

ercot  2019

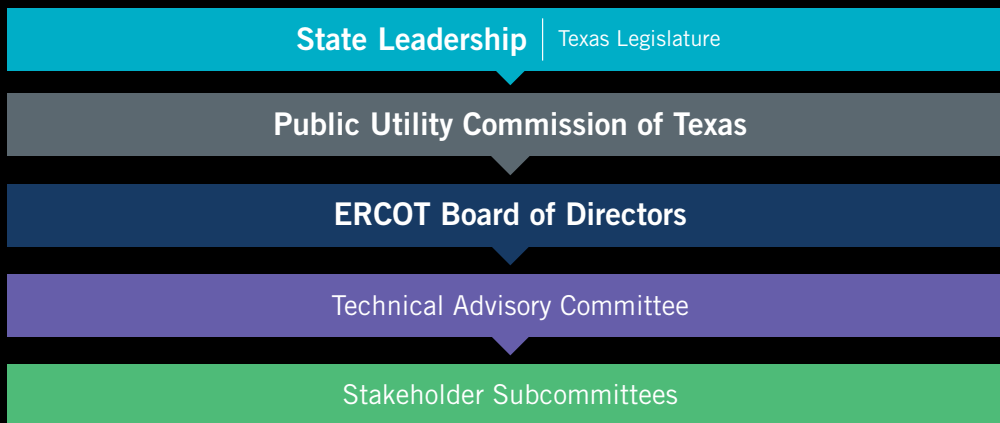
WHAT IS ERCOT?

The Electric Reliability Council of Texas, or ERCOT, is a nonprofit organization that manages the flow of electric power to more than 26 million Texas customers representing 90 percent of the state’s electric load. Over the past decade, energy use in ERCOT increased by 20 percent due to a strong Texas economy and population growth.

The ERCOT electric system is comprised of 46,500 miles of transmission lines and more than 680 generation resources. While ERCOT does not own these resources, it is responsible for ensuring the reliability of the electric system.

This is achieved through a competitive wholesale electricity market that pays resources only for the energy dispatched onto the grid, as well as other resources that are available to address sudden changes on the electric system. ERCOT also provides financial and accounting services for the wholesale market.

Additionally, the grid operator has an extensive transmission planning process to ensure the reliability of the electric system.



ERCOT is regulated by the Public Utility Commission of Texas (PUC) and the Texas Legislature. In 1999, the Texas Legislature restructured the Texas electric market and assigned ERCOT four primary responsibilities: provide system reliability, foster a competitive wholesale electricity market, foster a competitive retail market and provide open access to transmission.



2019 was another record-setting year for ERCOT. Electricity demand exceeded 74,000 MW, and the grid operator was equipped to handle the increased load. At the same time, a historically low reserve margin of 8.6% set the stage for some tight grid conditions during the hottest summer months.

Low power reserves resulted in the need to enter into emergency conditions on two occasions. This was the first time ERCOT declared an emergency since January 2014. During both events, ERCOT was able to maintain system reliability using the tools available once an Energy Emergency Alert is declared.

Over the past decade, energy use in ERCOT increased by 20 percent as the Texas economy flourished and the population increased. Between 2018 and 2019, annual energy use was up two percent. Historically, this growth has been primarily due to new industrial facilities along the coast near Houston and oil and gas activities in Far West Texas. The latest forecast issued by ERCOT indicates that load will continue to increase.

ERCOT's planning group is continually assessing system needs to address this growing electric demand and the changing energy landscape. In 2019, generation developers submitted a record number of interconnection requests for wind and solar facilities.

Beyond summer operations and planning, ERCOT established cross-functional teams to develop and implement market improvements, including Real-Time Co-optimization, Battery Energy Storage and Distribution Generation Resources. These efforts will help ERCOT reliably and efficiently address a changing grid.

The grid operator also began working on security initiatives to address the increased risk of cyberattacks on critical infrastructure.

Additionally, ERCOT was once again able to pass its 2020–2021 budget without raising the System Administration Fee. Without compromising affordability, ERCOT continues to position itself as one of the leading grid operators in managing an electric system that includes all generation resources.



ERCOT is committed to providing a transparent process for its policymakers and stakeholders. Stakeholder subcommittees, working groups and task forces provide open forums for market participants to evaluate market rules and procedures and weigh in on their effectiveness.

2019 Highlights

Supported approximately

200 stakeholder meetings



108 approved Revision Requests



132 new Revision Requests



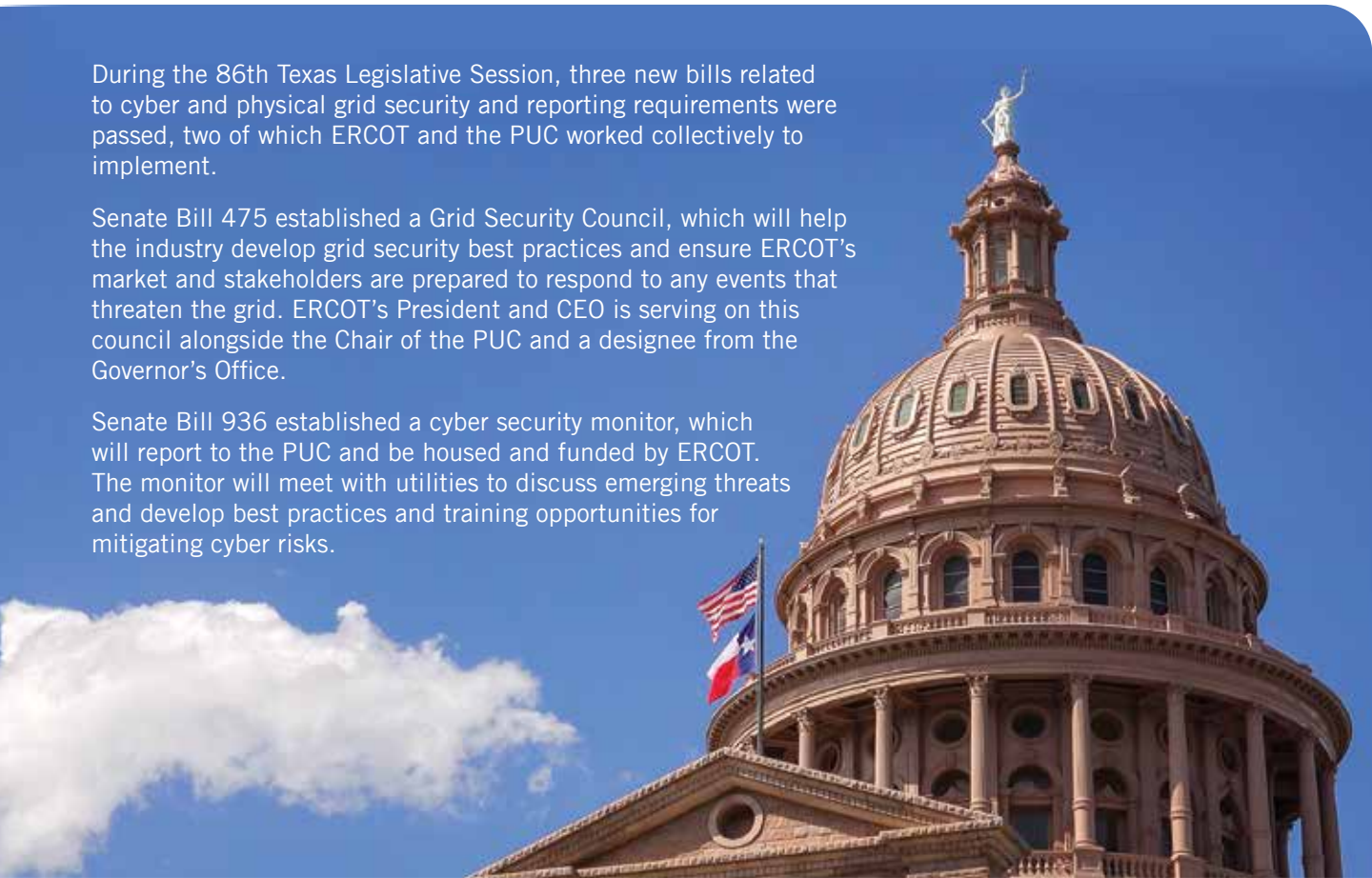
453 reports for actions from the Technical Advisory Committee and subcommittees



During the 86th Texas Legislative Session, three new bills related to cyber and physical grid security and reporting requirements were passed, two of which ERCOT and the PUC worked collectively to implement.

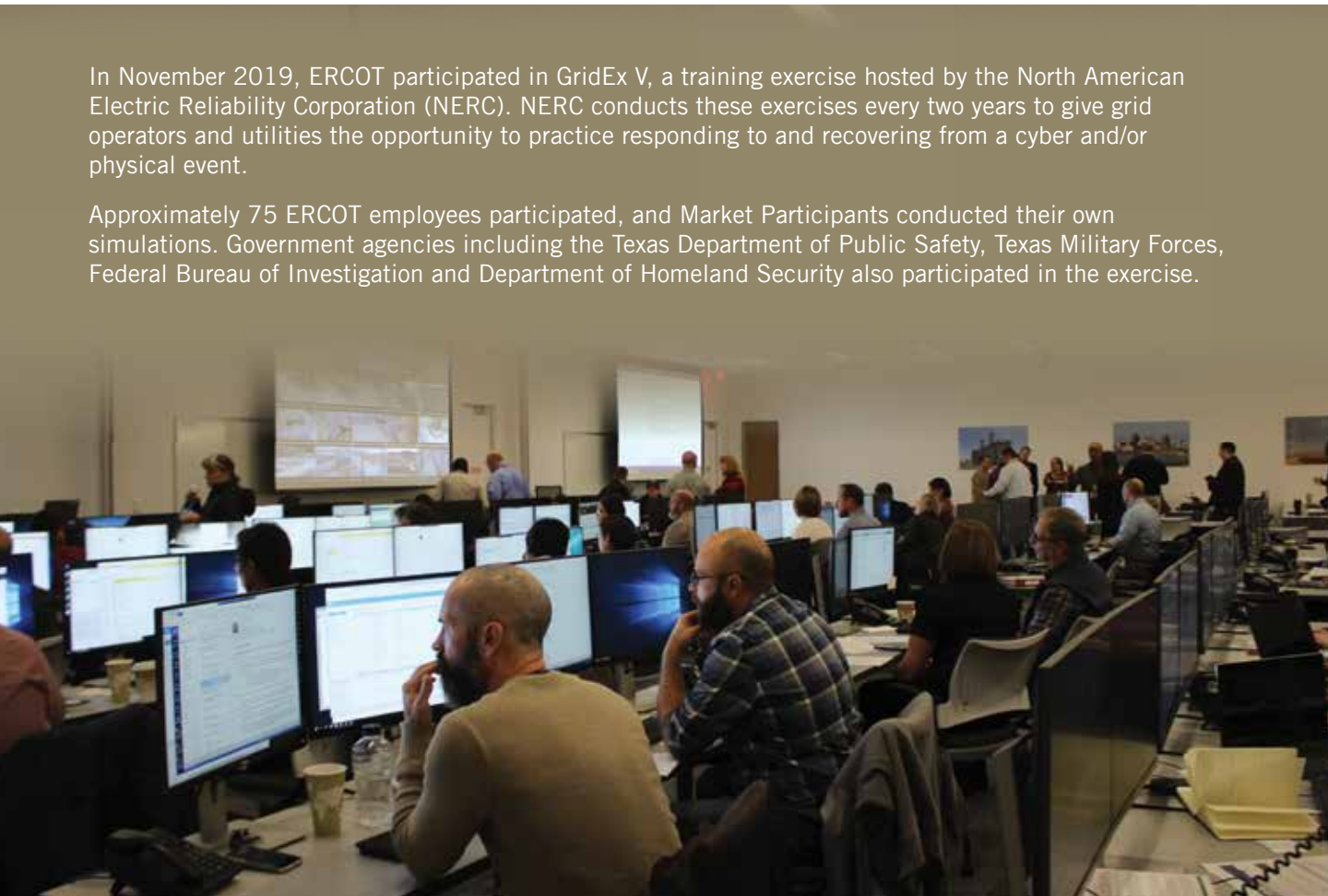
Senate Bill 475 established a Grid Security Council, which will help the industry develop grid security best practices and ensure ERCOT's market and stakeholders are prepared to respond to any events that threaten the grid. ERCOT's President and CEO is serving on this council alongside the Chair of the PUC and a designee from the Governor's Office.

Senate Bill 936 established a cyber security monitor, which will report to the PUC and be housed and funded by ERCOT. The monitor will meet with utilities to discuss emerging threats and develop best practices and training opportunities for mitigating cyber risks.



In November 2019, ERCOT participated in GridEx V, a training exercise hosted by the North American Electric Reliability Corporation (NERC). NERC conducts these exercises every two years to give grid operators and utilities the opportunity to practice responding to and recovering from a cyber and/or physical event.

Approximately 75 ERCOT employees participated, and Market Participants conducted their own simulations. Government agencies including the Texas Department of Public Safety, Texas Military Forces, Federal Bureau of Investigation and Department of Homeland Security also participated in the exercise.



In 2019, ERCOT initiated processes for the development and implementation of Real-Time Co-optimization as well as Battery Energy Storage and Distribution Generation Resources. The goal is to implement these market improvements in conjunction with a major upgrade of the Energy Management System in 2024.



Real-Time Co-optimization (RTC)

RTC is the process of dispatching energy and Ancillary Services interchangeably in the Real-Time Market. Key accomplishments in 2019 included the establishment of the RTC Task Force and the development of RTC key principles, which are being used to draft market protocols for RTC. Those principles were approved by the ERCOT Board of Directors in February 2020.



Battery Energy Storage (BES)

A BES Task Force was established in 2019 to identify key topics and concepts for the integration of Energy Storage Resources. Staff also began drafting Nodal Protocol Revision Requests (NPRRs) that will address technical requirements, modeling needs and market rules for these resources.



Distribution Generation Resources (DGRs)

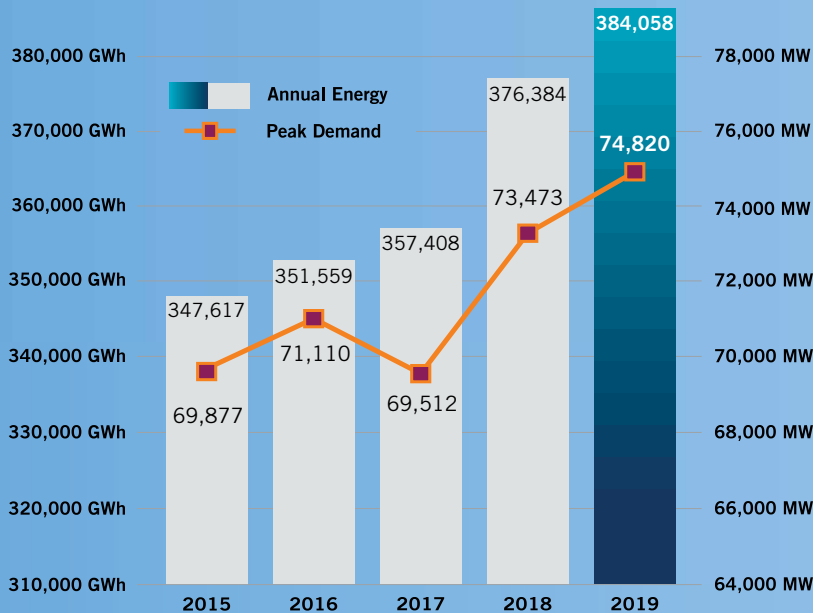
DGRs are resources that can be compensated by ERCOT for energy and Ancillary Services. Currently, all of the DGRs in ERCOT are batteries. In September 2019, ERCOT issued a market notice to temporarily limit the interconnection of new DGR projects while rules and requirements are developed through the stakeholder process. ERCOT is hosting a series of stakeholder workshops to gather input on the new requirements.

The ERCOT region continues to experience above-normal growth in peak electricity demand. Historically, this has been due to strong growth in Far West Texas and along the coast where new industrial facilities are being built. According to ERCOT’s latest forecast, load will continue to grow in the ERCOT region.

Electricity demand reached an all-time high in ERCOT in 2019 when system-wide load peaked at 74,820 MW on Aug. 12, between 4 and 5 p.m. This is more than 1,300 MW higher than the previous peak demand record set in 2018.

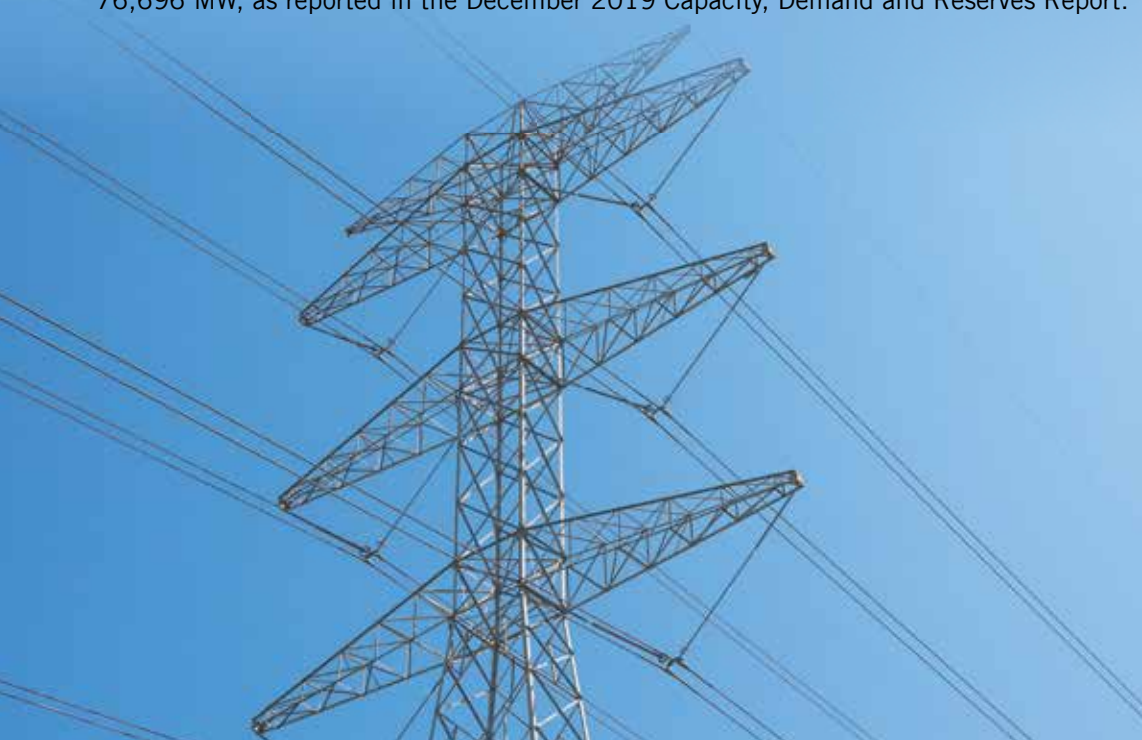
Demand Response (DR) from electric providers and consumers accounted for more than 2,000 MW on Aug. 12 when ERCOT set its new peak demand record.

2015-2019 Annual Energy and Peak Demand



Just prior to setting this record, ERCOT also set a new weekend peak demand record on Aug. 11, 2019, reaching 71,930 MW between 5 and 6 p.m.

In keeping with this trend, the summer peak forecast for 2020 is forecasted to be even higher at 76,696 MW, as reported in the December 2019 Capacity, Demand and Reserves Report.

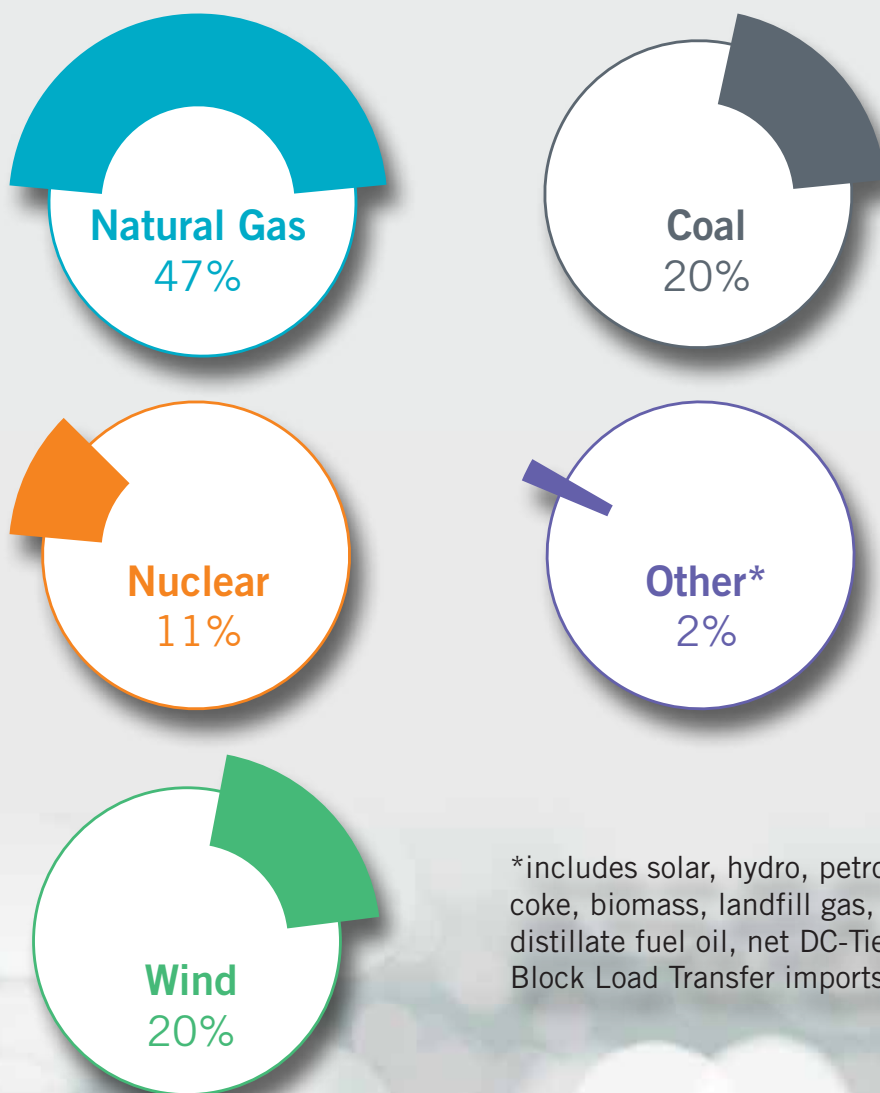


Annual energy use was up two percent in 2019 compared to 2018. In 2019, Texans consumed more than 384 billion kilowatt-hours.

While energy use continues to grow in ERCOT, the generation resource mix continues to evolve. More renewable resources are complementing traditional generation resources, and battery technology is becoming more prominent across the ERCOT region.

In 2019, the amounts of power produced by wind and coal were nearly equal, and power produced by wind exceeded the amount of power generated by coal during five months of the year. Natural gas-fired units accounted for the largest part of ERCOT's fuel mix.

2019 Annual Energy Fuel Mix



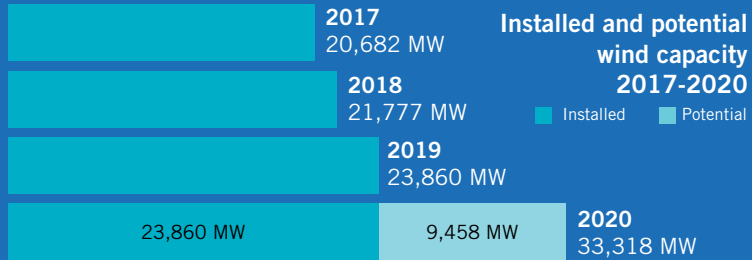
*includes solar, hydro, petroleum coke, biomass, landfill gas, distillate fuel oil, net DC-Tie and Block Load Transfer imports/exports

The ERCOT region continues to see more wind and utility-scale solar projects, and battery storage is beginning to make its mark as well. By the end of 2019, more than 67,000 MW of utility-scale solar was under study and more than 30,000 MW of wind.

Installed wind capacity reached 23,860 MW in 2019 and could exceed 33,000 MW by the end of 2020.

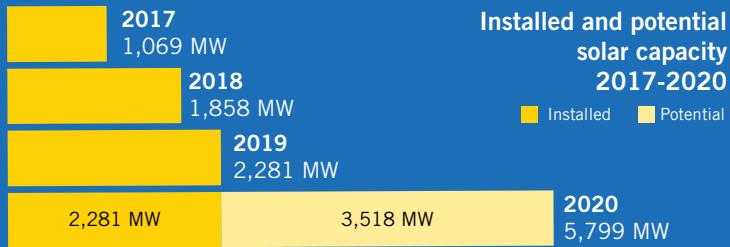
ERCOT's instantaneous wind output record for 2019 was 19,672 MW, set on Jan. 21, 2019 at 7:19 p.m. The wind penetration record of 57.88% was set on Nov. 26, 2019 and remains the current penetration record.

On Jan. 8, 2020, ERCOT set a new instantaneous wind output record of 20,066 MW at 10:18 p.m.



In 2019, utility-scale solar capacity reached 2,281 MW, and this number could double by the end of 2020.

With more solar projects coming online, wind and solar power have begun to complement each other. This benefit should increase as these resources continue to be built in diverse locations throughout the ERCOT grid.



Battery projects are also gaining traction in the ERCOT region, some of which are being co-located with solar projects. Battery storage totaled 104 MW in 2019 and is on track to exceed 350 MW by the end of 2020.



For the second year in a row, the number of interconnection requests in ERCOT has increased substantially. There were 343 requests in 2019, a more than 39 percent increase from 2018.

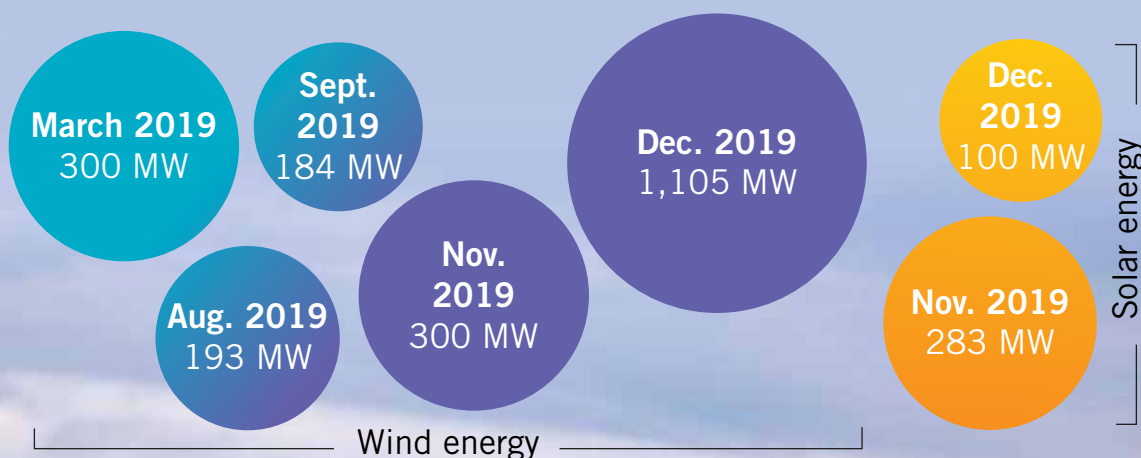
2017-2019 Interconnection Requests



Lower costs and an extension of federal tax incentives continue to drive more wind and solar development in ERCOT. By the end of 2019, the amount of utility-scale solar capacity under study exceeded the amount of wind capacity under study. Other resources in the interconnection queue include small, flexible gas-fired units and batteries.

In 2019, 10 wind projects and three solar projects totaling 2,466 MW became commercially operable.

Wind and solar projects that became commercially operable in 2019



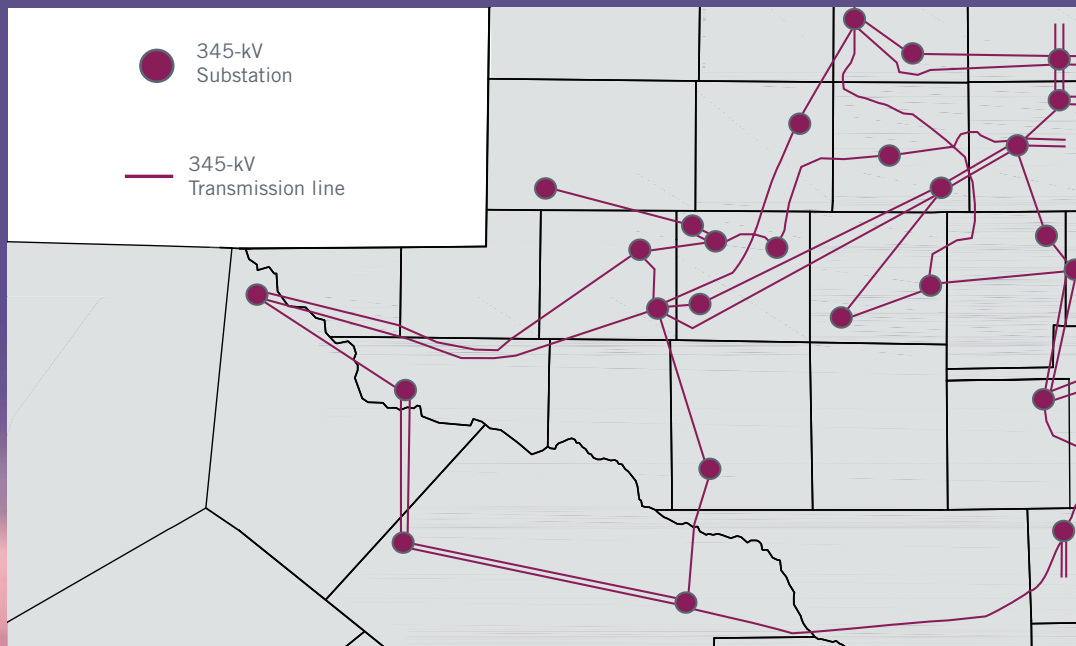
The Far West Texas region in ERCOT continues to experience unusually high load growth, with electric demand increasing significantly in this area over the past two years. In summer 2019, load exceeded 4,000 MW for the first time and was approximately 700 MW higher compared to 2018.

Based on current oil and gas customer requests for new service, planned transmission system improvements are sufficient to reliably serve demand through 2024. However, if the load grows faster than forecasted, more transmission improvements will be needed.

In 2019, ERCOT conducted the Delaware Basin Load Integration Study to develop a future transmission improvement roadmap using a higher-than-forecasted load level provided by Transmission Service Providers in consultation with their oil and gas customers.

The results of the study will be used to inform future planning needs in the ERCOT region and are not an endorsement for any new projects.

Delaware Basin Transmission Area

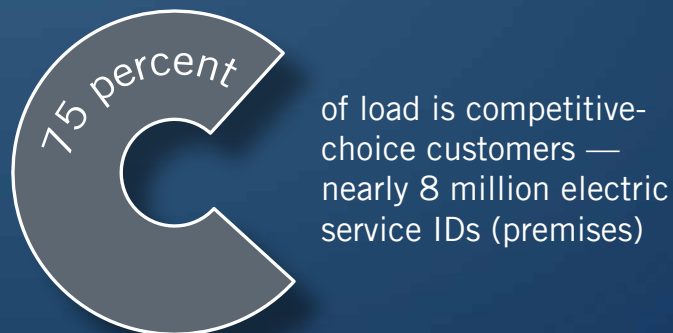
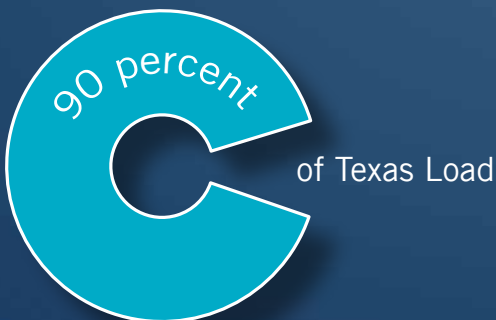


ERCOT FACTS

- 1,800+ active market participants that generate, move, buy, sell or use wholesale electricity
- 82,000+ MW of expected capacity for summer 2020 peak demand
- 680+ generating units, excluding PUNs
- 46,500+ miles of high-voltage transmission



More than **26 million** customers in the ERCOT region



ERCOT Board of Directors

Craven Crowell ■
Chair (Unaffiliated)

Judy Walsh ■
Vice Chair (Unaffiliated)

Rick Bluntzer ■
Just Energy Texas, LP
(Independent Retail Electric Provider)

Terry Bulger ■
(Unaffiliated)

Mark Carpenter ■
Oncor Electric Delivery Company
(Investor-Owned Utility)

Lori Cobos ■
Office of Public Utility Counsel
(Residential Consumer, ex officio)

Seth Cochran ■
DC Energy Texas, LLC
(Independent Power Marketer)

Peter Cramton ■
(Unaffiliated)

Nick Fehrenbach ■
City of Dallas
(Commercial Consumer)

Kevin Gresham ■
RWE Renewables Americas LLC
(Independent Generator)

Sam Harper ■
Chaparral Steel Midlothian, LP
(Industrial Consumer)

Clifton Karnei ■
Brazos Electric Power Cooperative, Inc.
(Cooperative)

Bill Magness
President and Chief Executive Officer, ERCOT (ex officio)

Karl Pfirrmann ■
(Unaffiliated)

Jackie Sargent ■
Austin Energy
(Municipal)

DeAnn T. Walker
Chair, Public Utility Commission of Texas
(ex officio, non-voting)

Segment Alternates

Keith Emery □
Tenaska Power Services Co.
(Independent Power Marketer)

Mike Kezar □
South Texas Electric Cooperative, Inc.
(Cooperative)

Glen Lyons □
ExxonMobil Power and Gas Services, Inc.
(Industrial Consumer)

Jennifer Richie □
City of Waco
(Commercial Consumer)

Ned Ross □
Direct Energy
(Independent Retail Electric Provider)

Steven Schleimer □
Calpine Corporation
(Independent Generator)

Wade Smith □
American Electric Power Service Corporation
(Investor-Owned Utility)

Ian Taylor □
New Braunfels Utilities
(Municipal)

■ Human Resources and Governance Committee Member ■ Finance and Audit Committee Member □ Human Resources and Governance Committee Alternate □ Finance and Audit Committee Alternate



Jan. 21
19,672 MW
New wind record

March 5
1,506 MW
First time 1,500 MW of solar generation reached

Aug. 11
71,930 MW
New weekend demand record

Aug. 12
74,820 MW
New all-time peak demand record

Nov. 26
57.88%
New wind penetration record with 18,084 MW load on the system



This publication is dedicated to Stephen Daniels and Joe Weatherly, who both passed away in 2019. Daniels served as ERCOT's Vice President of Digital Services, and Weatherly served as Manager of Network Modeling. Their contributions to ERCOT will always be remembered.

January
2019

February
2019

March
2019

April
2019

May
2019

June
2019

July
2019

August
2019

September
2019

October
2019

November
2019

December
2019

Colored lines represent highest daily peak demand for the ERCOT region from Jan. 1 to Dec. 31, 2019.

