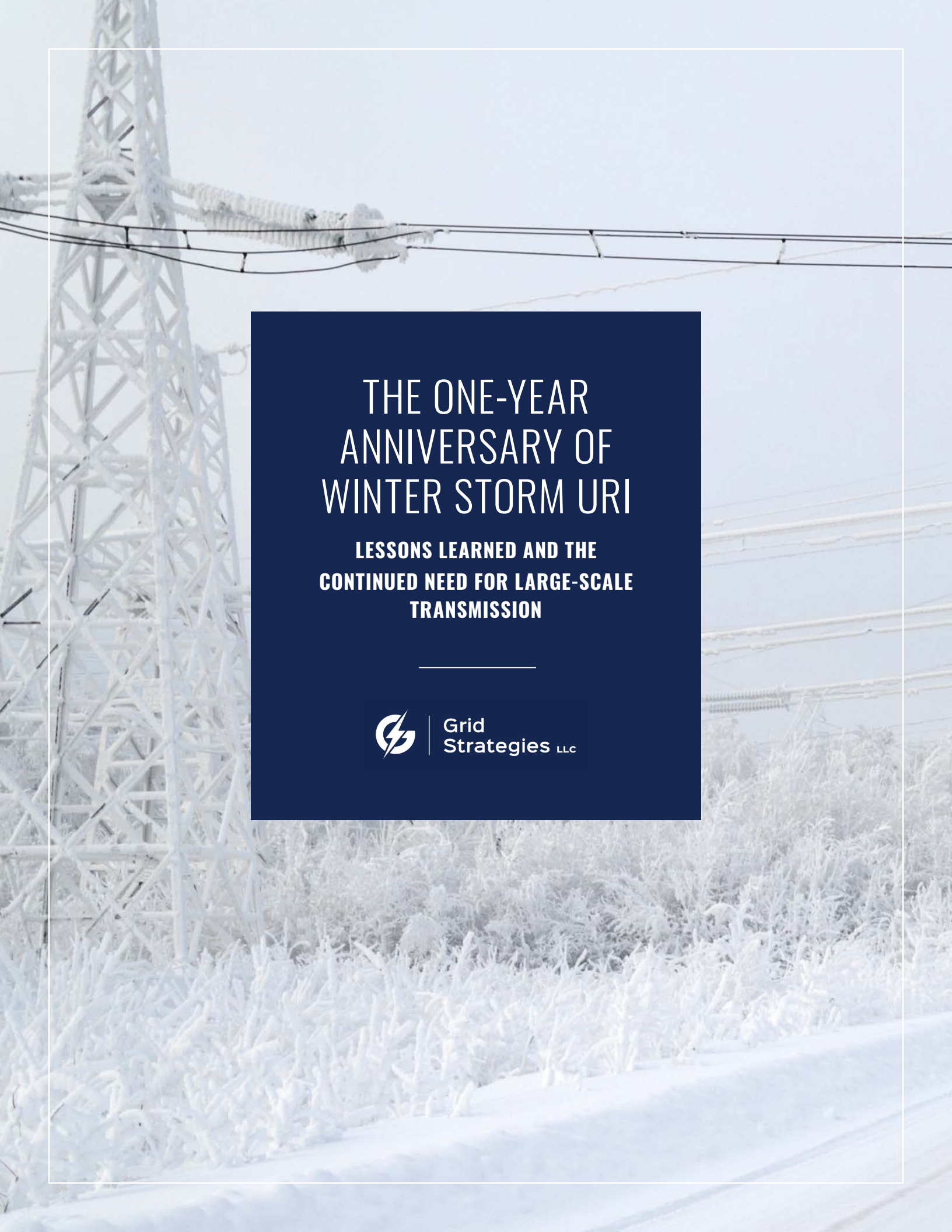

THE ONE-YEAR ANNIVERSARY OF WINTER STORM URI

LESSONS LEARNED AND THE CONTINUED NEED FOR LARGE-SCALE TRANSMISSION

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INTRODUCTION

One year after Winter Storm Uri led to an unprecedented catastrophe in Texas, it's time to revisit the causes and consequences of the grid failure there. While there were many separate reasons millions lost power for days on end, it is clear that more interregional transmission could help prevent a similar disaster in the future.

Uri also hit other states across the central U.S. hard. But unlike the main Texas grid, ERCOT, the Southwest Power Pool and Midcontinent Independent System Operator were able to import large amounts of power from their neighbors to avoid the worst of the outcomes experienced in Texas.

Texas serves as an example of the consequences of not having sufficient interregional electricity transmission. As extreme weather events become more severe and frequent, all regions are increasingly at risk of an extended outage like Texas experienced.

Transmission connections to other power regions provide a lifeline to import much needed electricity supply from areas not experiencing as extreme weather. In fact, large-scale transmission capacity provides many benefits, including:

- reducing the adverse impacts of extreme weather events like Winter Storm Uri;
- saving consumers money every day by providing them with access to lower-cost power;
- enabling more clean energy like solar and wind to be integrated onto the grid.

As just one example of the extraordinary benefits of building a better grid: an additional Gigawatt (GW) of transmission capacity can generate more than $100 million in consumer savings during an extreme weather event, defraying a significant share of its cost.

The Build Back Better legislation proposed in Congress would help spur construction of the needed interregional transmission lines. The legislation's transmission Investment Tax Credit alone could spur more than **$37 billion in new transmission development nationwide**, providing consumers with net savings of $75 billion on their electric bills. This $37 billion investment could drive more than 50 Gigawatts of new transmission lines, much larger than the major grid expansion within Texas and other central U.S. power systems last decade that enabled national wind generating capacity to nearly double.

BACKGROUND

In February 2021, Winter Storm Uri swept through Texas and other parts of the Central U.S., causing more than 4.5 million Americans to lose power for as long as four days as generating supply fell short of electricity demand. Tragically, the storm and associated power outages contributed to 246 deaths in the state of Texas alone.[1] As outlined in a joint report from the Federal Energy Regulatory Commission (FERC), North American Reliability Corporation (NERC), and Regional Entity staff, the Electric Reliability Council of Texas (ERCOT) experienced capacity[2] outages from generating units of all fuel types averaging 34,000 Megawatts (MW) for two consecutive days — nearly half of its 2021 all-time winter peak load of 69,871 MW.[3] For much of the event, generation supply on the ERCOT grid was estimated to be 10 Gigawatts (GW) short of demand.[4]

The anniversary of Winter Storm Uri is a fitting time to revisit the event. Now that the dust has settled and investigations regarding the cause and extent of the outages have been completed, it is clear that more interregional transmission connecting ERCOT to other geographic regions could have served as a lifeline to import much needed electricity supply from areas not experiencing extreme cold.

New, large-scale transmission capacity reduces the adverse impacts of extreme weather events like Winter Storm Uri, saves consumers money every day by providing them with access to lower-cost power, and enables more renewable resources to be integrated onto the grid. Despite the need for and benefits of new transmission, regionally planned transmission investment has decreased steadily over the last decade.[5] However, the Build Back Better Act (BBB) has the potential to spur new transmission construction as it includes provisions specifically aimed at overcoming the obstacles to planning and paying for large scale transmission investment. The BBB's transmission Investment Tax Credit (ITC) alone could spur over $37 billion in new transmission development, providing consumers with net savings of over $75 billion on their electric bills. The construction of interregional transmission capacity enabled by the passage of the Build Back Better Act would provide consumers with more reliable, more affordable, and cleaner power.

1 Texas Health and Human Services, "February 2021 Winter Storm-Related Deaths – Texas," December 31, 2021.

2 The FERC, NERC, and Regional Entity staff report specifies capacity in this context to be "expected" capacity: "Expected capacity includes any expected seasonal capacity derates, and for intermittent resources (e.g., wind, solar resources), expected capacity is calculated based on weather conditions." See FERC, NERC, and Regional Entity Staff, *The February 2021 Cold Weather Outages in Texas and the South Central United States*, at 8, November 2021.

3 *Id.*

4 Cramton, "Lessons from the 2021 Texas electricity crisis," March 23, 2021

5 Gramlich and Caspary, *Planning for the Future: FERC's Opportunity to Spur More Cost-Effective Transmission Infrastructure*, at 25, January 2021.

TRANSMISSION HELPED KEEP THE LIGHTS ON IN MISO AND SPP DURING WINTER STORM URI

A look into U.S. Department of Energy power flow transfer data during the time of the Winter Storm Uri demonstrates the reliability benefits that interregional transmission can provide. Due to a lack of interregional transmission, ERCOT was only able to import approximately 800 MW of power from the Southwest Power Pool (SPP) during the week of the cold snap, as shown in Figure 1 below.[6] SPP experienced shortfalls itself, as demonstrated by the reduction in exports to ERCOT on the 15th and 16th, which were exacerbated due to the scheduled outages of three of seven western interconnection Direct Current (DC) ties — Eddy County, Blackwater, and Rapid City.[7] ERCOT was able to import an additional 400 MW from Mexico up until the 15th, when Mexico experienced natural gas supply shortages.

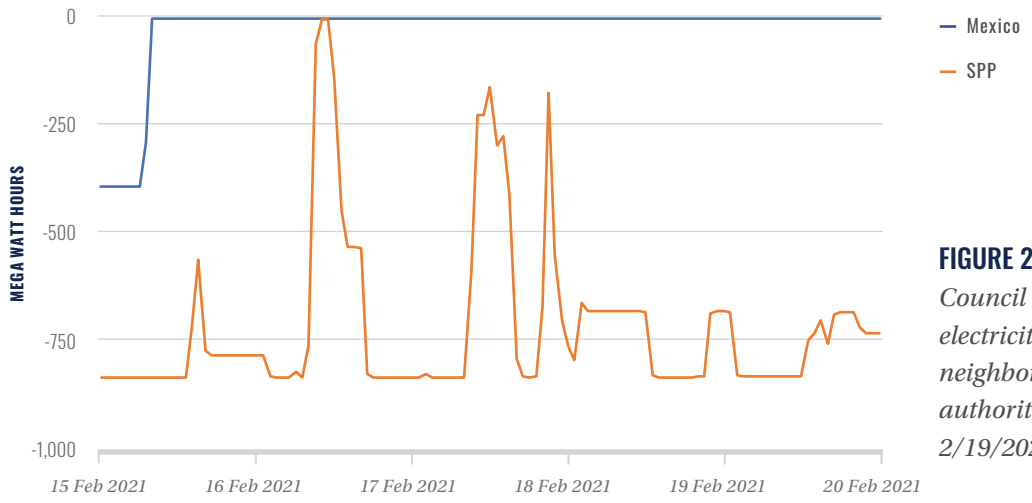

FIGURE 2. *Electric Reliability Council of Texas, Inc. (ERCO) electricity interchange with neighboring balancing authorities 2/15/2021-2/19/2021, Eastern Time*

While parts of the Midcontinent Independent System Operator (MISO) and SPP also experienced similar cold weather conditions, those RTOs were able to import electricity from other regions experiencing milder temperatures. As a result of its interregional transmission capacity, MISO was able to import a total of 13,000 MW during the peak of the event — about 15 times as much power as ERCOT was able to import. As shown in Figure 2 below, at maximum, MISO was able to import approximately 9,000 MW from PJM Interconnection, a few thousand MW from the Tennessee Valley Authority (TVA), and a combined 3,000 MW from Southern Company, Louisville Gas and Electric and Kentucky Utilities Company, and Canada. MISO was also able to export about 5,000 MW and 2,500 MW to SPP and Associated Electric Cooperative Incorporated, respectively, over the course of the cold snap.[8]

6 Goggin, *Transmission Makes the Power System Resilient to Extreme Weather*, at 8, July 2021.
7 SPP, *A Comprehensive Review of Southwest Power Pool's response to the February 2021 Winter Storm*, at 68, July 19, 2021.
8 Goggin, *Transmission Makes the Power System Resilient to Extreme Weather*, at 8, July 2021.

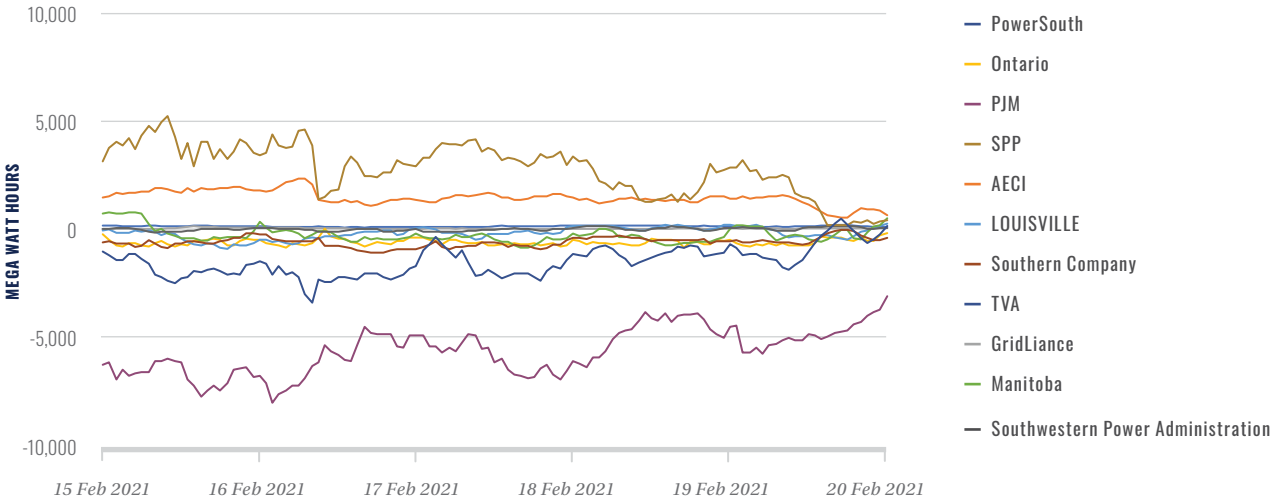

FIGURE 2. *Midcontinent Independent System Operator, Inc. (MISO) electricity interchange with neighboring balancing authorities 2/15/2021-2/19/2021, Eastern Time*

TRANSMISSION EXPANSION PROTECTS AGAINST ALL TYPES OF SEVERE WEATHER

Unfortunately, Winter Storm Uri is just the most recent extreme weather event in which expanded transmission capacity would have helped protect against localized spikes in electricity demand and outages of all generator types. These include:

- 2019 Texas heat wave led to high power prices across 12 days in August 2019;
- 2017/2018 "Bomb Cyclone" brought cold weather to the Mid-Atlantic region for nearly three weeks, causing natural gas price spikes and nearly exhausting fuel oil supplies in New England;
- January 2014 "polar vortex" event in the Northeast that caused PJM to resort to voltage reductions to avoid the need for rolling outages;
- 2019 Midwest "polar vortex" brought high electricity prices to the region.

The Congressional Research Service estimates that weather-related power outages cost Americans $25-$70 billion annually,[9] and these costs are likely to increase as severe weather becomes more common. The following chart shows that the average US customer experiences more than 4 hours of power outages per year, while states like Maine and West Virginia experience more than 12 hours of outages per year. While most outages are caused by failures on local lower-voltage electricity distribution systems, transmission system failures have been a major cause of events like the 2003 and 1965 blackouts, and have contributed to smaller

9 Executive Office of the President, *Economic Benefits of Increasing Electric Grid Resilience to Weather Outages*, (August 2013).

reliability events in recent years.[10] Transmission investment makes the network stronger and more resilient by providing more alternate paths for power to reach consumers in case severe weather or another event takes out major elements of the transmission system.

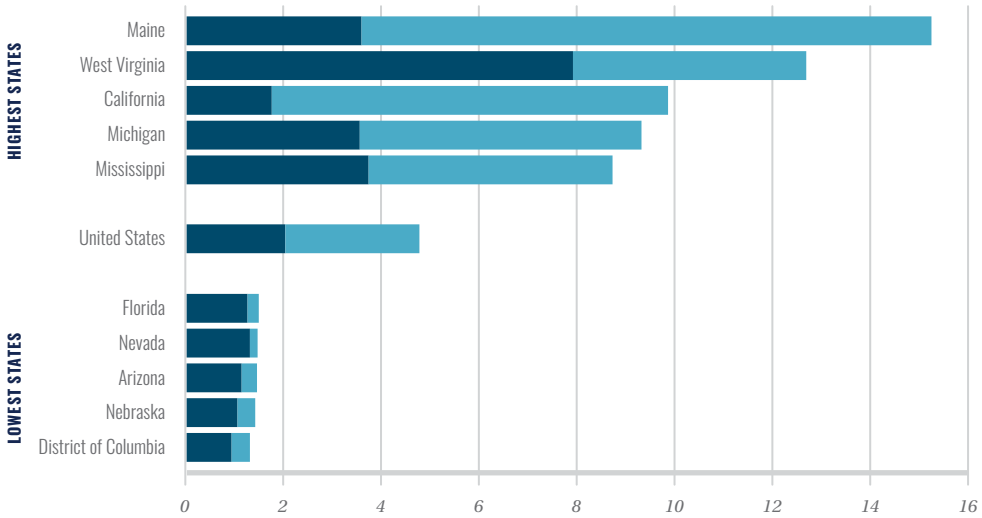

FIGURE 3. *Average hours of power outages per customer, select states (2019).*[11]

Source: U.S. Energy Information Administration, Annual Electric Power Industry Report

10 For example, transmission outages in the Northwest contributed to the August 2020 rolling blackouts in California by limiting imports. *See* CAISO, *Root Cause Analysis: Mid-August 2020 Extreme Heat Wave*, January 13, 2021.

11 U.S. Energy Information Administration, "U.S. Power Customers Experienced an Average of Nearly Five Hours of Interruptions in 2019," November 6, 2020.

TRANSMISSION BENEFITS

In addition to keeping the power on during severe weather events, transmission expansion also provides economic benefits by providing consumers with access to lower cost power. A Grid Strategies analysis evaluated the additional value additional transmission would have provided during Winter Storm Uri and other recent severe weather events. As shown in Table 1 below, an additional GW of transmission capacity during many of these events could have generated more than $100 million in consumer savings:[12]

TABLE 1. *Value of 1 GW of additional transmission by region for each recent extreme weather event*

Receiving region – delivering region	Savings per GW of additional transmission capacity (millions of $)
WINTER STORM URI, FEBRUARY 2021	
ERCOT – TVA	$993
SPP South – PJM	$129
SPP South – MISO IL	$122
SPP South – TVA	$120
SPP S – MISO S (Entergy Texas)	$110
MISO S-N (Entergy Texas - IL)	$85
MISO S (Entergy Texas) – TVA	$82
TEXAS HEAT WAVE, AUGUST 2019	
ERCOT – TVA	$75
NORTHEAST BOMB CYCLONE, DECEMBER 2017 – JANUARY 2018	
Eastern PJM (VA) – Western PJM (Northern IL)	$43
NYISO – PJM	$41
PJM – MISO	$38
NYISO – ISONE	$29
NORTHEAST POLAR VORTEX EVENT, JANUARY 2014	
PJM – MISO	$17
NYISO – PJM	$9
NYISO – MISO	$21
MIDWEST POLAR VORTEX EVENT, JANUARY 2019	
MISO – PJM	$2

12 Goggin, *Transmission Makes the Power System Resilient to Extreme Weather*, at 4, July 2021.

For reference, long-distance transmission construction costs approximately $700 million per GW of transmission capacity, based on the average cost for the 18 above-ground, shovel-ready projects identified in a recent report.[13] If a GW-scale transmission line connecting ERCOT to the Southeast, the nearly $1 billion value of power delivered to Texas just during the storm could have fully covered the cost of the transmission line. For the other weather events, the additional savings could have offset a significant share of new transmission costs.

LEVERAGING THE BUILD BACK BETTER ACT TO ENCOURAGE TRANSMISSION EXPANSION

Despite the significant reliability and regional savings benefits that large-scale transmission provides, transmission's value for making the grid more resilient against severe weather and other unexpected threats is not typically accounted for in transmission planning and cost allocation analyses. As such, federal action has the potential to spur significant, much needed transmission expansion in the U.S.

The Build Back Better Act (BBB) includes the following provisions specifically related to transmission:[14] a 30% Investment Tax Credit (ITC) for regionally significant transmission placed in service before the end of 2031, loans and grants for transmission, economic development support for host communities and technical support for siting authorities, and studies on interregional transmission. The 30% tax credit in particular has the potential to support the construction of dozens of GW of new transmission transfer capacity.[15] This transmission could reduce power sector carbon emission by nearly 150 million tons per year by bringing new low-cost wind and solar generation online.[16]

BBB would also bring significant economic benefits to consumers. The BBB's transmission Investment Tax Credit (ITC) alone could spur over $37 billion in new transmission development, providing consumers with net savings of **over $75 billion on their electric bills**. This estimate is based on the government's estimate of the impact of the tax credit[17] and analysis by regional grid operators and national laboratories indicating that every dollar invested in transmission yields around three dollars in benefits. Specifically, the Southwest Power Pool has found significant net benefits have already been realized from its recent transmission investments, with benefits expected to exceed costs by a factor of 3.5 over the lines' first 40 years.[18] The Midcontinent Independent System Operator has also found that its Multi-Value Projects offer a benefit-to-cost ratio of between 2.2 and 3.4.[19] Similarly, the National Renewable Energy

13 Goggin, Gramlich, and Skelly, *Transmission Projects Ready to Go: Plugging Into America's Untapped Renewable Resources*, April 2021.

14 Build Back Better Act, H.R. 5376, 117TH Cong. (2021).

15 See Goggin, Gramlich, and Skelly, *Transmission Projects Ready to Go: Plugging Into America's Untapped Renewable Resources*, April 2021.

16 Based on our estimate that every $1 billion in transmission investment reduces emissions by nearly 4 million short tons of carbon per year, and the government's estimate that the tax credit will drive over $37 billion in transmission investment per the next footnote. *See* Goggin, *Electricity Transmission Is a Low-Cost Tool for Carbon Abatement*, 2021.

17 The transmission tax credit in the Build Back Better Act was scored as costing $11.279 billion, which corresponds to $37.6 billion in transmission investment receiving a 30% tax credit. Eng and Lawrence, "House-passed $1.7 Trillion Build Back Better Reconciliation Legislation; Includes $325 Billion in Green Energy Tax Incentives and More Than $92 billion in Spending to Address Robust Climate Change Goals," November 19, 2021.

18 SPP, *The Value of Transmission*, January 26, 2016.

19 MISO, MTEP17 MVP Triennial Review, September 2017.

Laboratory Interconnections Seam study found benefit-to-cost ratios of between 1.8 to 2.9 for various transmission configurations.[20] Based on the average cost of around $700 million per GW of long-distance transmission capacity, the Build Back Better Act could spur over 50 GW of additional transmission capacity.

BUILDING A STRONGER, CLEANER GRID

Federal action like the Build Back Better Act has the potential to spur regionally significant transmission investment that is a win-win-win for more reliable, more affordable, and cleaner power. Transmission expansion provides this benefit every day, but the economic and reliability benefits are particularly pronounced when severe weather or another unexpected event strikes.

20 Brinkman, Novacheck, Bloom, and McCalley, "Interconnections Seam Study: Overview," at 32, October 2020.