 and 2050 will be required to meet increasing energy demands due to electrification.[8] This investment is in addition to investments needed to maintain the existing system and to integrate renewable energy to meet the existing load. Transmission investment could create new jobs for thousands of workers in the construction industry.

Furthermore, congested transmission lines are costing consumers billions of dollars and are also hampering the deployment of renewable energy. Congestion costs can be substantial; DOE estimated the congestion costs in 2016 among major regional grids to be $4.8 billion.[9] Without new transmission investment to alleviate congestion, many new renewable energy projects cannot proceed, and consumers have higher electricity bills than would otherwise be the case.

As Congress moves to fund substantial investments in responding to the economic crisis caused by COVID-19, there is an opportunity to put people to work while simultaneously modernizing the electric grid. Doing so would not only boost economic recovery but help advance climate change goals by lowering carbon emissions.

Economic Benefits of Investing in Grid Modernization

Grid modernization includes two components: (1) enhancements to the interstate high-voltage transmission network that can carry utility-scale renewable energy long distances to market and (2) improvements on the local distribution system to make it a smart, digitally enabled grid that can integrate new energy sources such as energy storage, solar panels, electric vehicles, and smart appliances. While the benefits accruing for grid modernization can be diverse, in the near term it can enable the creation of hundreds of thousands of jobs and boost economic activity.

- **Job creation and economic development**: Together, the transmission, distribution and storage sectors employ nearly 1.4 million American workers. Of this, nearly 800,000 are employed in electricity transmission and distribution, energy storage, and smart grid. There is much room for job creation and economic development resulting from a large-scale investment in grid modernization. The Brattle Group has estimated that transmission investment ranging between $12 billion and $16 billion per year through 2030 could stimulate $30 billion to $40 billion in annual economic activity and create 150,000 to 200,000 full-time jobs each year.[10] Furthermore, transmission investment has the potential to stimulate job creation and economic development benefits associated with renewable energy development and operations. Every $1 million investment in smart grid has the potential to lead to 4.3 to 8.9 direct and indirect jobs with utilities, contractors, and suppliers all across the country.[11] These will be high-value jobs in IT, core communications, energy management, telecom service, and system integration. Furthermore, smart grid investment can also boost new manufacturing and export opportunities for U.S. businesses.

- **Reliability and resilience**: Much of the nation's transmission infrastructure is nearing the end of its useful life, putting reliability at risk. Plus, the frequent occurrence of natural disasters such as hurricanes and wildfires have increased the urgency of making the grid more resilient. A robust transmission system can enhance resilience by enabling power from neighboring regions to flow to a region impacted by outages of available generation. Kansas utility Westar witnessed a 40% reduction in transmission-related power outages as it expanded its grid.[12] Smart grid technologies such as advanced metering at the customer level can enable automatic outage detection and service restoration while sensors and controls on the distribution system can enable detection and restoration of service at the circuit and substation level.[13]

- **Cost savings**: Grid modernization provides consumers with access to electricity from where it can be produced at the lowest cost at that point in time. This benefit becomes particularly important as the deployment of renewable energy in different regions of the country increases. Analyzing the costs and benefits of transmission upgrades nearing completion in 2017, MISO found that transmission improvements will provide $12 billion to $53 billion in net benefits over the next 20 to 40 years.[14] The benefits are 2.2 to 3.4 times greater than the transmission costs.

- **Environmental and climate benefits**: Finally, a 21st-century electric grid can confer significant climate benefits by enabling higher penetration of renewable energy at a scale and speed needed to decarbonize the U.S. economy and address climate change. Smart grid technologies will further incentivize utilities to optimize energy efficiency and demand-response measures.

Recommendations for Congress

1. **Extend the federal renewable energy tax incentives for five years, make them refundable, and make energy storage systems and transmission projects eligible for the Investment Tax Credit.** Supply chain disruptions, construction delays, and economic uncertainty are hampering the financing of many renewable energy projects through federal tax credits and jeopardizing the jobs of nearly 400,000 workers employed in wind and solar. Congress could help the clean energy industry address both the near-term challenges inflicted by COVID-19 and provide long-term policy certainty to help the industry grow:

   - **Rescue Phase**: In the immediate rescue phase, Congress should make the tax credits temporarily refundable to preserve their effectiveness in the current economic climate. This is important because wind and solar projects often rely on third-party "tax equity investors" whose willingness to fund projects wanes as they face revenue decline or losses. Congress should also extend the "placed-in-service" and "commence construction" deadlines to qualify for renewable tax credits to mitigate immediate pandemic-related impacts. These emergency requests can enable the renewable sector to continue using federal policy tools Congress *has already provided* to complete projects at risk due to COVID-19.

   - **Recovery Phase:** Congress should extend the federal tax credits for the renewable energy industry up to 2025, providing the industry with the much-needed policy certainty to recover from the economic fallout from COVID-19. Congress could also reconsider the current architecture of the federal tax credits and move toward a performance-based, technology- neutral tax credit system for domestic production of clean electricity, as proposed by Senator Wyden (D-OR).[15] Expanding ITC eligibility to all types of energy storage technologies will help accelerate new clean energy infrastructure investment, create jobs, and improve the grid's reliability and resilience. Extending the ITC to transmission developers can also support the build-out of transmission infrastructure to integrate more renewable energy onto the grid. Senator Heinrich (D-NM) has proposed legislation to promote the construction of regionally significant transmission projects across the country. The legislation would offer a 15% ITC for overhead lines and 25% for underground transmission lines and prioritizes the delivery of electricity from a rural area or offshore.[16]

2. **Reauthorize DOE's Smart Grid Investment Grant program and fund it at $20 billion to promote investments in smart grid technologies, tools, and techniques.** $3.4 billion was invested through ARRA's Smart Grid Investment Grant program to fund 99 projects from 2010 to 2015.[17] Including matching private sector investment, total spending on ARRA-funded smart grid projects reached $8 billion. Advanced metering infrastructure comprised the majority of investment, which, combined with other upgrades and improvements, increased distribution system reliability by up to 50%, generated peak-load reductions of more than 30%, and reduced operational costs by up to 50%.[18] Fifty smart grid development programs were also included, which trained over 75,000 workers nationwide. DOE found that nearly $3 billion invested through ARRA funding and matching private sector investment from August 2009 to March 2012 in smart grid deployment generated $6.8 billion in total economic output and supported 47,000 high-paying full-time equivalent jobs.[19]

   Congress should reauthorize the SGIG program for another five years and focus on critical areas to promote the modernization of the grid and the integration of distributed energy resources (DERs), including non-wire alternatives projects using DERs to avoid or defer transmission and distribution grid upgrades, equipment and controls to accommodate two-way flows of electricity, systems for

aggregating and controlling DERs, software solutions for automating interconnection, advanced metering infrastructure, demand response and load shifting programs, data management systems, methods of improving visibility of DERs on the grid, and communications systems.

The program would provide federal grants for smart grid investments made by utilities, grid operators, and other entities and create tens of thousands of jobs in the process.

3. **Expand low-cost loans and grants to rural electric co-ops to expand electricity transmission and broadband access through USDA's Rural Utilities Service (RUS).** RUS provides funding for the development and improvement of rural infrastructure, including water, electric power, and telecommunications. Rural America bears the economic and social burden of underinvestment in broadband, important not only to the people who live in rural communities but also to electric co-ops that serve them. Electric co-ops have begun installing fiber-based broadband to connect their generation, transmission, and distribution assets to bolster efficiency and reliability.[20] But, much more needs to be done. In order to help rural renewable energy projects reach distant customers, close the digital divide for millions of rural Americans, and enhance the business operations of rural co-ops, an expanded combination of grants and low-cost loans from USDA's RUS is essential. This will help create jobs in newly connected rural communities and support local economies.
4. **Authorize the Department of Transportation to provide $5 billion annually over 10 years in Transportation Infrastructure Finance and Innovation Act (TIFIA) loans to transmission projects that emphasize the integration of renewable energy.** Investor-owned and publicly owned utilities will likely make most of the investment to upgrade the transmission grid. In some circumstances, those utility investments and other non-utility transmission projects could benefit from credit assistance in the form of loans and loan guarantees to finance high-voltage transmission projects of national and regional significance. Credit assistance could be potentially advantageous for transmission projects that use high-voltage DC cables buried underground on an existing interstate and railroad right-of-way. While undergrounding typically is more costly, it can streamline the permitting process and lead to less opposition from local communities. This can speed up the creation of thousands of construction and operations jobs while transforming the electric system into a 21st-century modern grid.
5. **Leverage the DOE's Loan Guarantee Program to incentivize investment in transmission infrastructure.** DOE's loan program has $40 billion in existing spending authority[21] and provides another opportunity to incentivize infrastructure investments, including in transmission, without the need for any new appropriations. Previously, the program has made investments in a wide variety of low-carbon projects such as electricity transmission, utility-scale energy storage, advanced vehicle manufacturing, solar manufacturing, and nuclear projects. In 2011, the program provided a $343 million loan guarantee to One Nevada Transmission to move electricity, including from renewable energy, between the northern and southern parts of the state. The project created 400 construction jobs and 15 permanent jobs.[22] Based on its track record, the loan program's remaining loan and loan guarantee authority could further leverage $100 billion in energy infrastructure investments across the country.[23]
6. **Make strategic investments in energy storage deployment.** Energy storage is key to grid modernization by enabling the integration of renewable energy, providing reliable backup power during outages, and serving as a replacement for aging infrastructure. The sector currently employs nearly 78,000 people and is one of the fast-growing segments of the clean energy sector. COVID-19 is adversely impacting energy storage businesses, with two-thirds of them seeing delays in project

development that could lead to potential job losses.[24] In addition to extending the federal tax credit to energy storage technologies discussed earlier, we recommend that Congress:

- **Direct DOE to provide grants and technical assistance to local governments to streamline local permitting and inspections of distributed energy systems, including battery storage ($100 million over 5 years).** The patchwork of local permitting and inspection requirements can cause delays and increase costs for both local governments and consumers. DOE's Office of Energy Efficiency and Renewable Energy (EERE) has previously awarded funding to reduce soft costs associated with solar installations. Additional funding could support quicker permitting and installation of DERs.

- **Direct DOE to provide grants and technical assistance to electric co-ops to develop energy storage and microgrid projects, which will help rural communities improve their energy resiliency ($25 million over 5 years).** This would build on the success of DOE's Solar Utility Network Development Acceleration project, which provided grants to co-ops to offer solar energy to their members. The grants would enable the electric co-ops to identify, evaluate, and design storage and microgrid projects that derive energy from renewable sources. These grants could also support "community storage" projects,[25] which can enable co-ops to aggregate electric storage resources such as water heaters, available throughout the community in order to avoid peak power purchases and better integrate renewable energy.

- **Direct DOE to provide Energy Efficiency and Conservation Block Grants for distributed energy resources, including energy storage, to states, local governments, and other eligible entities to enhance grid resiliency and cost savings ($5 billion over 5 years)**. More funding for installing energy storage and other DERs can help improve grid resilience while mitigating the economic shock of COVID-19 to businesses; for instance, by reducing cost of electric service to businesses. The grants can be administered by reauthorizing and increasing the funding for the Energy Efficiency and Conservation Block Grant (EECBG) program. Funded by ARRA, EECBG was a one-time program that ran from 2009 to 2015 and provided $3.2 billion in block grants to cities, states, and Indian tribes to support a wide variety of energy efficiency and renewable energy activities. The program produced a net total job gain of more than 62,000 job years.[26]

About WRI

WRI focuses on the intersection of the environment and socio-economic development. We go beyond research to put ideas into action, working globally with governments, business, and civil society to build transformative solutions that protect the earth and improve people's lives. **www.wri.org**

Endnotes

1 "Unlocking the Inclusive Growth Story of the 21st Century: Accelerating Climate Action in Urgent Times," The New Climate Economy, August 2018, https://newclimateeconomy.report/2018/.

2 "U.S. Power Demand Falls to 16-Year Low as Coronavirus Cuts Use by Companies," Reuters, April 8, 2020, https://www.reuters.com/article/us-usa-power-demand-idUSKCN21Q36R.

3 Ravi Manghani, "WoodMac: Coronavirus Could Delay Construction of 5 Gigawatts of US Utility-Scale Solar," Greentech Media, April 2, 2020, https://www.greentechmedia.com/articles/read/woodmac-coronavirus-could-delay-5-gigawatts-of-utility-scale-solar.

4 "Short-Term Energy Outlook," U.S. Energy Information Administration, April 7, 2020, https://www.eia.gov/outlooks/steo/.

5 Brian Eckhouse, "U.S. Solar Workforce Could Be Halved by Virus, Group Says," Bloomberg Law, March 24, 2020, https://news.bloombergtax.com/daily-tax-report/u-s-solar-workforce-could-be-halved-by-virus-group-says-1.

6 "American Wind Energy Association Releases COVID-19 Outlook," American Wind Energy Association, March 19, 2020, https://www.awea.org/resources/news/2020/american-wind-energy-association-releases-covid-19.

7 Jeff St. John, "7 Transmission Projects That Could Unlock a Renewable Energy Bounty," Greentech Media, April 9, 2020, https://www.greentechmedia.com/articles/read/9-transmission-projects-laying-the-paths-for-cross-country-clean-energy.

8 Dr. Jürgen Weiss, J. Michael Hagerty, and María Castañer, "The Coming Electrification of the North American Economy: Why We Need a Robust Transmission Grid," The Brattle Group, March 2019, https://wiresgroup.com/wp-content/uploads/2019/03/Electrification_BrattleReport_WIRES_FINAL_03062019.pdf.

9 "Dynamic Line Rating: Report to Congress," U.S. Department of Energy, June 2019, https://www.eenews.net/assets/2020/01/27/document_ew_02.pdf.

10 "Employment and Economic Benefits of Transmission Infrastructure Investment in the U.S. and Canada," The Brattle Group, May 2011, https://brattlefiles.blob.core.windows.net/files/6534_employment_and_economic_benefits_of_transmission_infrastructure_investmt_pfeifenberger_hou_may_2011_wires.pdf.

11 Marcy Lowe, Hua Fan, and Gary Gereffi, "U.S. Smart Grid: Finding New Ways to Cut Carbon and Create Jobs," Center on Globalization, Governance & Competitiveness, Duke University, April 19, 2011, https://www.edf.org/sites/default/files/smart-grid-cut-carbon-create-jobs.pdf.

12 "Grid Vision: The Electric Highway to a 21st Century Economy," American Wind Energy Association, May 2019, https://www.awea.org/Awea/media/Resources/Publications%20and%20Reports/White%20Papers/Grid-Vision-The-Electric-Highway-to-a-21st-Century-Economy.pdf.

13 Philip Mihlmester and Anne Choate, "The 4 Main Pillars of Enhancing Utility Grid Resilience," Greentech Media, October 13, 2017, https://www.greentechmedia.com/articles/read/enhance-utility-grid-resilience-icf-international.

14 "A 2017 Review of the Public Policy, Economic, and Qualitative Benefits of the Multi-value Project Portfolio," MISO, September 2017, https://cdn.misoenergy.org/MTEP17%20MVP%20Triennial%20Review%20Report117065.pdf.

15 "Clean Energy for America Act: Overview," U.S. Senate Committee on Finance, n.d., https://www.finance.senate.gov/imo/media/doc/Clean%20Energy%20for%20America%20Act%20-%20One%20Pager%20(002).pdf.

16 Electric Power Infrastructure Improvement Act, https://www.heinrich.senate.gov/download/electric-power-infrastructure-improvement-act.

17 "Smart Grid Investment Grant (SGIG) Program Final Report," U.S. Department of Energy, December 15, 2016, https://www.smartgrid.gov/document/us_doe_office_electricity_delivery_and_energy_reliability_sgig_final_report.html.

18 "A Glimpse of the Future Grid through Recovery Act Funding," U.S. Department of Energy, n.d., https://www.energy.gov/sites/prod/files/2015/10/f27/OE%20ARRA%20Grid%20Modernization%20Highlights%20october2015_0.pdf.

19 "Economic Impact of Recovery Act Investments in the Smart Grid: Analysis of Vendor Payments through the Smart Grid Investment Grant and Smart Grid Demonstration Projects as of March 2012," U.S. Department of Energy, Electricity Delivery and Energy Reliability, April 2013, https://www.energy.gov/sites/prod/files/2013/04/f0/Smart%20Grid%20Economic%20Impact%20Report%20-%20April%202013.pdf.

20 Marguerite Reardon, "Electric Co-Ops Could Be the Key to Solving the Rural Digital Divide," *CNET*, February 9, 2020, https://www.cnet.com/news/electric-cooperatives-could-be-the-key-to-solving-the-rural-digital-divide/.

21 Dan Reicher, "The Department of Energy's Loan Guarantee Program Presents a Crucial Opportunity to Fund U.S. Infrastructure," Brookings, May 16, 2018, https://www.brookings.edu/blog/the-avenue/2018/05/16/the-department-of-energys-loan-guarantee-program-presents-a-crucial-opportunity-to-fund-u-s-infrastructure/.

22 "One Nevada Line: Loan Programs Office," n.d., U.S. Department of Energy, accessed April 14, 2020, https://www.energy.gov/lpo/one-nevada-line.

23 "Leveraging the DOE Loan Program: Using $39 Billion in Existing Authority to Help Modernize the Nation's Energy Infrastructure," Energy Futures Initiative, March 2018, https://docs.house.gov/meetings/CN/CN00/20190430/109329/HHRG-116-CN00-Wstate-FosterD-20190430-SD003.pdf.

24 "COVID-19 and the U.S. Energy Storage Industry," Energy Storage Association, March 23, 2020, https://energystorage.org/covid-19-the-u-s-energy-storage-industry-and-near-term-stimulus-ideas-to-support-americas-best-resilience-weapon/.

25 Christine Grant, Patrick Keegan, and Amy Wheeless, "Implementing Community Storage Programs," *TechSurveillance*, June 2016, http://www.communitystorageinitiative.com/wp-content/uploads/2016/05/tscommunitystoragejune2016.pdf .

26 "EECBG Evaluation—Weatherization and Intergovernmental Programs Support," n.d., Oak Ridge National Laboratory, accessed April 14, 2020, https://weatherization.ornl.gov/eecbg/.